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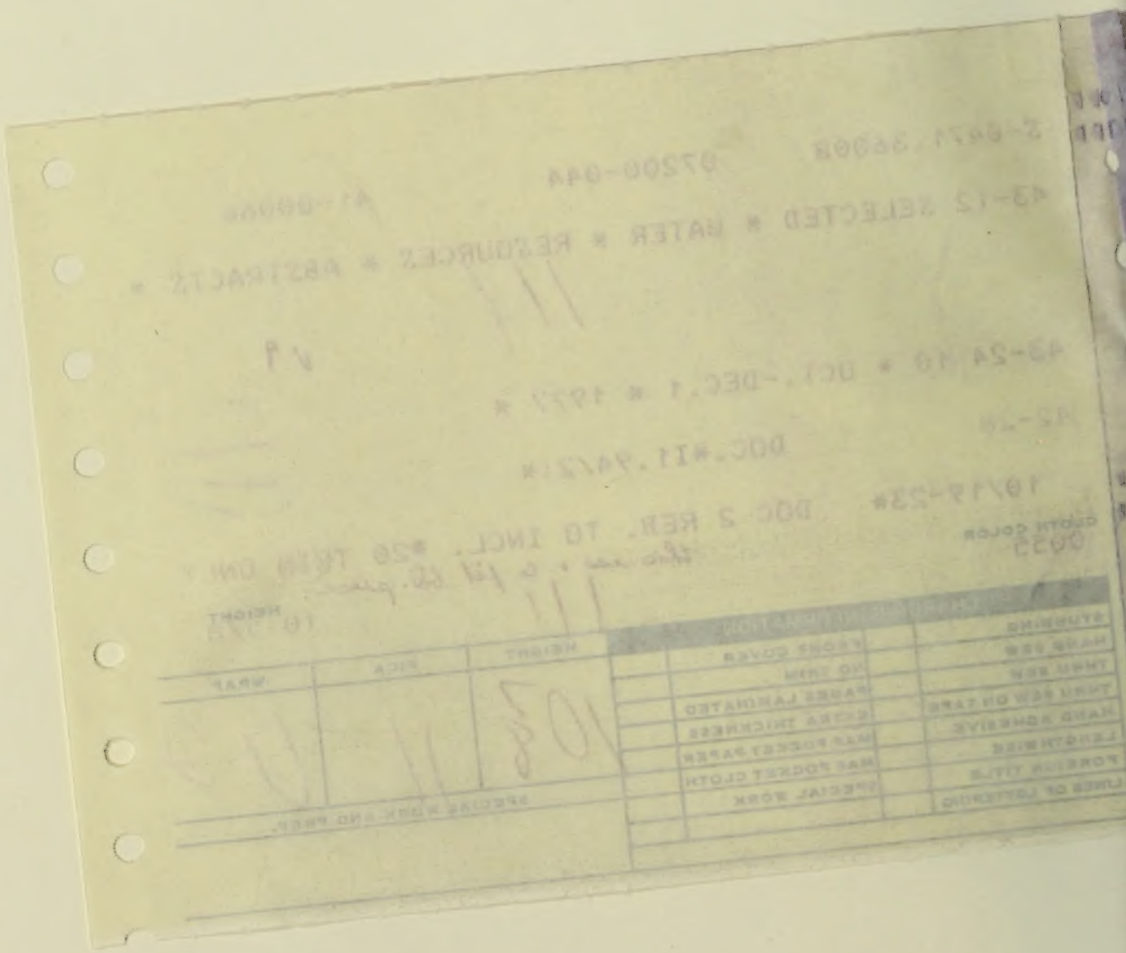

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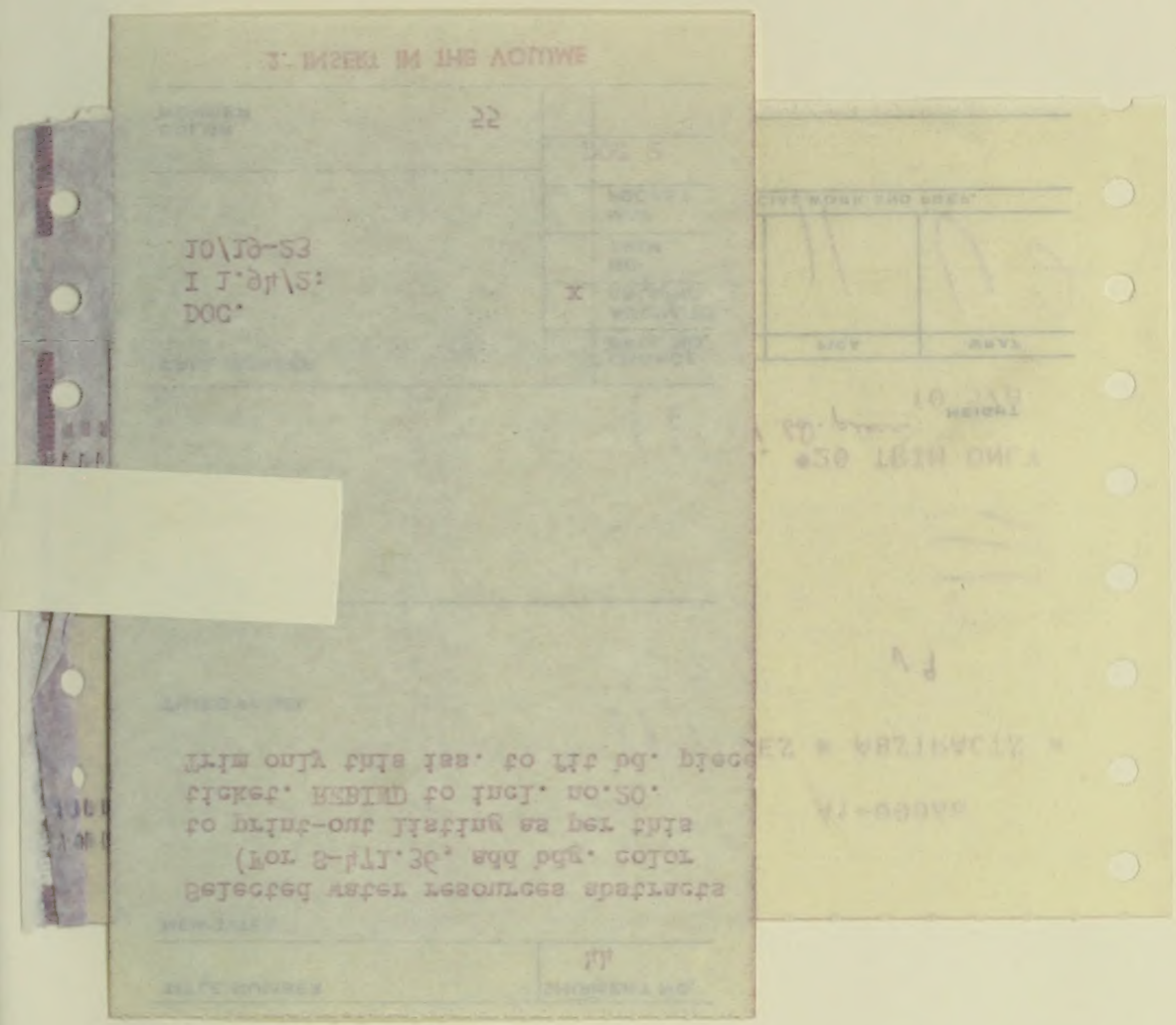

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SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 20
OCTOBER 15, 1977

W77-09601 -- W77-10100

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
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06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

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ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

A DSC (DIFFERENTIAL SCANNING CALORIMETRY) STUDY OF HEAT CAPACITY OF VICINAL WATER IN POROUS MATERIALS,
Miami Univ., Fla.
C. V. Braun, Jr., and W. Drost-Hansen.
In: Proceedings of the International Conference on Colloids and Surfaces, 50th Colloid and Surface Science Symposium, San Juan, Puerto Rico, June 21-25, 1976, Colloid and Interface Science, Vol. III, p 533-541. Academic Press, 1976. 2 fig, 20 ref, 1 tab.

Descriptors: *Water properties, *Pore water, Thermal capacity, Porous media, Water structure, Water analysis, Physical properties, Water types, Thermodynamic behavior.
Identifiers: *Vicinal water, *Differential scanning calorimetry.

Vicinal water (adjacent to solid interfaces) is thought to possess structures which differ notably from the bulk structure, and accordingly to show different thermodynamic properties. These properties were measured for various porous media (chromatographic glass, activated carbon, zeolite molecular sieves, and synthetic diamond powder), using a DSC method. Results to data have not provided firm additional evidence for the occurence of thermal anomalies, but do suggest that the heat capacity of water in porous media is significantly greater than for bulk water, measured by the same technique. Assuming that all of the water present possesses a modified structure, the apparent heat capacity is at least 20% larger than for bulk water and nearly independent of the specific chemical nature of the solid material. (Brown-IPC)
W77-09734

2. WATER CYCLE

2A. General

METHANE OXIDATION IN A EUTROPHIC CANADIAN SHIELD LAKE,
For primary bibliographic entry see Field 5C.
W77-09608

THE ORIGIN AND STRUCTURE OF AMERICAN ARID-ZONE ECOSYSTEMS. THE PRODUCERS: INTERACTIONS BETWEEN ENVIRONMENT, FORM AND FUNCTION,
San Diego Univ., Calif. Dept. of Biology.
P. C. Miller, and H. A. Mooney.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-740912-3, Price codes: A02 in paper copy, A01 in microfiche. Paper presented at: International Congress of Ecology, The Hague, Netherlands, September 1974. 34 p, 9 fig, 2 tab, 54 ref.

Descriptors: *Arid lands, *Climatic data, *California, *Ecosystems, *Vegetation, Adaptation, Shrubs, Precipitation(Atmospheric), Water utilization, Plant morphology, Soil moisture, Air temperature, Seasonal, Photosynthesis.
Identifiers: *Chile, *Mediterranean climate, *Evergreen shrubs, Plant water potential, Leaf resistance, Deciduous shrubs.

The Mediterranean scrub areas of California and Chile occur in a climate with winter rain, summer drought, and mild winter temperatures, with evergreen sclerophyllous shrubs predominating. Such areas are centered around 32.5 latitude, where climatic and vegetational differences occur between and within countries; coastal regions are drier than the inland and have more drought deciduous shrubs. California is hotter in the summer and cooler in the winter than Chile, and the vegetation there has a greater frequency of narrow, steeply inclined leaves. Air temperatures and precipitation patterns are discussed. Soil moisture is high throughout the soil profile in winter and spring; drier coastal conditions are also indicated in measurements of plant water potential and leaf resistance to water loss. The occurrence of evergreen, deciduous, shrub and herb forms are described. Narrow, steeply inclined leaves of hot summer active shrubs increase photosynthesis and water use efficiency. (Jahns-Arizona)
W77-09933

WATER SUPPLY FROM SHELBYVILLE AND CARLYLE LAKES AND THEIR OPTIMAL JOINT OPERATION,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-09943

RETURN PERIODS OF HYDROLOGICAL EVENTS,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 2B.
W77-09958

SENSITIVITY ANALYSIS OF THE WATER QUALITY FOR RIVER-RESERVOIR SYSTEMS MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5B.
W77-09981

APPLICATION OF THE U.S. GEOLOGICAL SURVEY RAINFALL RUNOFF SIMULATION MODEL TO IMPROVE FLOOD-FREQUENCY ESTIMATES ON SMALL TENNESSEE STREAMS,
Geological Survey, Nashville, Tenn. Water Resources Div.
H. C. Wibben.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 566, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-120, 1976. 53 p, 12 fig, 4 tab, 11 ref.

Descriptors: *Flood forecasting, *Flood frequency, *Model studies, *Tennessee, *Small watersheds, Analytical techniques, Simulation analysis, Rainfall-runoff relationship, Peak discharge, Correlation analysis, Hydrologic data, Evaluation.
Identifiers: *Rainfall-runoff models.

The U.S. Geological Survey rainfall-runoff simulation model was used in conjunction with National Weather Service climatological data to improve flood-frequency estimates for 52 small drainage basins in Tennessee. The basins range in size from 0.17 to 64 square miles (0.44 to 166 square kilometers) and are distributed throughout the State. Model parameters were determined by calibration with observed data from each site. Average error of peak discharge simulation was about 36 percent. Techniques used in screening data for calibration as well as those used to optimize parameter values are discussed. A scheme developed to assess the relative accuracy of the frequency curves based on observed and simulated data indicated that the simulated data are equivalent to nine years of observed data in defining 2-year floods, and fifteen years in defining 100-year floods. Discharges corresponding to the best estimate of flows for selected recurrence intervals are tabulated for each modeled basin. (Woodard-USGS)
W77-10004

SMALL CATCHMENT FLOOD MODELLING,
South African Dept. of Water Affairs, Pretoria. Div. of Hydrology.
For primary bibliographic entry see Field 2E.
W77-10083

2B. Precipitation

SATELLITE-DERIVED GLOBAL OCEANIC RAINFALL ATLAS (1973 AND 1974),
National Aeronautics and Space Administration, Greenbelt. Goddard Space Flight Center.
For primary bibliographic entry see Field 7C.
W77-09693

WEATHER MODIFICATION EFFECTS AND MANAGEMENT (A BIBLIOGRAPHY WITH ABSTRACTS),
National Technical Information Service, Springfield, Va.
R. J. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as NTIS/PS-76/0931, Price codes: N01 in paper copy, N01 in microfiche. Report NTIS/PS-76/0931, November 1976. 269 p.

Descriptors: *Weather modification, *Bibliographies, *Management, *Abstracts, Cloud seeding, Meteorology, Legal aspects, Weather, Climates, Effects, Water supply, Arid climates, Ecology, Precipitation(Atmospheric), Artificial precipitation, Remote sensing.
Identifiers: Weather modification effects.

The bibliography cited adverse and beneficial effects, effect on the climate, legal aspects, ecological effects, and the effect upon water supplies of weather modification. Studies related to the management and utilization of weather modification to increase the water supply in arid regions were included. Topics dealing with the theory and physics of cloud seeding and precipitation nucleation were excluded. This updated bibliography contains 172 abstracts, 47 of which are new entries to the previous edition. (Froehlich-ISWS)
W77-09694

TEMPORALLY AND AREALLY DISTRIBUTED RAINFALL,
Agricultural Research Service, Athens, Ga. Southeast Watershed Lab.
J. D. Dean, and W. M. Snyder.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 103, No. IR2, Proceedings Paper 13002, p 221-229, June 1977. 7 fig, 2 tab, 10 ref, 1 append.

Descriptors: *Climatology, Computers, *Floods, *Irrigation, *Rainfall intensity, Rainfall-runoff relationships, Rain gages, Optimization, Storms, Raindrops, Temporal distribution, Planning, *Rainfall disposition.
Identifiers: *Rainfall distribution, *Temporally distributed rainfall, Grid, Areally distributed rainfall, Grid element, Climatic determinations, Arithmetic mean, Thiessen method.

Areally distributed rainfall was computed readily by superimposing a square grid on the area of interest. Weights for each grid element for each rain gauge affecting the area were made functions of reciprocal distance to some power. Optimization confirmed the value of the exponent that is in general use. The method can be used to calculate the areal average of storm, day, or longer, total precipitation in climate determinations or water resource planning. Also, the method can be used to calculate moving fields of rainfall by short-time increments during the progress of a storm over an area. (Roberts-ISWS)
W77-09696

EXPERIENCES WITH THE USE OF THE AEROLOGICAL METHOD IN EVAPORATION STUDIES IN NORTHWESTERN EUROPE,
Helsinki Univ. (Finland). Dept. of Meteorology.
For primary bibliographic entry see Field 2D.
W77-09710

RELATION OF SOME METEOROLOGICAL ELEMENTS TO AVALANCHING IN THE DUKANT RIVER BASIN (WESTERN TIEN-SHAN),
For primary bibliographic entry see Field 2C.
W77-09718

ACCELERATION TO TERMINAL VELOCITY OF CLOUD AND RAINDROPS,
California Univ., Los Angeles. Dept. of Atmospheric Sciences.
P. K. Wang, and H. R. Pruppacher.
Journal of Applied Meteorology, Vol 16, No 3, p 275-280, March 1977. 4 fig, 20 ref. NSF DES75-09999.

Descriptors: *Raindrops, *Clouds, *Velocity, Particle size, Laboratory tests, Equations, Settling velocity, Pressure, Temperature, Drag, Cloud physics, Meteorology.
Identifiers: *Terminal velocity(Clouds and raindrops).

A theoretical method was given which allows computing the acceleration to terminal velocity of cloud and raindrops at various levels in the atmosphere. For drops of an equivalent radius between 800 and 3500 micrometers, theoretical predictions were found to agree well with the results of an experimental study carried out in the UCLA Rain-Shaft. For drops of a radius between 20 and 80 micrometers, theoretical predictions were found to agree well with the experimental results of Sartor and Abbott. Experiment and theory indicated that in air of 1000 mb and 20 C, drops of a radius greater than 1000 micrometers need distances of at least 12 m to accelerate to terminal velocity. (Sims-ISWS)
W77-09719

DEDUCTION OF ICE PARTICLE TYPES IN THE VICINITY OF THE MELTING LAYER FROM DOPPLER RADAR MEASUREMENTS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
R. R. Weiss, Sr., J. D. Locatelli, and P. V. Hobbs.
Journal of Applied Meteorology, Vol. 16, No. 3, p 314-316, March 1977. 5 fig, 5 ref. NSF ATM-74-14726-A02.

Descriptors: *Precipitation(Atmospheric), *Cloud physics, *Radar, Snow, Graupel, Rime, Aggregates, Ice, Crystals, Rainfall, Raindrops, Settling velocity, Temperature, Melting, Meteorology.
Identifiers: *Ice particles, Ice particle types, Dendrites, Doppler radar.

A technique was described for deducing, from vertically pointing Doppler radar measurements, whether the predominant ice particles just above the melting layer are graupel or aggregates of ice crystals. Under certain conditions, the type of graupel and the type of ice crystals which comprise the aggregates can be deduced. (Sims-ISWS)
W77-09720

THE ORIGIN AND STRUCTURE OF AMERICAN ARID-ZONE ECOSYSTEMS. THE PRODUCERS: INTERACTIONS BETWEEN ENVIRONMENT, FORM AND FUNCTION,
San Diego Univ., Calif. Dept. of Biology.
For primary bibliographic entry see Field 2A.
W77-09933

ARID LANDS OF SUB-SAHARAN AFRICA.
National Academy of Sciences, Washington, D.C. Commission on International Relations.
For primary bibliographic entry see Field 6E.
W77-09934

ICE NUCLEATION BY MICAS,
Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.
J. H. Shen, K. Klier, and A. C. Zettlemoyer.
Journal of Atmospheric Sciences, Vol. 34, No. 6, p 957-960, June 1977. 2 fig, 1 tab, 24 ref.

Descriptors: *Nucleation, *Cloud physics, *Cloud seeding, Laboratory tests, Crystals, Crystallization, Clouds, Precipitation(Atmospheric), Rain, Chemistry of precipitation, Freezing, Meteorology.
Identifiers: *Micas, Fluorine micas, Fluorophlogopite, Nucleants.

A fluorine mica, fluorophlogopite, was found to produce higher bulk water freezing temperature than many other nucleating agents including the parent hydroxphlogopite and even silved iodide. It is the most efficient catalyst yet found in this Laboratory. Fluorophlogopite has an inherently large mismatch with ice crystals, but the water cluster embryo apparently is sustained by an F-H-O hydrogen bond assisted by neighboring potassium ions. (Sims-ISWS)
W77-09956

RETURN PERIODS OF HYDROLOGICAL EVENTS,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
D. Rosbjerg.
Nordic Hydrology, Vol. 8, No. 1, 57-61, 1977. 1 ref.

Descriptors: *Annual peak discharge, *Poisson ratio, *Hydrology, Precipitation(Atmospheric), Stochastic processes, Model studies, Rainfall disposition, Floods, Rainfall intensity.
Identifiers: *Return periods, *Hydrological events, Annual maxima series, Annual exceedance series, Rainfall records.

A relation between return periods of hydrological events in annual maxima and partial duration series respectively was shown to be exactly fulfilled when the events take place according to a Poisson process. Furthermore, it was shown that the relation can be used as a good approximation when dealing with more regular processes than the Poissonian. A record of rainfall depths was analyzed. (Roberts-ISWS)
W77-09958

RAINFALL TRENDS IN 80 RAINFALL DISTRICTS OF SOUTH AFRICA,
South Africa Univ., Pretoria. Dept. of Geography.
P. A. Onesta, and P. Verhoef.
South African Journal of Science, Vol. 72, No. 9, p 274-276, September 1976. 2 fig, 2 tab, 12 ref.

Descriptors: *Rainfall, Regression analysis, Statistical analysis, *Precipitation(Atmospheric), Rainfall disposition, Africa.
Identifiers: *South Africa.

Reports are presented on the testing of the rainfall data in South African rainfall districts for long-term trends, and some parameters are established for future research work. Linear functions fitted for the period 1921-1970 showed a decrease in rainfall receipts over the eastern part of the country. (So African Water Info Center)
W77-10085

ON THE APPLICATION OF TREND SURFACES OF PRECIPITATION TO MOUNTAINOUS AREAS,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Agricultural Engineering.
R. E. Schulze.
Water SA, Vol. 2, No. 3, p 110-118, July 1976. 5 fig, 5 tab, 14 ref.

Descriptors: *Rainfall, Topography, Statistical methods, Thunderstorms, Rain gages, *Precipitation(Atmospheric), Africa, Watersheds(Basins).
Identifiers: Drakensberg, Cathedral Peak, South Africa.

The distribution of precipitation in mountainous, high runoff producing areas is a complicated function of atmospheric and surface interactions; for superimposed on a regional pattern of precipitation are influences of local topography and raingauge exposure. In hydrological modelling, studies indicate that the reliable and representative estimation of areal precipitation is very important for the successful simulation of streamflow events. The application of trend surface analysis to the estimation of catchment precipitation is tested at Cathedral Peak in the Natal Drakensberg. Results using this technique are shown to be successful for long-term, but not for short-term, more localised, precipitation records. (So African Water Info Center)
W77-10088

THE TEMPORAL VARIATION OF RAINFALL RUNOFF OVER THE SUMMER RAINFALL REGION OF SOUTH AFRICA,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Geography and Environmental Science.
M. A. Abbot, and T. G. Dyer.
South African Journal of Science, Vol. 72, No. 9, p 276-278, September 1976. map, 5 fig, 13 ref.

Descriptors: *Rainfall, Storm runoff, Summer, Temporal distribution, Time series analysis, Forecasting, Floods, Climatology, Droughts, Gaging.
Identifiers: South Africa.

Earlier work has shown that the rainfall over South Africa displays a pseudo-regular pattern with time and is of a regional character. Precipitation over the summer rainfall region oscillates with a period of the order of 20 years, which decreases in amplitude towards the southern part of the subcontinent. In the all-season coastal belt, rainfall displays two weaker oscillations, with periods of 10 and 20 years, respectively. In the present study, records of 10 runoff gauges were investigated. Runoff and rainfall exhibit the same oscillatory character which has a wavelength of approximately 20 years. For the summer rainfall region information now exists which will assist in the forecasting of droughts and floods, subject to the condition that the general circulation of the atmosphere over the sub-continent continues to behave as it has done for the past sixty years. (So African Water Info Center)
W77-10091

2C. Snow, Ice, and Frost

PRECIPITATION TREND AND STORM ANALYSIS IN COLORADO.
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
M. S. Kuo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 250, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, Summer 1975. 64 p, 13 fig, 20 tab, 26 ref. OWRT A-018-COLO(1).

Descriptors: *Colorado, *Precipitation(Atmospheric), Data collections, *Statistical methods, *Storms, Rainfall intensity, Rainfall disposition, *Thunderstorms.

The precipitation trend in Colorado was studied statistically using 56 years of data collected at 61

stations. The precipitation is found to have an annual decrease of 0.01 inches over the 56 year period although this result was not statistically significant. Precipitation periods (referred to as storms) were used to describe the variation of the precipitation in space and time. The state of Colorado was divided into six geographic regions, and area weighted hourly precipitation data were summed to obtain the volume of water yielded by each storm. It was found that 80% of the annual volume is produced by 30% of the storms. The western third of the state shows no marked seasonal variation in precipitation, but the southern half receives more precipitation than the northern half. The middle third of the state receives 60% of its precipitation in the summer, and the eastern part, the high plains, receives 80% during the summer months. Thunderstorms predominate during the summer, large scale storms in the winter. The summer precipitation volume is correlated with the annual volume in all regions. After categorizing the storms events of all sizes than the driest years with no noticeable change in the distribution of the size of the storms. (Martin-Colo-St).
W77-09685

BASAL TILL FABRICS OF MODERN ALPINE GLACIERS,
Washington Univ., Seattle. Dept. of Geological Sciences.
H. H. Mills.
Geological Society of America Bulletin, Vol 88, No 6, p 824-828, June 1977. 4 fig, 3 tab, 29 ref.

Descriptors: *Glaciers, *Till, *Glacial soils, Glacial drift, *Glacial sediments, Soils, Soil types, Ice, Geological surveys, Data processing, Geology, Glaciology.
Identifiers: Till fabrics, Modern glaciers, *Basal tills.

Basal-till fabrics from three alpine glaciers ranging in length from 2.5 to 7.5 km were analyzed. Fabric patterns are similar to those reported from basal tills of lowland glaciers: a single model parallel to iceflow direction and a preference for upglacier dips. Eigenvalue analysis, however, showed that the preferred planes of the axes are weaker than those reported from one Pleistocene ice sheet. Two methods of analysis indicated that there is little relation between clast orientation and clast size or shape. (Sims-ISWS)
W77-09704

NORTH ATLANTIC ICE-RAFTING: A MAJOR CHANGE AT 75,000 YEARS BEFORE THE PRESENT,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2J.
W77-09706

MOVEMENT OF SNOW AVALANCHES,
N. S. Bakhvalov, A. G. Kulikovskiy, V. N. Kurkin, Ye. I. Sveshnikova, and M. E. Eglit.
Soviet Hydrology, Selected Papers, No 4, p 243-248, 1975. 4 ref, 3 fig. Translated from Transactions of the Central Asian Regional Hydrometeorological Scientific Research Institute (Trudy SARNIGMI), No 15(96), p 3-15, 1974.

Descriptors: *Avalanches, *Snow, *Model studies, Theoretical analysis, Movement, Snowpacks, Foreign research, Movement, Mathematical models, Analytical techniques, Analysis, Mathematical studies, Hydraulics, Flow, Velocity, Profiles.
Identifiers: *USSR, *Snow dust avalanches.

Theoretical analyses were presented for the movement of dense dry or wet snow avalanches and a snow dust avalanche along a slope. For the dry or wet avalanches, the snow movement was described by equations similar to those used in hydraulics to describe homogeneous liquid flows. It was assumed that it is sufficient to take into account only the average parameters over the cross section thickness of the moving layer. And for the forces of resistance associated with internal friction for a uniform velocity distribution in the avalanche, one can use the laws of hydraulics. For the movement of snow dust forming a snow avalanche or air wave accompanying some dense avalanches, the complete equations of the hydraulics of turbulent flows of mixtures of various components were used. (Humphreys-ISWS)
W77-09716

MATHEMATICAL DESCRIPTION OF SOME PHYSICAL SNOW COVER CHARACTERISTICS,
Yu. M. Denisov, and Ye. B. Trofimova.
Soviet Hydrology: Selected Papers, Issue No 4, p 249-251, 1975. 2 fig, Translated from Transactions of the Central Asian Regional Hydrometeorological Scientific Research Institute (Trudy SARNIGMI), No 15(96), p 87-93, 1974.

Descriptors: *Snow cover, *Mathematical models, *Moisture content, Ice, Water, Temperature, Air temperature, Evaporation, Foreign research, Foreign countries, Snow, Mathematical studies, Analytical techniques.
Identifiers: *USSR, Heat transport, Moisture transport.

Snow cover was regarded as a complex system consisting of three phases: ice, water, and moist air. On this basis, a system of equations was derived, describing heat and moisture transport in the snow, which gave the particular solution of a one-dimensional problem for dry snow. In constructing a mathematical model, it was assumed that ice particles in the snow always are coated with water, and, if the pores in the snow are not completely filled with water, air can border only on water. Computation results were presented for snow temperatures at various depths and for the variations of evaporation from the snow surface. Snow surface temperature variations repeated the pattern of air temperature fluctuations, and the fluctuations attenuated with depth were shifted in time. (Humphreys-ISWS)
W77-09717

RELATION OF SOME METEOROLOGICAL ELEMENTS TO AVALANCHING IN THE DUKANT RIVER BASIN (WESTERN TIEN-SHAN),
M. K. Yefimov, and Ye. M. Kozik.
Soviet Hydrology, Selected Papers, No 4, p 252-255, 1975. 2 tab. Translated from Transactions of the Central Asian Regional Hydrometeorological Scientific Research Institute (Trudy SARNIGMI), No 15(96), p 144-148, 1974.

Descriptors: *Avalanches, *Snow, *Forecasting, On-site investigations, Analysis, Evaluation, Climatology, Equations, Snow cover, Foreign research, Foreign countries, Air temperature.
Identifiers: *USSR(Dukant River Basin).

Avalanching is known to depend strongly on meteorological conditions and on snow cover properties, which are determined mainly by the preceding weather. The effect of some given meteorological elements on avalanching varies, depending on physiographic conditions, and has not been sufficiently studied to forecast avalanching reliably or to indicate avalanche danger or the lack of it. Avalanching was studied in the area of the Dukant avalanche station. Factors considered were: (1) average daily, maximum, and minimum air temperatures at a height of 2.0 m above the soil surface; (2) amount and type of precipitation; and (3) snow cover depth and its variation in the course of the day. Linear regression equations of the relationships obtained for 128 avalanches were tabulated. The formulas were recommended for forecasting avalanches after the date of establishment of a permanent snow cover and subsequent snowfall totaling 60 mm, which is necessary to cover small shrubs, rocks, and other surface irregularities that prevent avalanche formation on mountain slopes. (Humphreys-ISWS)
W77-09718

DEDUCTION OF ICE PARTICLE TYPES IN THE VICINITY OF THE MELTING LAYER FROM DOPPLER RADAR MEASUREMENTS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2B.
W77-09720

ICE NUCLEATION BY MICAS,
Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.
For primary bibliographic entry see Field 2B.
W77-09956

2D. Evaporation and Transpiration

WATER EXCHANGE OF JUICY FRUITS OF TREES AND BUSHES, (IN RUSSIAN),
N. I. Antipov.
Fiziol Rast (Mosc) 23(1), p 152-155, 1976.

Descriptors: *Trees, Age, *Fruit crops, *Transpiration, *Moisture content, *Shrubs.
Identifiers: Aronia melanocarpa, Berberis vulgaris, Cerasus vulgaris, Crataegus sanguinea, Frangula alnus, Phellodendron reclinata, Lonicera xylosteum, Padus racemosa, Phellodendron amurense, Prunus spinosa, Rhamnus cathartica, Ribes nigrum, Ribes rubrum, Rosa majalis, Sambucus racemosa, Sorbus aucuparia, Transpiration, Trees, Viburnum-opulus.

Transpiration and water content were studied in the juicy fruits and leaves of 17 spp. of trees and bushes (Cerasus vulgaris, Padus racemosa, Ribes rubrum, R. nigrum, Grossularia reclinata, Prunus spinosa, Crataegus sanguinea, Sorbus ancuparia, Aronia melanocarpa, Phellodendron amurense, Sambucus racemosa, Lonicera xylosteum, Rhamnus cathartica, Rosa majalis, Viburnum opulus, Frangula alnus, Berberis vulgaris). The rate of transpiration calculated per wet mass was much lower in the fruits than in the leaves. The rate of transpiration calculated per surface unit was higher in the young fruits and lower in the ripe fruits in comparison with leaves. The water content was higher in the young fruits, which use it at a higher rate than the ripe fruits in the process of transpiration.–Copyright 1976, Biological Abstracts, Inc.
W77-09611

EXPERIENCES WITH THE USE OF THE AEROLOGICAL METHOD IN EVAPORATION STUDIES IN NORTHWESTERN EUROPE,
Helsinki Univ. (Finland). Dept. of Meteorology.
M. Alestalo, and H. Savijarvi.
Nordic Hydrology, Vol 8, No 1, p 47-56, 1977. 4 fig, 3 tab, 9 ref.

Descriptors: *Evaporation, Europe, *Synoptic analysis, Water vapo, Humidity, Precipitation(Atmospheric), Meteorological data, Cyclones, Surface waters.
Identifiers: *Aerological methods, *Baltic Sea.

Two different approaches of the aerological method were used for estimating evaporation in northwestern Europe in the period 1969-1970. Daily operational aerological observations gave better results for homogeneous areas than for a nonhomogeneous surface. One drawback in the mentioned approach was the non-uniform station network due to a lack of observations and resulting in scattered values even for monthly means. Based on annual mean moisture fluxes at the aerological stations, the evaporation from the

Bothnian Sea was estimated to be about 33 mm/year. The main convergence of the water vapor flux occurred below the 900 mb level and was largely due to the mean part of the flux. The results appeared to be dependent on the homogeneity of the data sample. In both approaches, the main sources of error was the lack of data and the low quality of available data, because divergence calculations are sensitive to errors in wind data. The linearity approximation used also failed in low levels. Careful data checking and the use of complete data samples are needed when the aerological methods is applied. (Roberts-ISWS)
W77-09710

A MODEL OF TRANSPIRATION AND INTERCEPTION LOSS FROM A SPRUCE FOREST IN PLYNLIMON, CENTRAL WALES,
Institute of Hydrology, Oxon (England).
I. R. Calder.
Journal of Hydrology, Vol 33, No 3/4, p 247-265, May 1977. 5 fig, 2 tab, 11 ref.

Descriptors: *Transpiration, *Interception, *Forests, *Forest watersheds, *Evaporation, Lysimeters, Weather data, Optimization, *Model studies, Foreign studies, Foreign research, Stations.
Identifiers: *Interception loss, *Wales(Plynlimon), Spruce forest.

A model of evaporation loss (interception plus transpiration) from a spruce forest, based on the Penman-Monteith equation, was derived from lysimeter and automatic weather station data. Values for the aerodynamic resistance and the other canopy parameters required by a Rutter type of interception model were obtained using optimization techniques. The techniques also were used to obtain the parameter values in a transpiration model which made use of the empirical surface resistance equation. Good agreement with observation was found for transpiration predictions at all times. Good predictions of interception loss were obtained only if small zero offset errors in the measurement of vapor pressure deficit were absent. The feasibility of using the model, together with the derived parameter values, to predict losses from spruce forests in other locations, was discussed. A wide range of meteorological data were available for the study, covering the typical year of 1974 and the exceptionally hot and dry summer of 1975. The data were deficient in one important respect: significant amounts of snowfall did not occur in either year, and it was not possible to test the models of snow evaporation from the canopy. (Roberts-ISWS)
W77-09711

EVALUATION OF AN EVAPOTRANSPIRATION MODEL FOR CORN,
Kansas State Univ., Manhattan. Dept. of Agronomy.
W. D. Rosenthal, E. T. Kanemasu, R. J. Raney, and L. R. Stone.
Agronomy Journal, Vol 69, No 3, p 461-464, May-June 1977. 4 fig, 1 tab, 16 ref.

Descriptors: *Evapotranspiration, *Model studies, *Corn(Field), *Kansas, *Soil water, On-site tests, Computer models, Input-output analysis, Irrigation practices, Meteorological data, Withdrawal, Soil profiles, Crop response.
Identifiers: Neutron attenuation, Water use efficiency.

An empirical evapotranspiration model was developed and tested for corn (Zea mays (L.) cv. Dekalb XL72A) grown on two sites in Kansas; soil water estimates determined by the computerized model were compared with neutron attenuation estimates. Required daily inputs for the model include leaf area index, solar radiation, effective precipitation and maximum and minimum air temperatures; outputs include transpiration, evaporation, advective contribution and soil water content. Model estimates were within 6% of neutron attenuation estimates during the growing season. The greatest water use efficiency and yield was achieved with an irrigation treatment involving 40% depletion of the maximum available water in the 150-cm profile. The model used has potential in scheduling irrigation on corn since required meteorological inputs can be routinely obtained at the field site. Leaf area index must be measured, estimated from remote sensing techniques, or simulated from leaf growth models. (Jahns-Arizona)
W77-09941

EFFECT OF INCREASING FOLIAGE REFLECTANCE ON THE CO2 UPTAKE AND TRANSPIRATION RESISTANCE OF A GRAIN SORGHUM CROP,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Div. of Agricultural Meteorology.
S. Moreshet, G. Stanhill, and M. Fuchs.
Agronomy Journal, Vol 69, p 246-50, March-April 1977. 6 fig, 3 tab, 7 ref.

Descriptors: *Reflectance, *Leaves, *Photosynthesis, *Transpiration control, *Grain sorghum, Solar radiation, Dry farming, Crop response, Crop production, Spectrophotometry, On-site tests.
Identifiers: *Foliage reflectance, *CO2 uptake, Kaolin spraying, Leaf resistance, Israel, Senescence.

Two years of field studies of labeled CO2 uptake rates on kaolin-sprayed and unsprayed sorghum leaves indicated the coating caused a 23% decrease in net photosynthesis similar to the 26% reduction of solar radiation absorption detected with a spectrophotometer after spraying. Measurements were made during the rainless summers of 1973 and 1974 on an unirrigated sorghum crop (Sorghum bicolor L. Moench 'Hazera 726') in the Lakhish area of Israel. Grain yield increases had occurred after whitening of the crop canopy. Decreased photosynthesis persisted for several weeks and was greater 6 weeks after the last kaolin application. Most leaves had a slightly increased leaf resistance as well as reduced CO2 uptake; both effects were accentuated by high insulation. Enhanced senescence of the kaolin-coated leaves was confirmed by measurements of the dynamics of light-dependent CO2 uptake of leaves of different ages using neutral filters and independent measurements of green leaf area. However, field measurements with a diffusion porometer indicated only slight reductions in the leaf surface diffusion resistance of coated leaves. A possible explanation is presented to reconcile the decrease in photosynthesis with the observed grain yield increase of treated sorghum. (Jahns-Arizona)
W77-09942

ON PENMAN'S EQUATION FOR ESTIMATING REGIONAL EVAPORATION,
Edinburgh Univ. (Scotland). Dept. of Meteorology.
A. S. Thom, and H. R. Oliver.
Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 436, p 345-357, April 1977. 4 fig, 28 ref.

Descriptors: *Evaporation, *Equations, *Regional analysis, *Estimating, Ventilation, Rainfall, Radiation, Meteorology, Forecasting, Winter, Summer, Vegetation.
Identifiers: *Penman's equation, *Regional evaporation, Hydrometeorology, Radient energy, Energy balance, Aerodynamic terms.

The form of Penman's evaporation equation most extensively applied in hydrometeorology was discussed. It was shown that the equation underemphasizes the importance of ventilation relative to radiation in maintaining regional evaporation. A generalized ventilation term was proposed, and a modified equation for evaporation was derived. The new equation was calibrated to give the same annual total for short vegetation as Penman's original version. The new equation predicted both an enhancement of winter evaporation at the expense of summer evaporation and a significant increase in annual total evaporation with vegetation size, especially in regions of frequent substantial rainfall. (Roberts-ISWS)
W77-09953

EVAPORATION FROM A WARM, WAVY SURFACE: A LABORATORY STUDY,
Delaware Univ., Newark. Coll. of Marine Studies.
R. J. Lai.
Journal of Physical Oceanography, Vol. 7, No. 3, p 431-435, May 1977. 6 fig, 15 ref.

Descriptors: *Evaporation, *Surfaces, *Laboratory tests, Stratified flow, Water, Laboratory equipment, Winds, Laboratories, Convection, Waves(Water), Sprays.
Identifiers: *Evaporation rates, Wind waves, Wave conditions, Forced convection, Free stream velocity, Stratified air flow, Buoyancy flux.

The evaporation rates from small wind-waves by forced convection in a range where the spray of water by strong wind action was not important were studied in a laboratory. The effects on evaporation of free stream velocity, wave conditions, and temperature differences between air and water (either stable or unstable stratified air flow) were investigated. For stably stratified air flow, the evaporation rate correlates well with general dynamical parameters but not for unstably stratified flow. The buoyancy flux near the boundary appears to play an important role in moisture transfer at the sea-air interface. The effect of the buoyancy flux was considered important inside the diffusion sublayer. The thickness of the diffusion sublayer is not only a function of shear velocity and roughness, but it is also a function of buoyancy flux. Therefore, a final form of evaporation rate can be given in a dimensionless form that applies well to both stable and unstable stratified flow and indicates that the buoyancy flux from the boundary strongly affects the evaporation rate. (Roberts-ISWS)
W77-09954

2E. Streamflow and Runoff

BRINK DEPTH METHOD IN RECTANGULAR CHANNEL,
Agricultural Univ., Wageningen (Netherlands). Dept. of Hydrology and Catchment Hydrology.
For primary bibliographic entry see Field 8B.
W77-09695

DEEP DISTRIBUTARY CHANNELS AND GIANT BEDFORMS IN THE UPPER CARBONIFEROUS OF THE CENTRAL PENNINES, NORTHERN ENGLAND,
Keele Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-09700

OPTIMAL OPERATION OF FLOOD CONTROL SYSTEMS, (FINAL REPORT; V.II),
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 4A.
W77-09927

THE ORIGIN OF HORIZONTAL LAMINAE IN EPHEMERAL STREAM CHANNEL-FILL,
Birbeck Coll., London (England). Dept. of Geology; and Birbeck Coll., London (England). Dept. of Geology;
For primary bibliographic entry see Field 2J.
W77-09950

STATISTICAL ANALYSIS OF THE IMPACT OF GROUND WATER PUMPAGE ON LOW-FLOW HYDROLOGY,
Wisconsin Univ., Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W77-09952

COMPUTATION OF UNSTEADY FLOWS IN RIVERS AND ESTUARIES BY THE METHOD OF CHARACTERISTICS,
Geological Survey, Reston, VA. Water Resources Div.
C. Lai, and C. A. Onion.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253-785, Price codes: A10 in paper copy, A01 in microfiche. Computer Contribution Report, June 1976. 186 p, 5 fig, 3 tab, 5 ref.

Descriptors: *Model studies, *Unsteady flow, *Rivers, *Estuaries, *Computer models, Open channel flow, Analytical techniques, Computer programs, Mathematical models.

This report is a program documentation to the latest revision (1975) of the unsteady open-channel flow simulation model by the method of characteristics, Version 13 in the program series, which employs a multiple-reach scheme treating each subreach as a prismatic shape. A long waterway of variable cross section, properties and coefficients may be divided into a number of subreaches, each being considered uniform in geometry and in other factors. The basic method of characteristics using specified time intervals is applied to each subreach, and additional boundary conditions are imposed at the junctions between subreaches. For the user's convenience, the program incorporates several types of options covering input, accuracy, boundary conditions, data formats, output, and continuation. The program accepts input data in three forms--data cards only, cards and user-supplied subroutines, and cards and disk stage data. Boundary values are either stage or velocity and are given either in numerical data or equation form. The user may employ or bypass the extrapolation procedures by weighing the trade-off between accuracy and computer time. By eight output options provided in the program, he can also tailor the outputs to suit his need. (Woodard-USGS)
W77-09993

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1976 WATER YEAR,
Geological Survey, Little Rock, Ark. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09997

COMPUTATION OF RECORDS OF STREAM-FLOW AT CONTROL STRUCTURES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
D. L. Collins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 666, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-8, April 1977. 57 p, 13 fig, 9 tab, 5 ref.

Descriptors: *Streamflow, *Flow rates, *Control structures, *Equations, *Discharge coefficient, Methodology, Instrumentation, Hydraulic structures, Hydraulic turbines, Locks, Spillway gates, Automation, Computer programs, Hydrologic data, Manometers, Leakage.
Identifiers: *Streamflow computations.

Traditional methods of computing streamflow records on large, low-gradient streams require a continuous record of water-surface slope over a natural channel reach. This slope must be of sufficient magnitude to be accuratly measured with available stage measuring devices. On highly regulated streams, this slope approaches zero during periods of low flow and accurate measurement is difficult. Methods are described to calibrate multipurpose regulating control structures to more accurately compute streamflow records on highly-regulated streams. Hydraulic theory, assuming steady, uniform flow during a computational interval, is described for five different types of flow control. The controls are: Tainter gates, hydraulic turbines, fixed spillways, navigation locks, and crest gates. Detailed calibration procedures are described for the five different controls as well as for several flow regimes for some of the controls. The instrumentation package and computer programs necessary to collect and process the field data are discussed. Two typical calibration procedures and measurement data are presented to illustrate the accuracy of the methods. (Woodard-USGS)
W77-10003

APPLICATION OF THE U.S. GEOLOGICAL SURVEY RAINFALL RUNOFF SIMULATION MODEL TO IMPROVE FLOOD-FREQUENCY ESTIMATES ON SMALL TENNESSEE STREAMS,
Geological Survey, Nashville, Tenn. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-10004

VARIATION OF WIDTH AND DISCHARGE FOR NATURAL HIGH-GRADIENT STREAM CHANNELS,
Geological Survey, Lawrence, Kans. Water Resources Div.
W. R. Osterkamp, and E. R. Hedman.
Water Resources Research, Vol 13, No 2, p 256-258, April 1977. 1 fig, 1 tab, 13 ref.

Descriptors: *Streamflow, *Estimating, *Channel morphology, *Width, *Gradients(Streams), Analytical techniques, Equations, Regression analysis.
Identifiers: *High-gradient streams, *Stream width-discharge relationship.

Standardized measurements of width at gaging stations on high-gradient stream channels show that a power function relation, indicative of static allometric growth, exists between width and average discharge in the downstream direction. Results are in close agreement with studies by Leopold and Maddock (1953) and confirm their 'b' exponent. Workers currently using active channel width measurements as a means of estimating average discharge from ungaged basins should consider 2.0 as a standard exponent of the regression relation. (Woodard-USGS)
W77-10009

SMALL CATCHMENT FLOOD MODELLING,
South African Dept. of Water Affairs, Pretoria. Div. of Hydrology.
D. W. Cousens, and J. R. Burney.
Water SA, Vol. 2, No. 4, p 150-155, October 1976. 2 fig, 4 hydrographs, 1 tab, 7 ref.

Descriptors: *Mathematical models, *Watersheds(Basins), Accuracy, Hydrographs, Model studies, Test procedures, Statistical models, Runoff, Computers, Rainfall, *Flood forecasting, Africa.
Identifiers: South Africa.

An accurate simulation model for small catchments influenced by variation in rainfall intensity is necessary in the design of hydrologic structures in South Africa. Two simulation techniques were tested and compared; the Huggins model and the synthetic hydrograph model. A correlation was found between inherent sensitivity and the amount of cost and work involved to achieve the desired solution. (So African Water Info Center)
W77-10083

ON THE APPLICATION OF TREND SURFACES OF PRECIPITATION TO MOUNTAINOUS AREAS,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2B.
W77-10088

FURTHER IMPORTANT FEATURES OF THE FISH FAUNA OF THE CLANWILLIAM OLIFANTS RIVER SYSTEM, SOUTHWESTERN CAPE,
Albany Museum, Grahamstown (South Africa).
R. A. Jubb.
Piscator, No. 92, p 154-157, December 1975. 2 fig, 9 ref.

Descriptors: *Freshwater fish, Fish barriers, Fish migration, River systems, Predator-prey relationships, Africa.
Identifiers: Barbus erubescens, Barbus calidus, Oreodaimon quanthlambae, Kneria auriculata, Barbus trurensis, *Olifants River, Treur River, Blyde River, South Africa.

Research work in the field and in the laboratory by the ichthyologist of the Albany Museum, Mr. P. Skelton, has resulted in the discovery of yet another endemic Barbus species in the catchment of the Clanwilliam Olifants River. The new species is named Barbus erubescens. A description of taxonomic characters is supplied. (So African Water Info Center)
W77-10090

2F. Groundwater

AN ELECTRIC ANALOG AND DIGITAL COMPUTER MODEL OF THE CHIPUXET GROUND WATER AQUIFER, KINGSTON, RHODE ISLAND,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
D. Geisser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 251, Price codes: A08 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 149 p, 51 fig, 11 tab, 29 ref, 2 append. OWRT A-056-RI(1), 14-31-0001-5040.

Descriptors: *Aquifers, Analog computers, Digital computers, *Rhode Island, *Model studies, *Computer models, *Groundwater resources, Simulation analysis.
Identifiers: *Chipuxet aquifer(RI).

The goal was to develop a simulation model of the Chipuxet River Aquifer. This model was used to study the availability of ground water in the Chipuxet River Aquifer and in particular, to assist the Rhode Island State Water Resources Board in the selection of an optimal pumping scheme proposed for the area. Two criteria for selecting the optimum pumping scheme were the desire to minimize (1) the effect of proposed pumping on the areas' water table configuration, and (2) its effect on the discharge in the Chipuxet River. Modeling of the Chipuxet Modeling of the Chipuxet River was accomplished through the use of both electric analog and digital computer techniques. With the electric analog, it was possible to simulate the flow of water within the aquifer electrically. Using the digital computer, it was possible to describe the flow of water within the aquifer mathematically. This investigation revealed that a pumping scheme which concentrated the pumping in the vicinity of 30 Acre Pond was optimal. It also revealed that none of the proposed pumping schemes appear to have any acceptable effects on either the areas' water table configuration or the discharge in the Chipuxet River. Finally, this investigation resulted in the development of two

working models of the Chipuxet River Aquifer which can be utilized during future investigations of the ground water in the area.
W77-09637

DRAIN SPACING BASED ON DYNAMIC EQUILIBRIUM,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
D. B. McWhorter.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 103, No. IR2, Proceedings Paper 13022, p 259-271, June 1977. 3 fig, 4 tab, 13 ref, 2 append.

Descriptors: *Drains, *Water table, *Groundwater movement, *Mathematical models, Equations, Aquifers, Groundwater recharge, Hydraulic properties, Flow, Depth, Discharge(Water), Saturated flow, Drawdown, Boundaries(Surfaces).
Identifiers: *Spacing(Drains), Parallel drains, Boussinesq equations, Drainout, Superposition.

Superposition was used to obtain an equation for the water table elevation between parallel drains in response to a periodic sequence of instantaneous recharge events of arbitrary volume and timing. The mathematical developments are especially useful for calculating the spacing of parallel-relief drains required to achieve a prescribed maximum water table elevation under conditions of 'dynamic equilibrium.' A drain-spacing calculation, compared with the results obtained by the Bureau of Reclamation's (USDI) approximate, dynamic-equilibrium method, showed the latter to result in a drain spacing that is on the safe side. The spacing method reported herein provides a mathematically correct alternative to the pioneering dynamic equilibrium calculation and maintains the flexibility required to handle conditions of variable recharge and drainout times. (Visocky-ISWS)
W77-09698

GROUND-WATER RESOURCES OF THE LEXINGTON, KENTUCKY, AREA,
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09996

SELECTED WATER-LEVEL RECORDS FOR WESTERN OKLAHOMA, 1975-1976,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09998

GROUND-WATER LEVELS IN OBSERVATION WELLS IN OKLAHOMA, 1975,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09999

ANNUAL WATER-RESOURCES REVIEW WHITE SANDS MISSILE RANGE, 1976 - A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10005

A METHOD OF ESTIMATING PARAMETERS AND ASSESSING RELIABILITY FOR MODELS OF STEADY STATE GROUNDWATER FLOW 1. THEORY AND NUMERICAL PROPERTIES,
Geological Survey, Lakewood, Colo. Water Resources Div.
R. L. Cooley.
Water Resources Research, Vol 13, No 2, p 318-324, April 1977. 1 fig, 37 ref.

Descriptors: *Model studies, *Groundwater movement, *Least squares method, *Steady flow, Numerical analysis, Aquifer characteristics, Hydrogeology, Geohydrologic units, Boundary layers, Sinks, Methodology, Forecasting, Regression analysis.

A new nonlinear least squares solution for the hydrogeologic parameters, sources and sinks, and boundary fluxes contained in the equations approximately governing two-dimensional or radial steady state groundwater motion was developed through use of a linearization and iteration procedure applied to the finite element discretization of the problem. Techniques involving (1) use of an iteration parameter to interpolate or extrapolate the changes in computed parameters and head distribution at each iteration and (2) conditioning of the least squares coefficient matrix through use of ridge regression techniques were proven to induce convergence of the procedure for virtually all problems. Because of the regression nature of the solution for the parameter estimation problem, classical methods of regression analysis are promising as an aid to establishing approximate reliability of computed parameters and predicted values of hydraulic head. Care must be taken not to compute so many parameters that the stability of the estimates is destroyed. Reduction of the error variance by adding parameters is desirable provided that the number of degrees of freedom for error remains large. (Woodard-USGS)
W77-10008

GEOHYDROLOGY OF MUSCATINE ISLAND, MUSCATINE COUNTY, IOWA,
Geological Survey, Iowa City, Iowa. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10012

FLUCTUATIONS OF GROUND-WATER LEVELS IN LEE COUNTY, FLORIDA, IN 1975 WATER YEAR,
Geological Survey, Tallahassee, Fla. Water Resources Div.
T. H. O'Donnell.
Open-file report 76-854, 1977. 77 p, 60 fig, 7 tab, 3 ref.

Descriptors: *Groundwater, *Water level fluctuations, *Observation wells, *Aquifer characteristics, *Florida, Data collections, Pumping, Groundwater recharge, Rainfall, Artesian aquifers, Water table aquifers, Hydrographs.
Identifiers: *Lee County(Fla).

During the 1975 water year, rainfall was about average at Page Field, Florida, and from 20-25 percent below average at Lehigh Acres and Sanibel Island. Water levels were monitored in 57 observation wells in Lee County, Florida. Of the 23 wells that tap the water-table aquifer, one record high and 5 record low water levels were established. Record low water levels were established in 5 of 20 wells that tap the sandstone aquifer and in 1 of 10 wells that tap the upper Hawthorn aquifer. A record high water level was established in 1 of 3 wells that tap the lower Hawthorn aquifer. (Woodard-USGS)
W77-10014

ELECTRICAL WATER PROSPECTING.
Council for Scientific and Industrial Research, Pretoria (South Africa). Geophysics Div.
Scientiae, Vol. 16, No. 4, p 22-23, August 1975. 1 fig.

Descriptors: Geomorphology, Geophysics, Groundwater, *Resistivity, Electrodes, Water resources, Aquifers, Boreholes, Droughts, *Exploration, *Water sources, Africa.
Identifiers: Hereroland, South West Africa, Southern Africa.

The use of geoelectrical soundings to find water in arid Hereroland in the North of South West Africa is described. Work is directed at improving the siting of useful boreholes, which had previously achieved a success rate of only about 30% in this area. Principles of the resistivity method are explained, and the conformation of water-bearing layers in Hereroland is illustrated. As the regional geo-electrical survey progresses, it should be possible to delineate promising areas for borehole siting. Electrical resistivity might also indicate the quantity of groundwater available at a given site. (So. African Water Info. Center)
W77-10100

2G. Water In Soils

AN AUTOMATIC SCANNING APPARATUS FOR GAMMA SPECTROMETRY FOR THE DETERMINATION OF THE MOISTURE CONTENT IN SOIL COLUMNS, (IN DUTCH),
H. Verplancke, and M. De Boodt.
Meded Fac Landbouwwet Rijksuniv Gent 39(1), p 121-133. 1974.

Descriptors: *Spectrophotometry, *Moisture content, *Automation, Equipment, Measurement, *Soil moisture meters.

An automatic column scanner was built with the following criteria in mind: Restriction of the measurement to a slice 5 mm in thickness. Location of the slice with an accuracy within 0.1 mm. The possibility of scanning 1 m-long columns. Free choice of the column orientation in the gravity field, e.g., vertical and horizontal. Radial rotation of the column to reduce gravity influences on horizontal flow. Possibilities for water supply at both ends of the column. Stepwise determination of the moisture content in the column with adjustable counting time per position together with an adjustable selection of the measurement location. Preadjustment of the traject of scanning and automatic recycling timing.—Copyright 1976, Biological Abstracts, Inc.
W77-09613

DETERMINATION OF HYDRAULIC PARAMETERS TO ESTIMATE WATER MOVEMENT AND WATER STORAGE IN UNDISTURBED SOIL: COMPARISON OF FIELD AND LABORATORY METHODS, (IN GERMAN),
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
H. Fluehler, P. Germann, F. Richard, and J. Leuenberger.
Z Pflanzenernaehr Bodenkd 3, p 329-342, 1976.

Descriptors: *Water storage, *Soil water movement, *Soil moisture, Tensiometers, Hydraulic conductivity, *Moisture content, Drainage, Loess, *Neutron meters.

In an undisturbed soil monolith in continuous connection with the underlying loess soil layer 60 tensiometer and a neutron probe-access tube were used, respectively, to determine the matric potential and water content changes during a transient drainage experiment. Within the matric potential range of 0 to approximately -50 to -100 mbar the soil moisture characteristics determined in the laboratory and in the field were substantially indifferent. When the matric potential was more negative than -100 mbar the slope of these curves and hence of the specific moisture capacities were comparable. The field-measured conductivity functions differed considerably from those values which were measured under laboratory conditions or computed from the soil moisture characteristic data. The conductivities were expressed as a function of the matric potential which was possibly the major reason for these differences. However, the changes in water content in this dense silty clay loam were too small to express the unsaturated conductivity as a function of the absolute water

content. The most serious problems in extrapolating the results of the less time consuming labor calculation methods to field conditions arise in that range of matric potentials where water movement is significant.--Copyright 1977, Biological Abstracts, Inc.
W77-09624

INFLUENCES OF SOME PEAT SOIL FEATURES ON THE CAPILLARY WATER SUPPLY, (IN GERMAN),
Ausseninstitut fuer Moorforschung und Angewandte Bodenkunde, Bremen (West Germany).
W. Burghardt.
Z Pflanzenernaehr Bodenkd 3, p 343-355, 1976.

Descriptors: *Capillary water, Water supply, *Peat, Grasses, Drought resistance, *Soil profiles, *Bogs, Decomposing organic matter, *Pore pressure, *Fen.
Identifiers: *Weisse Moor(West Germany).

In the Weisse Moor near Gifhorn (West Germany) the grassland suffered in summer 1972 from extreme drought, on peat soil profiles with a thin top layer of moderately decomposed high hog over layers of slightly decomposed transition forms from bog to fen. This transition peat form was marked by the nature of its pores. This probably led to the considerable reduction of the unsaturated water flow. The capillary water supply of the grassland from saturated deeper peat layers (30 cm) was limited.--Copyright 1977, Biological Abstracts, Inc.
W77-09626

DEGRADATION OF A NONIONIC SURFACTANT IN SOILS AND PEAT,
California Univ., Riverside. Dept. of Soil Physics.
For primary bibliographic entry see Field 5B.
W77-09638

INFLUENCE OF CATION CONTENT ON THE BIOLOGICAL ACTIVITY OF FENSULFOTHION IN PLAINFIELD SAND,
Department of Agriculture, London (Ontario). Research Inst.
C. R. Harris, and B. T. Bowman.
Soil Science Society of America Journal, Vol. 40, No. 3, p 385-389, May-June 1976. 2 fig, 1 tab, 39 ref.

Descriptors: *Cations, *Cation adsorption, *Insecticides, Soils, Soil investigations, Toxicity, *Bioassay, *Sands, Soil treatment.
Identifiers: *Crickets, *Fensulfothion.

A study was conducted to assess the influence of cations on the biological activity of the organophosphorus insecticide, fensulfothion in soil. Bioassays were done using first stage crickets as test insects and a Plainfield sand without and amended with various concentrations of reagent chloride salts of NH (4+), K(+), Ca(2+), Fe(3+), and Al(3+). The toxicity of fensulfothion decreased with increasing cation content, with the effect being most pronounced with trivalent > divalent > monavalent cations. Results of the bioac.vity study paralleled those of an earlier adsorption study on fensulfothion-cation montmorillonite suspensions. (Skogerboe-Colorado State)
W77-09639

SULFUR-COATED FERTILIZERS FOR SUGARCANE: I. PLANT RESPONSE TO SULFUR-COATED UREA,
Florida Univ. Belle Glade. Dept. of Plant Nutrition.
For primary bibliographic entry see Field 3F.
W77-09640

SULFUR-COATED FERTILIZERS FOR SUGARCANE: II. RELEASE CHARACTERISTICS OF SULFUR-COATED UREA AND KC1,
Florida Univ. Belle Glade. Dept. of Plant Nutrition.
For primary bibliographic entry see Field 3F.
W77-09641

AMMONIA VOLATILIZATION AND NITROGEN UTILIZATION FROM SULFUR-COATED UREAS AND CONVENTIONAL NITROGEN FERTILIZERS,
Texas A and M Univ., Corpus Christi. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 3F.
W77-09642

EFFECT OF PRETREATMENT ON LOSS OF NITROGEN-15-LABELLED FERTILIZER NITROGEN FROM WATERLOGGED SOIL DURING INCUBATION,
Prairie View A and M Coll., Tex.
E. McKenzie, Jr., and L. T. Kurtz.
Soil Science Society of America Journal, Vol. 40, No. 4, p 534-537, July-August 1976. 1 fig, 3 tab, 27 ref.

Descriptors: *Denitrification, *Nitrogen, *Incubation, Soil chemistry properties, Soil tests, Soil investigations, Soils, Nutrients, *Soil treatment, *Fertilizers, Fertilization.
Identifiers: *Nitrogen-15 loss(Soil samples).

Soil preparation treatments (field-moist, intact cores; oven-dried, intact cores; and oven-dried, crushed, screened soil) greatly influenced fertilizer nitrogen loss under waterlogged conditions in the laboratory. Nitrogen (300 pp2m) as N-15-labelled calcium nitrate was added to samples from selected horizons of Drummer silty clay loam and they were subsequently covered with water and incubated for 0, 4, 8, 16, and 32 days. Samples of upper (above 51 cm) soil horizons were incubated at 21C while those from deeper horizons were incubated at 18C. Oven-drying and crushing of the soil during preparation increased fertilizer nitrogen loss. Only 34% of the fertilizer nitrogen disappeared from field-moist, intact soil cores while approximately 90% disappeared from both oven-dried, intact cores and crushed screened samples. Maximum rate of denitrification of fertilizer nitrogen in field-moist, intact cores was 3.58% of the applied nitrogen per day. This rate was approximately one-third of that in the oven-dried, intact cores and one-ninth of that in the oven-dried, crushed samples. (Skogerboe-Colorado State)
W77-09643

PICLORAM DEGRADATION IN SOILS AS INFLUENCED BY SOIL WATER CONTENT AND TEMPERATURE,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 5B.
W77-09644

NITRITE DECOMPOSITION IN FLOODED SOIL UNDER DIFFERENT PH AND REDOX POTENTIAL CONDITIONS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
O. Van Cleemput, W. H. Patrick, Jr., and R. C. McIlhenny.
Soil Science Society of America Journal, Vol. 40, No. 1, p 55-60, January-February 1976. 4 fig, 3 tab, 32 ref.

Descriptors: Soils, *Soil investigations, Soil properties, *Soil chemistry, *Nitrites, Sterilant, Soil sterilants, *Oxidation reduction potential, Hydrogen ion concentration.
Identifiers: *Nitrite decomposition(Soils), *Flooded soils.

Nitrite decomposition products were studied in a flooded soil suspension maintained under different pH and redox potential conditions. The effect of a sterilant, HgC12 on nitrite breakdown was also investigated. Soil suspensions were incubated for several days with the pH maintained at 4.5, 6, and 8 and the redox potential maintained at 0 and +200 mV. Nitrite was then added to the suspensions and the decomposition products were determined by mass spectrometry. Under acid conditions significant amounts of N2 and nitrogen oxide gases (N20, NO) were formed in both the moderately reduced (+200 mV) and reduced (0 mV) suspensions. At higher pH's the nitrite reduction rate was slightly less and the amounts of nitrogen oxide gases formed were considerably less with N2 being the major product. The chemical sterilant decreased the conversion of nitrite to N2 and markedly increased the formation of NO. The significant production of NO under acid conditions both with and without the sterilant, suggest the likelihood of self-decomposition of nitrous acid as a major mechanism of nitrite loss. (Skogerboe-Colorado State)
W77-09645

EVALUATION OF THE PARAMETERS OF SOIL PHOSPHORUS AVAILABILITY FACTORS IN PREDICTING YIELD RESPONSE AND PHOSPHORUS UPTAKE,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.
R. C. Dalal, and E. G. Hallsworth.
Soil Science Society of America Journal, Vol. 40, No. 4, p 541-546, July- August 1976. 1 fig, 5 tab, 37 ref.

Descriptors: *Phosphorus, Nutrients, Crop production, *Crop response, Wheat, Evaluation, Soils, *Absorption, Forecasting.
Identifiers: *Phosphorus uptake(Soils).

The importance of quantity, intensity, capacity, and rate factors of soil P availability to account quantitatively for the variation in P uptake and wheat grain yield in pot and field experiments was studied. Among the parameters of the quantity factor, L value was found to be highly correlated with P uptake at 35 and 150 days after planting (maturity) when all the soils were considered. However, the carbonate P was found to be the best parameter of the quantity factor when the soils containing high amounts of hematite/goethite were excluded. The parameters of the intensity factor were significantly correlated with P uptake at the later stage (150 days). The rate factor, as measured by AER was better correlated with P uptake at 35 days than with P uptake at 150 days after planting. The quantity factor as measured by the carbonate P accounted for 75 and 93% of the variation in P uptake and grain yield, respectively. The capacity factor, Mb when combined with the quantity factor accounted for more of the variation in P uptake (150 days) from 75 to 86%. The intensity and the rate factors had a smaller effect. (Skogerboe-Colorado State)
W77-09646

DISTRIBUTION OF PLUTONIUM IN TRINITY SOILS AFTER 28 YEARS,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W77-09647

MICROBIAL FORMATION OF VOLATILE SELENIUM COMPOUNDS IN SOIL,
Cornell Univ. Agricultural Experiment Station, Ithaca, N. Y. Dept. of Agronomy.
J. W. Doran, and M. Alexander.
Soil Science Society of America Journal, Vol. 40, No. 5, p 687-690, September-October 1976. 3 fig, 2 tab, 18 ref.

Descriptors: *Selinium, Soils, Soil investigations, *Soil chemistry, Soil properties, Microbiology,

*Pollutant identification, Gas chromatography, Mass spectrometry.
Identifiers: *Microbial formation(Soils).

Selenium was volatilized from soils amended with elemental Se, selenite, selenate, trimethylselenonium chloride, selenomethionine, and selenocystine and incubated in air or anaerobically. The processes were wholly or largely the result of microbial action. The conversion of selenite and selenate to volatile products was enhanced if soil was amended with organic materials. Indigenous soil Se was also volatilized in the presence of supplemental organic matter. The products were identified by combined gas chromatography-mass spectrometry. Dimethyl selenide was generated from all Se compounds tested when amended soils were incubated in he presence of air. Under anaerobic conditions, dimethyl selenide was produced from the three organic Se compounds and selenate, and a product tentatively identified as hydrogen selenide (H2Se) was evolved from soil receiving elemental Se, selenite, selenate, or selenocystine. Dimethyl diselenide was also formed from selenomethionine in soil incubated in air or anaerobically. (Skogerboe-Colorado State)
W77-09648

PREDICTING 2,4,5-T MOVEMENT IN SOIL COLUMNS,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 5B.
W77-09649

COMMENTS ON NITRATE REDUCTION IN UNSATURATED SOIL,
California Univ., Berkeley. Dept. of Soil Biology.
A. D. McLaren.
Soil Science Society of America Journal, Vol. 40, No. 5, p 698-699, September-October 1976. 1 fig, 12 ref.

Descriptors: *Nitrites, *Nitrates, Ions, Soils, Soil investigations, Nitrification, Kinetics, Microbiology.
Identifiers: *Soil nitrites, Microbial ecology, *Nitrate reduction(Soils), *Unsaturated soils.

Cyclic oxidation and reduction of nitrite and nitrate in soil are analyzed in terms of first-and zero-order microbial kinetic reactions, respectively. A reversible reaction step involving these ions can account for a low, but constant concentration of nitrate in an unsaturated field soil for long periods or for considerable depths in a laboratory soil column. (Skogerboe-Colorado State)
W77-09650

ADSORPTION OF DODECYLBENZENE SULFONATE ON NA(+)-MONTMORILLONITE: EFFECT OF SALT IMPURITIES,
Chevron Oil Field Research Co., La Habra, Calif.
D. M. Clementz, and J. L. Robbins.
Soil Science Society of America Journal, Vol. 40, No. 5, p 663-665, September-October 1976. 1 fig, 12 ref.

Descriptors: *Adsorption, *Montmorillonite, Surfactants, Anion exchange, *Clays, Salts, Sulfur compounds, *Sulfonates, Sodium, Ions.

The adsorption of purified dodecylbenzene sulfonate (ABS) on Na(+)-montmorillonite follows the Langmuir isotherm, reaching a maximum amount adsorbed which corresponds to the anion exchange capacity of the clay. When a commercial grade ABS is used, the adsorption process is more complex and occurs in two distinct steps. In dilute solutions, the salt impurity has a minor effect on adsorption and the result is essentially the same as that obtained for the purified surfactant. However, as the salt concentration is increased to a given value, enhanced adsorption due to hemimicelle formation occurs. (Skogerboe-Colorado State)
W77-09651

CATION-EXCHANGE CAPACITY OF ACID SOILS USING ALUMINUM CHLORIDE AND BARIUM CHLORIDE-TRIETHANOLAMINE,
Klamath National Forest Yreka, Calif.
E. B. Alexander.
Soil Science Society of America Journal, Vol. 40, No. 6, p 961-963, November-December 1976. 1 tab, 6 ref.

Descriptors: Laboratory tests, *Cation exchange, Soil properties, *Soil tests, Soil investigations, *Acidic soils, *Chlorides, *Soil classification, Analytical techniques.

Base saturation is such an important criterion for classifying soils in the U.S. Soil Taxonomy that a procedure has been developed for scantily equipped field laboratories. Exchange acidity and cation-exchange capacity (CEC) are determined in sequence with the same samples. The procedure involved (i) displacement of exchangeable hydrogen and Al with BaC12-triethanolamine solution and back-titration with HC1 to determine the exchange acidity, (ii) saturation with Al from A1C13 solution, (iii) removal of excess Al with water, (iv) displacement of Al with BaC12-triethanolamine solution and back-titration with HC1 to determine the exchange capacity, and (v) estimation of basic cations by the difference between the CEC and the exchange acidity. This is an extension of a well-established procedure for determining exchange acidity. The CEC results compare closely with the sums of cations for acid subsoils, but are low for Al horizons with much organic matter. (Skogerboe-Colorado State)
W77-09652

SIMULTANEOUS TRANSPORT OF NITRATE AND GASEOUS DENITRIFICATION PRODUCTS IN SOIL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5B.
W77-09653

SOIL TEMPERATURES AND HEAT LOSS FOR A HOT PIPE NETWORK BURIED IN IRRIGATED SOIL,
Energy Resources Co., Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W77-09654

EFFECTS OF BORON AND NITROGEN ON GRAIN YIELD AND BORON AND NITROGEN CONCENTRATIONS OF BARLEY AND WHEAT,
Department of Agriculture, Charlottetown (Prince Edward Island). Research Station.
For primary bibliographic entry see Field 3F.
W77-09655

PHOSPHORUS-ZINC INTERACTION IN RELATION TO ABSORPTION RATES OF PHOSPHORUS, ZINC, COPPER, MANGANESE, AND IRON IN CORN,
Haryana Agricultural Univ., Hissar (India). Dept. of Soils.
For primary bibliographic entry see Field 3F.
W77-09656

CALCIUM AND STRONTIUM ABSORPTION BY CORN ROOTS IN THE PRESENCE OF CHELATES,
Minnesota Univ., Minneapolis. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W77-09657

INFLUENCE OF IONIC STRENGTH AND INORGANIC COMPLEX FORMATION ON THE SORPTION OF TRACE AMOUNTS OF CD BY MONTMORILLONITE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-09658

CHEMICAL DISTRIBUTION AND GASEOUS EVOLUTION OF ARSENIC-74 ADDED TO SOILS AS DSMA-(74)AS,
Tennessee Univ., Knoxville. Dept. of Plant and Soil Science; and Tennessee Univ., Knoxville. Agricultural Experiment Station.
For primary bibliographic entry see Field 5B.
W77-09659

EFFECT OF LEACHING FRACTION ON RIVER SALINITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 5G.
W77-09697

DRAIN SPACING BASED ON DYNAMIC EQUILIBRIUM,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W77-09698

A LABORATORY MODEL TO INVESTIGATE THE SOIL MOISTURE CONDITIONS ON A DRAINING SLOPE,
Bristol Univ. (England). Dept. of Geography.
M. G. Anderson, and T. P. Burt.
Journal of Hydrology, Vol 33, No 3/4, p 383-390, May 1977. 8 fig, 1 tab, 4 ref.

Descriptors: *Drainage, *Soil moisture, *Model studies, Laboratory tests, Flow, Streamflow, Laboratory equipment, Moisture, Moisture availability, Drains, Moisture content, Moisture meters, Drainage programs, Slopes, Soil water.
Identifiers: *Draining slopes, Flow mechanisms, Slope drainage, Low streamflow, Drainage model, Slope model.

A laboratory slope drainage model was constructed to test results obtained by Hewlett and Hibbert who suggested that unsaturated flow is the dominant flow mechanism at the later stages of drainage. The results from the model, together with hydraulic conductivity determinations, indicated the slope discharge to be controlled by saturated flow throughout drainage. The laboratory slope model consisted of a 4 m length of plastic guttering of 5.5 cm radius and was packed with sand and supported on a dexion frame at an angle of 20 deg. Tensiometers were placed at 5-cm intervals up the slope and connected to a scanivalve fluid switch and pressure transducer. The system enabled the rapid scanning of tension conditions over the slope, and the complete slope tensions could be monitored within one minute. Slope discharge was measured using a funnel and graduated cylinder placed below the base of the pipe. The small disparity between predicted discharge and observed discharge can be attributed to the difficulties in precisely measuring the water table slope and the extent of the saturated conditions above the water table. (Roberts-ISWS)
W77-09712

VIRUS AND BACTERIA REMOVAL FROM WASTE WATER BY RAPID INFILTRATION THROUGH SOIL,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
For primary bibliographic entry see Field 5D.
W77-09860

THE EFFECTS OF WATER CONTENT OF THE TOPSOIL ON MICRONUTRIENT AVAILABILITY AND UPTAKE IN A SILICEOUS SANDY SOIL,
Adelaide Univ. (Australia). Dept. of Agronomy.
E. K. S. Nambiar.
Plant and Soil, Vol 46, p 175-183, 1977. 4 tab, 12 ref.

Descriptors: *Soil water, *Topsoil, *Nutrients, *Absorption, Oats, Adsorption, Subsoil, Acidic soil, Sands, Soil-water-plant relationships, Planting management, Root development, Plant physiology, Drying, Manganese, Zinc, Copper, *Australia.
Identifiers: *Micronutrients, Root weight, Shoot weight.

Experiments were conducted in South Australia to determine the effects of topsoil water content on manganese, zinc and copper availability and their uptake by oats grown on a sandy soil. Topsoil water content significantly reduced root growth in that layer, but drying for up to 42 days had no significant effect on micronutrient concentrations in the shoots as long as water stress did not occur. Micronutrient application caused increases in shoot weight and subsoil root weight, while topsoil root weight declined. Applications of Mn, Zn and Cu did not increase concentrations of these elements in the shoot, whether soil was wet or dry. However, micronutrient concentrations in the root were increased by such application. The acidic, siliceous sand was surprisingly effective at rendering Mn, Zn and Cu unavailable; possible explanations for the results are given. The removal of micronutrients from the exchangeable pool, probably mediated by organic matter, was more important than fluctuations in soil water content. (Jahns-Arizona)
W77-09930

SEEPAGE FROM SMALL EARTH DAMS,
Western Australia Dept. of Agriculture, South Perth.
For primary bibliographic entry see Field 8D.
W77-09932

THE NATURE OF CHANGES IN BULK DENSITY WITH WATER CONTENTS IN CRACKING CLAY,
Queensland Wheat Research Inst., Toowoomba (Australia). Primary Industries Dept.
R. D. Berndt, and K. J. Coughlan.
Australian Journal of Soil Research, Vol 15, p 27-37, 1976. 6 fig, 1 tab, 13 ref.

Descriptors: *Bulk density, *Moisture content, *Clays, *Interstices, *Shrinkage, Laboratory tests, Soil analysis, On-site investigations, Soil water, Drying, Soil properties, Soil mechanics.
Identifiers: Soil cores, Cracking clay.

Laboratory experiments were conducted in Queensland to determine the effect of changing water content on the bulk density of undisturbed cores of a cracking clay; results were compared with those from a field sampling of the same soil. Laboratory cores shrank three-dimensionally and normally within the water content range measured in the field soil; volume changes during drying were approximately 95% of those expected from normal shrinkage. Deviation from normal was attributed to small internal cracks and to structural shrinkage at high water contents. The swelling of supported cores was approximately three-dimensional, except for some unconfined swelling and disruption of the core surface. After unidimensional swelling was induced by confining dry cores to reduce the void ratio before wetting, shrinkage was three-dimensional, indicating reorientation of soil particles during the unidimensional swelling phase. Field data indicated unidimensional shrinkage at water contents above 0.47 g g-1; these results were attributed to sampling inaccuracies from using a small-diameter core sampler, and the actual bulk density relationship was considered three-dimensional. Bulk density variability is considerably greater at lower water contents. (Jahns-Arizona)
W77-09937

AN EVALUATION OF TOTAL SOLAR REFLECTANCE AND SPECTRAL BAND RATIOING TECHNIQUES FOR ESTIMATING SOIL WATER CONTENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Reginato, J. F. Vedder, S. B. Idso, R. D. Jackson, and M. B. Blanchard.
Journal of Geophysical Research, Vol. 82, No. 15, p 2101-2104, May 20, 1977. 5 fig, 12 ref.

Descriptors: *Remote sensing, *Soil moisture, *Solar radiation, *Arizona, Reflectance, Soils, Irrigation, *Moisture content, *Soil water, Microwaves, Radiation, Infrared radiation, Measurement, Drying, Soil science, Estimating, Evaluation.
Identifiers: Pyranometers, Multispectral scanners.

For several days in March of 1975, reflected solar radiation measurements were obtained from smooth and rough surfaces of wet, drying, and continually dry Avondale loam at Phoenix, Arizona, with pyranometers located 50 cm above the ground surface and a multispectral scanner flown at a 300-m height. The simple summation of the different band radiances measured by the multispectral scanner proved to be as good as the pyranometer data for estimating surface soil water content if the multispectral scanner data were standardized with respect to the intensity of incoming solar radiation or the reflected radiance from a reference surface, such as the continually dry soil. Without this means of standardization, multispectral scanner data are most useful in a spectral band ratioing context. The results indicated that, for the bands used, no significant information on soil water content could be obtained by band ratioing. Thus the variability in soil water content should insignificantly affect soil-type discrimination based on identification of type-specific spectral signatures. Therefore, remote sensing, conducted in the 0.4-to 1.0 micrometer wavelength region of the solar spectrum, would seem to be much more suited to identifying crop and soil types than to estimating of soil water content. (Sims-ISWS)
W77-09957

AMMONIA VOLATILIZATION FROM SURFACE APPLICATIONS OF AMMONIUM COMPOUNDS ON CALCAREOUS SOILS: V. SOIL WATER CONTENT AND METHOD OF NITROGEN APPLICATION,
Texas A and M Univ., El Paso. Agricultural Research Station.
L. B. Fenn, and R. Escarzaga.
Soil Science Society of America Journal, Vol 40, No 4, p 537-541, July-August 1976. 2 fig, 1 tab, 14 ref.

Descriptors: *Nitrogen, Fertilization, Nutrients, Temperature, Ammonia, Ammonium compounds, *Calcareous soils, *Soil water, Fertilizers.
Identifiers: *Ammonia-nitrogen.

Ammonia-nitrogen losses from soils were dependent on the existence of sufficient water for solubilization of the applied NH4-compounds. Laboratory data revealed that NH3 volatilization from (NH4)2SO4 was greatly reduced on soils with 55% water at 12, 22 and 30 degrees C as compared to soils with 30% water. Ammonia-nitrogen losses were the highest at all temperatures and nitrogen application rates when soils contained 13 to 30% soil water. Dry NH4-chemicals did not dissolve in soils with 0 and 8% soil water, therefore, little NH3 was lost. Application of a concentrated (NH4)2SO4 solution to soils with 8% water resulted in near maximum NH3 loss. This same solution, when applied to the surface of an oven dry soil, resulted in lower losses. Application of NH4NO3 to soils with 55% water resulted in lower NH3 losses when compared to soils with 8 to 30% water. Soils with 0% water retained essentially all applied NH4(+)-N whether applied in dry or concentrated liquid form. (See also W77-01515) (Skogerboe-Colorado State)
W77-09960

THE INFLUENCE OF CATION EXCHANGE CAPACITY AND DEPTH OF INCORPORATION ON AMMONIA VOLATILIZATION FROM AMMONIUM COMPOUNDS APPLIED TO CALCAREOUS SOILS,
Texas A and M Univ., El Paso. Agricultural Research Station.
L. B. Fenn, and D. E. Kissel.
Soil Science Society of America Journal, Vol 40, No 3, p 394-398, May-June 1976. 2 fig, 3 tab, 15 ref.

Descriptors: *Cation exchange, *Calcareous soils, Soils, Soil properties, Soil investigations, Soil chemistry, Model studies, *Ammonium compounds.

The objective was to determine the influence of soil cation exchange capacity (CEC) and depth of incorporation on NH3-N volatilization from NH4(+)-N compounds applied to calcareous soil. This study was conducted in the laboratory on soils with a wide range of CEC. An increasing CEC resulted in decreasing NH3 losses. Ammonium sulfate produced higher soil pH values and NH3 losses than did NH4NO3. The pH of the soil decreased with increasing NH4NO3 application rates. With NH4NO3, percent NH3(-)N losses increased as the application rates increased. Incorporation of the NH4(+)-compounds into the soil reduced NH3 losses. Increasing depths of NH4(+)-incorporation resulted in reduced NH3 loss. Losses decreased as the CEC of soil increased. The effectiveness of soil depth in reducing NH3 loss was associated with soil water content. Decreasing the soil water increased the effectiveness of soil incorporation for reducing NH3 losses. (Skogerboe-Colorado State)
W77-09961

RELEASE OF CADMIUM FROM CLAYS AND PLANT UPTAKE OF CADMIUM FROM SOIL AS AFFECTED BY POTASSIUM AND CALCIUM AMENDMENTS,
Ohio Agricultural Research and Development Center, Wooster.
F. Haghiri.
Journal of Environmental Quality, Vol 5, No 4, p 395-397, October-December 1976. 2 tab, 11 ref.

Descriptors: *Cadmium, *Potassium, *Clays, *Calcium, Kaolinite, Illite, Soybeans, Heavy metals, *Soil amendments.
Identifiers: Cadmium sorption.

The effects of percent K and/or Ca saturation on the release of Cd from Cd-treated H-clays (kaolinite and illite) and on the Cd availability to plants from Cd-treated Canfield silt loam soil were determined. The concentration of Cd in the dialyzates from both kaolinite and illite clays increased as the percent Ca or K saturation of the clays in the suspension decreased. The release of Cd from both clays was greater in the presence of Ca than K. In a separate experiment, the concentration of Cd in soybean shoots (Glycine max L. Merr.) 'Corsoy' decreased with increasing percent Ca or K saturation of the soil. The results indicated that Cd uptake by soybean shoots could be impaired to a great extent by K application. (Skogerboe-Colorado State)
W77-09962

MICROBIAL INORGANIC POLYPHOSPHATES: FACTORS INFLUENCING THEIR ACCUMULATION,
Ohio Agricultural Research and Development Center, Wooster.
I. L. Pepper, R. H. Miller, and C. P. Ghonsikar.
Soil Science Society of America Journal, Vol 40, No 6, p 872-875, November-December 1976. 2 fig, 5 tab, 8 ref.

Descriptors: *Phosphorus, *Soil chemistry, Soil properties, Soil investigations, *Phosphates, Inorganic compounds.
Identifiers: *Phosphorus solubilization(Soils), *Microbial inorganic polyphosphates.

Infrared spectra of microbially synthesized, acid labile, inorganic P compounds extracted from soils provided additional evidence that they are inorganic polyphosphates (poly P). Incubation studies with glucose amended soils demonstrated the transient nature of naturally occurring poly P. Experiments are reported on the conditions which optimize poly P synthesis in soil. A 2-week incubation period (preincubation) with a source of carbon (2% glucose or 4% straw) and a further 2-day incubation period (postincubation) after adding a source of ortho P resulted in the maximum accumulation of poly P. The quantity of poly P also increased with increasing rates of orthophosphate from none to 1,000 micro g soil/g. Longer periods of postincubation reduced poly P accumulation. Poly P synthesis was greater when relatively insoluble sources of P were added to soils and accumulation followed the order; $FePO4.2H2O$ > rock phosphate > $Ca(H2PO4)2.H2O$ > $KH2PO4$. The results suggest that poly P synthesis may accompany P solubilization in soils and be an integral part of the soil P cycle. (Skogerboe-Colorado State)
W77-09965

AMMONIUM DIFFUSION AS A FACTOR IN NITROGEN LOSS FROM FLOODED SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-09966

EXTRACTION OF SOIL WATER USING CELLULOSE-ACETATE HOLLOW FIBERS,
Oak Ridge National Lab., Tenn.
D. R. Jackson, F. S. Brinkley, and E. A. Bondietti.
Soil Science Society of America Journal, Vol 40, No 2, p 327-329, March-April 1976. 5 fig, 1 tab.

Descriptors: *Soil water, Soils, *Soil investigation, Soil properties, Soil chemistry, Laboratory tests, Sampling, Greenhouses, Permeability.
Identifiers: *Hollow fibers(Cellulose-acetate), Soil columns.

Cellulose-acetate hollow fibers were used to extract soil solutions from soil columns. The fibers have unique characteristics of small diameter and high flexibility and permeability which are ideally suited for use in soils. Two experiments were completed to demonstrate the usefulness of the hollow fibers. A 109Cd-tagged soil column was leached with distilled water, and subsequently soil water was extracted with the fibers. The effective radius of soil-water extraction by the fibers was evaluated. The results show that the fibers can extract soil solution for chemical assay at moisture levels ranging from 20 to 50%. Applications of this technique include sampling soil solution from greenhouse pots and experimental microcosms. (Skogerboe- Colorado State)
W77-09967

COMPARISON OF FIVE KINETIC MODELS FOR ORTHOPHOSPHATE REACTIONS IN MINERAL SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
C. G. Enfield, C. C. Harlin, and B. E. Bledsoe.
Soil Science Society of America Journal, Vol 40, No 2, p 243-249, March-April 1976. 3 fig, 2 tab, 31 ref.

Descriptors: *Kinetics, Soils, Soil investigation, Soil properties, Soil chemical properties, Adsorption, Diffusion, Sorption, *Model studies, *Phosphates, *Soil chemistry.
Identifiers: *Orthophosphates, Mineral soils, *Kinetic models(Soils).

The kinetics of orthophosphate sorption with 25 mineral soils have been experimentally measured under laboratory conditions. The 25 mineral soils represent a wide range of physical and chemical properties. Regression analyses have been performed fitting the experimental data to five kinetic models. The five kinetic models include: a linearized first-order sorption, a first-order Freundlich sorption, an empirical function, a diffusion-limited Langmuir sorption, and a diffusion-limited Freundlich sorption. Mean correlation coefficients of 0.81, 0.83, 0.84, 0.86, and 0.88 were obtained for the models, respectively. (Skogerboe-Colorado State)
W77-09968

INFLUENCE OF LONG TERM TILLAGE, CROP ROTATION, AND SOIL TYPE COMBINATIONS ON CORN YIELD,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-09969

COMPUTER SIMULATION OF PHOSPHORUS MOVEMENT THROUGH SOILS,
New Hampshire Univ., Durham. Inst of Natural and Environmental Resources.
For primary bibliographic entry see Field 5B.
W77-09970

ESTIMATION OF COMPONENTS OF SOIL CATION EXCHANGE CAPACITY FROM MEASUREMENTS OF SPECIFIC SURFACE AND ORGANIC MATTER,
University Coll., Dublin (Ireland). Dept. of Soil Science.
D. Curtain, and G. W. Smillie.
Soil Science Society of America Journal, Vol 40, No 3, p 461-462, May-June 1976. 3 tab, 14 ref.

Descriptors: *Cation exchange, *Organic matter, Soil textures, Soils, Soil properties, Soil investigations, *Pollutant identification.
Identifiers: *Specific surface measurement(Soils), *Ireland.

Cation exchange capacities of Irish soils developed from a wide range of parent materials were found to be highly correlated with organic matter content and specific surface but not with clay content. Multiple regression analysis showed that organic matter in combination with specific surface accounted for 97% of the variation in CEC whereas organic matter and clay content only accounted for 58% of the variation. The better correlation between CEC and specific surface than between CEC and clay content, is attributed to the ability of surface area measurements to reflect the presence of phyllosilicates in silt and sand fractions of soils and to the fact that these minerals have less variable surface charge densities than cation exchange capacities. It is proposed that specific surface provides a better estimate than clay content of the mineral component of CEC for soils of varying mineralogy. (Skogerboe-Colorado State)
W77-09971

POTASSIUM SOURCES AND AVAILABILITY ON A DEEP, SANDY SOIL OF EAST TEXAS,
Texas A and M Univ., College Station. Dept. of Soil Mineralogy.
F. M. Hons, J. B. Dixon, and J. E. Matocha.
Soil Science Society of America Journal, Vol 40, No 3, p 370-373, May-June 1976. 2 fig, 4 tab, 28 ref.

Descriptors: *Potassium, Nutrients, *Soil properties, *Bermuda grass, Soil investigations, Soil profiles, Fertilization, Root development, *Sands, *Texas, Coasts.
Identifiers: Mica, Darco soils.

Soil properties were assessed that may have contributed to the failure of Coastal bermudagrass to respond to application of K on Darco fine sand for 5 consecutive years. The depth to which plant roots absorbed K was assessed by field observation and by determination of K levels in control and treatment plots. Potassium minerals were determined by chemical methods to assess potential nutrient sources. Potassium removal was indicated to at least 160 cm by soil solution content and to 235 cm by exchangeable K concentration and Gapon selectivity values. Depth of bermudagrass rooting was in agreement with chemical indicators of K removal. (Skogerboe-Colorado State)
W77-09972

RELATION BETWEEN THE KINETICS OF NITROGEN TRANSFORMATION AND BIOMASS DISTRIBUTION IN A SOIL COLUMN DURING CONTINUOUS LEACHING,
Connecticut Agricultural Experiment Station, New Haven.
J. L. Starr, and J. Y. Parlange.
Soil Science Society of America Journal, Vol 40, No 3, p 458-460, May-June 1976. 1 fig, 5 ref.

Descriptors: *Nitrogen, *Leaching, *Kinetics, Microorganisms, Soils, Soil investigations, *Biomass, *Distribution.
Identifiers: Soil columns, Microbes.

Nitrogen concentration profiles in soil columns with associated microbial distributions have been used in the past to deduce the kinetics of nitrogen transformations during steady leaching. Owing to the many factors which control microbial reaction kinetics in continuous flow systems, the effect of biomass variation and order of reaction cannot be separated by simply measuring steady-state concentrations profiles. It is shown that in practice these measurements only lead to some average kinetics for the system observed, even when the microbe distribution is measured independently. Previously published experimental data in conjunction with a derived expression are used to illustrate the point. (Skogerboe-Colorado State)
W77-09973

SAMPLING THE UNSATURATED ZONE OF IRRIGATED LANDS FOR RELIABLE ESTIMATES OF NITRATE CONCENTRATIONS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
J. M. Rible, P. A. Nash, P. F. Pratt, and L. J. Lund.
Soil Science Society of America Journal, Vol 40, No 4, p 566-570, July-August 1976. 5 fig, 5 tab, 9 ref.

Descriptors: *Nitrates, *Nitrogen, Soils, Soil properties, Soil investigations, *Sampling, *Irrigated lands, Root zone, Estimating, Water pollution sources.
Identifiers: Soil variability, *Nitrate-nitrogen concentrations(Soils).

Data from a study of 56 field sites were used to examine the variability of nitrate-nitrogen concentrations in the unsaturated zone underneath the root zone. The specific data were nitrate-nitrogen concentrations in soil water in samples taken at 0.9-m intervals from the 4.5- to 11.9-m depth from four holes per site. Analyses of variance of these data provided estimates of variances that were used to predict the depth sampling interval and the number

of holes required for site means to be within confidence limits of 10, 20, and 30%. Calculations were based on sampling intervals of 0.9, 0.6, and 0.3 m providing 9, 13, and 26 samples per hole, respectively. Relationships developed between number of sites, number of holes required, sampling interval, and confidence limits were used to test selected sampling plans for degree of precision in comparison with the actual sampling procedure. A cost analysis of the field study indicated that it would cost three to four times more than the field study to use a sampling plan which would reasonably ensure that 75% of the sites' true means fall within 20% of the measured means at a confidence level of 95%. (Skogerboe-Colorado State)
W77-09974

CHANGES IN THE PHYSICAL PROPERTIES OF SOIL CLAYS DUE TO PRECIPITATED ALUMINUM AND IRON HYDROXIDES: II. COLLOIDAL INTERACTIONS IN THE ABSENCE OF DRYING,
Hawaii Univ., Honolulu. Dept. of Soil Science.
S. A. El-Swaify.
Soil Science Society of America Journal, Vol 40, No 4, p 516-520, July-August 1976. 6 fig, 13 ref.

Descriptors: *Clays, *Flocculation, Soils, Soil properties, Soil investigations, Soil chemistry, *Soil chemical properties, *Alkalis(Bases), Iron compounds.
Identifiers: *Iron hydroxide, *Aluminum hydroxide.

Colloidal stability diagrams were constructed for suspensions of an illite, a kaolinite, and a mixture of the two into which Al(OH)3 and Fe(OH)3 were precipitated. These diagrams covered a pH range from 2.5 to 12.5 and electrolyte concentrations up to the flocculation value. It was revealed, in accordance with expected interactions of colloids with widely different isoelectric points, that the colloidal stability of each mixture was dependent on the charge balance between its individual constituents. Therefore, as long as a system has not encountered a drying cycle, hydroxides may provide favorable (flocculating) or non-favorable (colloidally stable) effects on soil structure depending on hydroxide type, its surface reactivity, and the clay mineral with which it may be associated. Generally, the two hydroxides provided equal enhancement of clay colloidal stability above their isoelectric points. However, Al(OH)3 was more active in inducing clay flocculation and charge reversal at low pH values. (See also W77-03073) (Skogerboe-Colorado State)
W77-09975

MOVEMENT OF CARBARYL THROUGH CONGAREE SOIL INTO GROUND WATER,
Clemson Univ., S.C. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 5B.
W77-09976

UPTAKE OF CADMIUM BY SOYBEANS AS INFLUENCED BY SOIL CATION EXCHANGE CAPACITY, PH AND AVAILABLE PHOSPHORUS,
Argonne National Lab., Ill.
J. E. Miller, J. J. Hassett, and D. E. Koeppe.
Journal of Environmental Quality, Vol. 5, No. 2, p 157-160, April-June 1976. 1 fig, 5 tab, 21 ref.

Descriptors: *Cadmium, *Cation exchange, *Phosphorus, Greenhouses, Heavy metals, *Soybeans, *Absorption, *Plant growth, Crop response, Soil chemistry.
Identifiers: Heavy metal Pollution, Cadmium sorption.

The accumulation of cadmium and its effect on vegetative growth of soybeans in soils with a range in cation exchange capacity (CEC), pH and available phosphorus (P) were investigated in greenhouse experiments. Cadmium uptake decreased as soil pH and CEC increased, while increasing available soil P was related to increased Cd accumulation. Cadmium extracted from the soil by Bray P1 reagent, Bray P2 reagent, 2N MgC12, and 0.1N EDTA was significantly correlated with plant Cd concentrations. The growth of the soybean shoots was generally depressed when tissue concentrations reached 3-5 micro g Cd/g dry weight. Cadmium uptake by soybeans was correlated with the ratio of added Cd to the Cd sorptive capacity of soil. (Skogerboe-Colorado State)
W77-09977

LONG-TERM EVALUATION OF SLOW-RELEASE NITROGEN SOURCES OF TURFGRASS,
Community Coll. of the Finger Lakes, Canandaigua, New York.
For primary bibliographic entry see Field 3C.
W77-09978

SOLUBILITY AND SOLUBILITY PRODUCT OF DICALCIUM PHOSPHATE DIHYDRATE IN AQUEOUS SOLUTIONS AND SOIL SOLUTIONS,
Alabama Agricultural Experiment Station, Auburn. Dept. of Soils.
A. C. Bennett, and F. Adams.
Soil Science Society of America Journal, Vol. 40, No. 1, p 39-42, January-February 1976. 3 tab, 10 ref.

Descriptors: *Phosphates, Soils, Soil investigations, Soil properties, *Solubility, Aqueous solutions, Organic compounds, *Hydrates.
Identifiers: Phosphate fixation, Ionic activity, Ionic pairs, *Dicalcium phosphate, Dihydrate.

The solubility product (Ca(2+)) (HPO4(2-)) of CaHPO4.2H2O was determined in several aqueous solutions containing ions common to soil solutions. Extrapolation of analytical Ca and P concentrations to zero ionic strength yielded pK(sp) values ranging from 6.54 to 6.59 and averaging 6.57 for 10 aqueous salt solutions. A method of successive approximation that computed ionic activity was used to determine the pK(sp) for three concentrations of 15 different aqueous salt solutions saturated with CaHPO4.2H2O. Calculated pK(sp) values ranged from 6.44 to 6.63; the average was 6.55. Eight soil samples that varied widely in pH and soil-test P were treated with CaHPO4.2H2O at rates of 600 to 3,000 ppm P. Soil solutions were displaced, analyzed, and (Ca(2+))-(HPO4(2-)) was calculated. Eight of the 20 samples of soil were considered to be saturated with CaHPO4.2H2O because their (Ca(2+)) (HPO4(2-)) values were approximately the same as that for similar aqueous salt solutions. It was concluded that the presence of excess CaHPO4.2H2O in soil could be inferred by ion-activity products of displaced soil solutions. (Skogerboe-Colorado State)
W77-09979

THE SLOW REACTION WHICH CONTINUES AFTER PHOSPHATE ADSORPTION: KINETICS AND EQUILIBRIUM IN SOME TROPICAL SOILS,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
D. N. Munns, and R. L. Fox.
Soil Science Society of America Journal, Vol. 40, No. 1, p 46-51, January-February 1976. 7 fig, 2 tab, 18 ref.

Descriptors: *Phosphates, *Top soil, *Adsorption, Soils, Soil investigations, *Kinetics, Lime, Hysteresis, Soil properties, *Soil chemistry.
Identifiers: *Tropical soils, *Phosphate adsorption(Soils).

Dissolved phosphate was mixed with topsoil samples, and the decline in solution phosphate concentration (P) was followed for 200-300 days by periodically shaking and extracting subsamples with 1 or 10 mM CaC12. During the first 20-40 days, (P) declined faster in soil suspensions that were being shaken than it did in undisturbed soil at 0.1 bar moisture. After 40 days of reaction, shaking time had little effect. The slow fixation had first-order kinetics with respect to (P). The relative rate was faster in an Andept than in three Oxisols. It was unaffected by limel, though lime increased the strength of adsorption. Equilibrium was achieved at 50 days in an Andept and 100-200 days in three Oxisols. At equilibrium, the amount of adsorbed phosphate remaining labile was estimated from values of (P), using 6-day adsorption isotherms. Labile phosphate so estimated amounted to 30-50% of the added phosphate, implying that the residual value of phosphate added to these soils should be substantial and permanent except for removal by crops and erosion. Desorption isotherms diverged from adsorption isotherms diverged from adsorption isotherms less markedly with increasing time after phosphate addition, as if the slow reaction caused much of the apparent hysteresis. (Skogerboe-Colorado State)
W77-09980

SCIENTIFIC BASES OF A SYSTEM FOR AVERTING UNFAVORABLE CONSEQUENCES OF STEPPE SOIL IRRIGATION, (IN RUSSIAN),
Moscow State Univ. (USSR).
B. G. Rozanov.
Vestn Mosk Univ Ser 6 Biol Pochvoved. 29(3), p 19-25, 1974.

Descriptors: *Soil water, *Irrigation, Vegetation, Soil organisms, Geochemistry, Hydrogeology, Regulation, *Soil conservation.
Identifiers: USSR.

The solution of a problem of regulation of steppe soil water regime by the way of irrigation involves a number of side and secondary consequences unfavorable for future vegetation, soil organisms, hydrogeological and geochemical conditions. Measures for averting the unfavorable consequences of irrigation include engineering, meliorative and agrotechnical methods.--Copyright 1975, Biological Abstracts, Inc.
W77-10021

2H. Lakes

A GUIDE TO AERATION/CIRCULATION TECHNIQUES FOR LAKE MANAGEMENT,
Tetra Tech., Inc., Lafayette, Calif.
For primary bibliographic entry see Field 5G.
W77-09603

NUTRIENT DIVERSION: RESULTING LAKE TROPHIC STATE AND PHOSPHORUS DYNAMICS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-09604

STUDIES ON THE RECLAMATION OF STONE LAKE, MICHIGAN,
Notre Dame Univ., Ind.
For primary bibliographic entry see Field 5G.
W77-09605

WASTEWATER TREATMENT BY NATURAL AND ARTIFICIAL MARSHES,
Wisconsin Univ., Oshkosh.
For primary bibliographic entry see Field 5D.
W77-09606

TEMPERATURE EFFECTS ON THE DENITRIFICATION PRODUCTS BY TWO AQUATIC PSEUDOMONAS SPECIES,
For primary bibliographic entry see Field 5C.
W77-09607

ECOLOGY OF THE AZOV VIMBA, VIMBA VIMBA CARINATA (PALL.), OF THE TSIMLYANSK RESERVOIR, (IN RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Volgograd (USSR).
V. V. Yaremenko.
Vopr Ikhtiol. 14(4), p 693-696, 1974.

Descriptors: *Reservoirs, *Spawning, *Ectotypes, *Aquatic habitats, Ecology, Care, Population, Freshwater fish.
Identifiers: Abramis ballerus, Abramis brama, *Azov vimba, Blicca bjoerkna, Russian-SFSR, *Tsimlyansk Reservoir(USSR), *Vimba, Vimba vimba carinata, Carpbream, Zope, Silver bream, *USSR.

The vimba population of the Tsimlyansk Reservoir on the Don River (Russian SFSR, USSR) was formed from the Azov vimba Vimba vimba carinata and was caught in trawl catches for the 1st time in 1956. The process of adaptation and increase in abundance in the Tsimlyansk reservoir have proceeded more slowly than for the common carp, carpbream (Abramis brama), zope (A. ballerus), silver bream (Blicca bjoerkna) and other fishes. Two groups differing in spawning ecology have formed in the vimba population: a lithorheophilic group and a group reproducing in the presence of a weaker current. The 1st group is more abundant.--Copyright 1975, Biological Abstracts, Inc.
W77-09610

MACROPHYTE-SEDIMENT RELATIONSHIPS IN CHAUTAUGUA LAKE,
For primary bibliographic entry see Field 5C.
W77-09612

THE PHYSICO-CHEMICAL LIMNOLOGY OF THE MWENDA RIVER MOUTH, LAKE KARIBA,
Rhodesia Univ., Salisbury. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-09614

THE CONSEQUENCES OF IMPOUNDMENT ON AN ARCTIC CHAR LAKE SYSTEM. AN ANALYSIS BY SIMULATION MODELLING,
For primary bibliographic entry see Field 5B.
W77-09616

AN INVESTIGATION OF THE ROLE OF ORGANIC MATERIALS IN FRESHWATER SYSTEMS,
For primary bibliographic entry see Field 5C.
W77-09618

MELOSIRA GRANULATA (EHR.) RALFS: MORPHOLOGY AND ECOLOGY OF A COSMOPOLITAN FRESHWATER DIATOM,
For primary bibliographic entry see Field 5C.
W77-09619

INTENSIVE LARGE CITY INFLUENCE ON REED-BANKS, (IN GERMAN),
Technische Universitaet, Berlin (West Germany). Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W77-09621

DIATOMS IN POND PLANKTON: RELATIONSHIPS TO EPIPHYTIC AND EPIPELIC POPULATIONS,
For primary bibliographic entry see Field 5C.
W77-09628

ANALYSIS OF THE POPULATION DYNAMICS OF OSCILLATORIA REDEKEI VAN GOOR IN LAKE EDEBERG,
For primary bibliographic entry see Field 5C.
W77-09629

A FOOD WEB MODEL FOR LAKE MICHIGAN: PART I-JUSTIFICATION AND DEVELOPMENT OF THE MODEL,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W77-09631

PLANKTON ECOLOGY IN LONG POND, ST. JOHNS, NEWFOUNDLAND: A POLLUTED POND CHARACTERIZED BY A HIGH FLUSHING RATE,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-09664

MERCURY ACCUMULATION BY LARGEMOUTH BASS (MICROPTERUS SALMOIDES) IN RECENTLY IMPOUNDED RESERVOIRS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5C.
W77-09667

THE EFFECT OF WIND ON THE DISTRIBUTION OF CHLOROPHYLL A AND CRUSTACEAN PLANKTON IN A SHALLOW EUTROPHIC RESERVOIR,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5B.
W77-09679

SHORT TERM SEDIMENTATION RESPONSE IN LAKES IN WESTERN UNITED STATES AS MEASURED BY AUTOMATED SAMPLING,
New Mexico Univ., Albuquerque. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-09701

DOMESTIC AND AGRICULTURAL CONTRIBUTIONS TO THE INPUTS OF PHOSPHORUS AND NITROGEN TO LOUGH NEAGH,
Northern Ireland Dept. of Agriculture, Antrim. Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5B.
W77-09722

DILUTION CHARACTERISTICS OF EFFLUENTS IN DEEP WATER RESERVOIRS DETERMINED WITH A RADIOACTIVE INDICATOR (ON THE EXAMPLE OF LAKE BAIKAL), (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W77-09735

LEAD AND FRESHWATER FISHES: PART 2--IONIC LEAD ACCUMULATION,
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
For primary bibliographic entry see Field 5C.
W77-09779

CALCIUM CARBONATE FORMATION BY ENTEROMORPHA NANA ALGAE IN A HYPERSALINE VOLCANIC CRATER LAKE,
Australian National Univ., Canberra. Dept. of Biogeography and Geomorphology.
J. Dodson.
Hydrobiologia. Vol. 44, No. 2/3, p 247-255. 1974.

Descriptors: Marl, Basalts, *Algae, Australia, *Calcium carbonate, Craters.
Identifiers: Aragonite, Enteromorpha-nana.

On the black basaltic rock surfaces in shallow water around the margin of Lake Gnotuk (Australia), and for several meters above the present lake, there is a thick white coating of aragonite marl. The water in the lake is supersaturated with CaCO3. From close observation and experimental work, it is evident that the marl is produced by the alga E. nana which lives in the shallow lake water and grows attached to the basalt. The general mechanism of CaCO3 precipitation by aquatic plants is outlined, and in E. nana, it can be demonstrated that the closed tubular thallus absorbs HCO-3 from the outside water and secretes CO2-3 inside the tube. This secretion of CO2-3 greatly increases the ionic product of (CA2+)(CO2-3) in the water inside the thallus, and leads to the precipitation of aragonite and its accumulation at the base of the tube.--Copyright 1974, Biological Abstracts, Inc.
W77-09787

A REPORT ON STUDIES OF THE EFFECTS OF DREDGING AND DISPOSAL IN THE GREAT LAKES WITH EMPHASIS ON CANADIAN WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-09794

FILTERING RATE INHIBITION OF DAPHNIA PULEX IN WINTERGREEN LAKE WATER,
Michigan State Univ., East Lansing. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-09910

THE SHORE AND THE WATER-THE LOCALIZATION OF DAMAGE AND THE REGULATION OF FISH MANAGEMENT IN CONTROLLED LAKES, (IN SWEDISH),
For primary bibliographic entry see Field 4A.
W77-09935

URCEOLARIDS (CILIATA, PERITRICHA) FROM FISHES OF THE URALS, (IN RUSSIAN),
Siberian Research Inst. of the Fish Industry, Sverdlovsk (USSR). Ural Div.
V. V. Kashkovskii.
Parazitologiya (Leningr). 8(4), p 368-378, 1974.

Descriptors: *Fish parasites, *Protozoa, Lakes, Ponds.
Identifiers: *Peritricha, Trichodina carassii, Trichodina domerguei acuta, Trichodina domerguei esocis, Trichodina meridionalis, Trichodina mira, Trichodina mutabilis, Trichodina nigra, Trichodina nigra gobii, Trichodina nigra nemachili, Trichodina nobilis, Trichodina pediculus, Trichodina policirra, Trichodina reticulata, Trichodina rostrata, Trichodina spathulata, Trichodina urinaria, Trichodinella, Trichodinella epizootica, Trichodinella epizootica lotae, Trichodinella percarum, Tripartiella bulbosa, Tripartiella copiosa, Tripartiella incisa, Urals, *Urceolariids, *USSR.

Parasitological investigations were carried out in 15 lakes and 7 ponds of the Sverdlovsk and Cheljabinsk regions of USSR in 1966-1972. Fishes (5008 specimens of 17 spp.) of different ages were examined. In them were 23 spp. and forms of ur-

ceolariids (Tripartiella bulbosa, T. copiosa, T. incisa, Trichodina domerguei f. esocis, T. domerguei f. acuta, T. meridionalis, T. mira, T. mutabilis, T. nobilis, T. nigra, T. nigra f. gobii, T. nigra f. nemachili, T. pediculus, T. policirra, T. reticulata, T. rostrata, T. spathulata, T. urinaria, Trichodina carassii, Trichodinella, T. epizootica, T. percarum, T. epizootica f. lotae). Microphotographs, biometrical indices of Infusoria and degrees of infestation in waters of different types are given.--Copyright 1975, Biological Abstracts, Inc.
W77-09936

CHARACTERISTICS OF THE ZOOPLANKTON OF THE LOWER REACHES OF THE IRGIZ AND TURGAY RIVERS, (IN RUSSIAN),
Kazakh Research Inst. of Fisheries, Balkhash (USSR).
For primary bibliographic entry see Field 5C.
W77-09940

WATER SUPPLY FROM SHELBYVILLE AND CARLYLE LAKES AND THEIR OPTIMAL JOINT OPERATION,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-09943

SEASONAL VARIATIONS IN GREAT LAKES DESIGN WAVE HEIGHTS: LAKE ERIE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-09986

DICKEY-LINCOLN SCHOOL LAKES HYDROTHERMAL MODEL STUDY; HYDRAULIC LABORATORY INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-09987

LAKE DARDANELLE, ARKANSAS RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-09988

DESIGN FOR SMALL-BOAT HARBOR IMPROVEMENTS, PORT WASHINGTON HARBOR, WISCONSIN; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-09989

IGLOO WAVE ABSORBER TESTS FOR PORT WASHINGTON HARBOR, WISCONSIN; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-09990

THE GREAT DISMAL SWAMP: MANAGEMENT OF A HYDROLOGIC RESOURCE WITH THE AID OF REMOTE SENSING,
Geological Survey, Reston, Va. Water Resources Div.; and Great Dismal Swamp National Wildlife Refuge, Suffolk, Va.; and National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
V. Carter, M. K. Garrett, L. Shima, and P. Gammon.
Water Resources Bulletin, Vol 13, No 1, p 1-12, February 1977. 4 fig, 6 ref.

Descriptors: *Swamps, Hydrology, *Remote sensing, *Mapping, *Aerial photography, Satellites(Artificial), Wetlands, Marshes, Lakes, Vegetation, Photogrammetry.
Identifiers: *Great Dismal Swamp(NC and VA).

The Great Dismal Swamp is a forested wetland located on the Virginia-North Carolina border on the southern Atlantic coastal plain. It covers 84,000 hectares and is developed on organic soils ranging in depth from 4 meters in ancient drainage channels to less than 0.3 meters along the outer edges. Lake Drummond, approximately 4.0 kilometers in diameter, is almost centrally located within the gently east sloping gradient of the swamp. The origin and present hydrologic regime of the swamp and Lake Drummond are still in dispute because of the complex regional geology and fragmented historical record. Both color infrared aerial photography and Landsat data are providing information to meet present and future management goals for the Great Dismal Swamp National Wildlife Refuge. High and low altitude color infrared photographs are being used to study the hydrology and map the present vegetation of the swamp. A variety of significant ecologic units have been identified with the photographs. The completed maps will be used to evaluate analyses of Landsat digital data. Once the present data base is compiled, it is hoped that routine analysis of Landsat data can be used for updating or to indicate areas where low altitude coverage or ground checking is desirable. The data base also will aid in identifying and evaluating trends that may provide guidelines for wetland management. (Woodard-USGS)
W77-10007

PLANKTONIC CILIATES IN THE IVAN'KOVO WATER RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W77-10010

STUDIES ON THE BOTTOM FAUNA OF FOUR LAKES IN EASTERN HIKKAIDO (LAKES KUSSHYARO-KO, AKAN-KO, TORO-KO AND SHIKARIBETSU KO, (IN JAPANESE),
Mieken Science Education Center, Yokkaichi (Japan).
For primary bibliographic entry see Field 5C.
W77-10028

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 17-4, NUMERICAL MODEL FEASIBILITY STUDY,
Army Engineer Waterway Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10048

BOTTOM WITHDRAWAL CAN ENHANCE LAKE WATER QUALITY,
Arkansas Univ., Fayetteville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-10049

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFGYL. PART 1, AVAILABLE PHOSPHORUS IN URBAN RUNOFF AND LAKE ONTARIO TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10052

AN INVESTIGATION OF THE NEARSHORE REGION OF LAKE ONTARIO IFYGL.
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
For primary bibliographic entry see Field 5C.
W77-10053

RESTORATION OF LOWER ST. REGIS LAKE (FRANKLIN COUNTY, NEW YORK),
New York State Dept. of Health, Albany. Environmental Health Center.
For primary bibliographic entry see Field 5C.
W77-10054

BAY SPRINGS LAKE WATER-QUALITY STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W77-10055

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION: VOL. 4. PHYTOPLANKTON OF LAKE MICHIGAN,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W77-10056

BIOLOGICAL, CHEMICAL AND PHYSICAL RELATIONSHIPS IN THE STRAITS OF MACKINAC,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W77-10058

UNDERWATER HABITATS FOR SCIENTIFIC RESEARCH IN THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 7B.
W77-10060

BIOLOGICAL EFFECTS AND PERSISTENCE OF METHYL PARATHION IN CLEAR LAKE, CALIFORNIA,
Lake County Mosquito Abatement District, Lakeport, Calif.
For primary bibliographic entry see Field 5C.
W77-10063

THE ECOLOGY OF CHYDORIDAE (CLADOCERA) OF LAKE BAIKAL (IN RUSSIAN),
Irkutskii Gosudarstvennyi Universitet (USSR). Lake Baikal Biological Station.
G. L. Vasil'eva, and N. N. Smirnov.
Zool Zh 54(9), p 1293-1305, 1975.

Descriptors: *Ecology, *Lakes, *Crustaceans, *Distribution patterns, Benthos, Littoral, Population, Cellulose, Biomass.
Identifiers: Alona labrosa, Alona rectangula, Alona setosocaudata, Baikal, *Chydoridae, Chydorus piger, Chydorus sphaericus, Kozhowia baicalensis, Kozhowia gajewskajae, Kozhowia kozhowi, Kozhowia primigenia, Pollution zone, USSR, Population structure, Population density.

The distribution of Chydoridae in Lake Baikal (USSR) was studied. Males of 4 spp. of the genus Kozhowia were found. The endemic Chydoridae form a complex characteristic of the mesobenthos of open and slightly protected littoral regions. The annual dynamics of population structure and density was studied for K. baicalensis, Alona labrosa and A. setosocaudata. They live and propagate in the pollution zone of the Baikal cellulose plant. The population density of Chydoridae in Lake

Baikal attains 10-15,000/m2 and that of Chydorus sphaericus 80,000. The biomass of Chydoridae makes, on the average, 0.5-10% of the whole mesobenthos biomass and up to 50% at some stations. (A. rectangula, C. piger, K. Primigenia, K. gajewskajae and K. kozhowi are also mentioned.)
W77-10064

THE DARWENDALE RESERVOIR AS A FISHERY,
Rhodes Univ. (Salisbury). Dept. of Zoology.
A. P. Bowmaker.
The Rhodesia Science News, Vol. 10, No. 6, p 152-156, June 1976, map, fig, 3 ref.

Descriptors: Reservoirs, Fisheries, Nutrients, Water temperature, Water level fluctuations, Commercial fishing, Spawning, Fish migration, *Fish management, Africa.
Identifiers: Tilapia rendalli, Sarotherodon macrochir, Hydrocynus vittatus, Labeo altivelis, Clarias gariepinus, Darwendale Dam, Lake McIlwaine, Huyani River, *Rhodesia, Southern Africa.

Rhhodesia ideally situated to produce fish at a high return per unit area. The present nutrient status of the Hunyani river system and the tropical situation create ideal conditions for the production of a high yield of fish in the Lake McIlwaine/Darwendale reservoir system. This paper aims to clarify the role of fish production as one facet of a multi-purpose utilisation, and to suggest guidelines for the proper management of the system from a food production viewpoint. Possible production levels are estimated. (So. African Water Info. Center)
W77-10096

WATERFOWL (ANATIDAE) ON IRRIGATION LAKES IN THE ORANGE FREE STATE,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Nature Conservation.
J. N. Geldenhuys.
The Ostrich, Vol. 46, No. 3/4, p 219-235, 1975. 9 tab, map, 6 fig, 13 ref.

Descriptors: Bioindicators, Water birds, Irrigation, Lakes, Dams, Breeding, Seasonal, Populations, Migration patterns, Food chains, Africa, Farm ponds, Impoundment, Africa.
Identifiers: Erfenis Dam, Koppies Dam, Bloemhof Dam, Allemanskraal Dam, Krugersdrift Dam, Tierpoort Dam, Rustfontein Dam, Kalkfontein Dam, *Orange Free State, South Africa.

The influence of large man-made impoundment on the total permanent water are and shoreline length in South Africa has been described previously. The future of South African waterfowl will be determined largely by their ability to exploit the new artificial environments. The emphasizes a need for data on the distribution and population strength of waterfowl utilizing these habitats. There are no systematic counts of water fowl on irrigation lakes in the Orange Free State, though a relatively high number of these waters exist in the province. In other parts of the country censuses have been conducted, but these usually were restricted to one particular locality at a time. The aim of the present study was to investigate the incidence and population size of fifteen duck species on none irrigation lakes in the Orange Free State from August 1972 to July 1973. The most common species were the Egyptian Goose, South African Shelduck, Yellowbilled duck, and Spurwinged duck, in that order. Relatively high seasonal fluctuations were found in populations of the South African Shelduck, Cape Teal, Southern Pochard, and to a lesser extent in the Spurwinged goose and Cape Shoveller. (So. African Water Info. Center)
W77-10097

LAKE SIBAYA - A LAND-LOCKED ESTUARY,
Rhodes Univ., Grahamstown (South Africa) Inst. of Freshwater Studies.
M. N. Bruton.
Scientiae, Vol. 16, No. 6, p 19-28, 1975. 14 fig, 54 ref.

Descriptors: Estuaries, Bioindicators, *Environmental effects, Ecology, Limnology, *Lakes, Benthic fauna, Zooplankton, Seasonal, Food chains, Fish hatcheries, Feeding habits, Diatoms, Primary productivity, Africa.
Identifiers: *Lake Sibaya, Kwazulu, Tongaland, Natal, South Africa.

Lake Sibaya was apparently once an estuary and there are many creatures living in it that are normally only found in salt waters. Research is being conducted on how these estuarine organisms have adapted to the foreign environment of a freshwater lake. With the increasing commercial development of hitherto unexploited areas of South Africa, Lake Sibya and its environs are among the few remaining regions as yet virtually undisturbed by man, and offers a rare opportunity to study an ecosystem in its pristine state. Research is providing the scientific data necessary for the rational exploitation of the natural resources of the lake, and in a wider context, making available information that should be of inestimable value for the management of natural lakes, man-made dams and other water systems throughout South Africa. A summary is made of research projects and results. A bibliography on Lake Siby is included (So. African Water Info. Center)
W77-10099

2I. Water In Plants

CONCERNING THE INFLUENCE OF THE HYDROGEN ION CONCENTRATION AND OF THE BICARBONATE CONCENTRATION ON THE STRUCTURE OF BIOCENOSES OF MOUNTAIN BROOKS, (IN GERMAN),
H. Ziemann.
Int Rev Gesamten Hydrobiol 60(4), p 523-555, 1975.

Descriptors: *Hydrogen ion concentration, *Bicarbonates, Streams, *Diatoms, *Aquatic insects, *Mayflies, Water temperature, Trophic level, *Stoneflies, Water chemistry.
Identifiers: Biocenoses, *Trichoptera.

The diatom flora and the Plecoptera, Ephemeroptera and Trichoptera fauna were investigated in 2 mountain brooks in the Thueringer Woods (East Germany), which had differing chemistries. The different effects on the biocoenoses of the regional factors of water chemistry, and of extra-regional factors, current and temperature are discussed. The zoocoenotic division of mountain streams is affected by extra-regional factors; the structure of the diatom associations and the distribution of individual species of the insect fauna are dependent on the regional effect of the water chemistry. The correlation of halobic indices as ecological characteristics of the diatom flora with the factors of water chemistry, the pH and alkalinity, and their relationship with the distribution of some insect species suggest that the halobic index is a useful criterion for the ecological classification of waters. For the judgement of trophic conditions and the self-purification of waters, the halobic index can be regarded as an additional criterion.
W77-09620

ECOLOGICAL AND TOPOGRAPHIC SERIES OF VEGETATION OF EROSION FORMS OF RELIEF IN THE NORTHEAST OF THE CHERNIGOV TERRITORY, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
A. I. Kuz'Mychov, and I. S. Antonov.
Ukr Bot Zh 32(2), p 217-219, 1975.

Descriptors: *Ecology, *Topography, *Vegetation, Erosion, *Forest management.
Identifiers: *USSR(Northeast Chernigov Territory).

Fragments of primary forest vegetation derivative forest aggregations and herbaceous vegetation on unforested slopes are described for the region under study (USSR). Peculiarities in distribution of different associations of the forest and herbaceous vegetation are dependent on exposition of slopes and their steepness. These associations are discussed and a short description of the plant cover composition is presented for most of them.
W77-09622

A PRACTICAL APPARATUS FOR QUANTITATIVE SAMPLING OF EPILITHIC PERIPHYTON, (IN FRENCH),
Liege Univ. (Belgium). Dept. of Botany.
For primary bibliographic entry see Field 7B.
W77-09623

THE EFFECTS OF GRANITIC SAND ON THE DISTRIBUTION AND ABUNDANCE OF SALMONIDS IN IDAHO STREAMS,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
L. C. Stuehrenberg.

Descriptors: Sediments, Trout, Salmon, Benthos, Sediment transport, Insect drift, Fish food organisms, Streams, *Idaho, Aquatic insects, *Sands, *Distribution, *Salmonids, Biota.
Identifiers: *Central Idaho Batholith, *Chinook salmon, *Steelhead trout, Bedload sediment.

In the summers of 1972 and 1973 an interdisciplinary team studied the effects of different levels of Central Idaho Batholith on the aquatic biota in streams. The work was conducted in artificial stream channels at the Hayden Creek Experimental Research Station and in streams in the Central Idaho Batholith. The fisheries part of the study assessed: (1) the effects of sediment in summer habitat on juvenile steelhead trout (Salmo gairdneri) and chinook salmon (Oncorhynchus tsawytscha), and (2) the effect of sediment in winter habitat on juvenile steelhead trout and chinook salmon. Zuvenile steelhead trout and chinook salmon were not affected by the levels of batholith sediment added to riffle sections during summer but a reduction of pool area by sediment caused a direct decrease in the number of fish present in the pools. Under winter stream conditions age-O steelhead trout and chinook salmon did not remain in riffle sections when sediment filled the interstitial spaces of the gravel substrate.
W77-09797

THE ORIGIN AND STRUCTURE OF AMERICAN ARID-ZONE ECOSYSTEMS. THE PRODUCERS: INTERACTIONS BETWEEN ENVIRONMENT, FORM AND FUNCTION,
San Diego Univ., Calif. Dept. of Biology.
For primary bibliographic entry see Field 2A.
W77-09933

COMPARATIVE STUDY OF THE ANTIFUNGAL ACTIVITY OF TRITERPENE GLYCOSIDES OF PACIFIC HOLOTHURIANS, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Biologii.
M. M. Anisimov, V. V. Shcheglov, V. A. Stonik, A. L. Kul'ga, and E. V. Levina.
Dokl Akad Nauk SSSR Ser Biol. 107(3), p 711-713, 1972.

Descriptors: Fungicides.
Identifiers: *Glycosides(Triterpene), *Holothurians(Pacific), Antifungal activity.

The antifungal activity of several holothurian triterpene glycosides was shown.--Copyright 1975, Biological Abstracts, Inc.
W77-09938

SIMULATION OF PLANT GROWTH BY HUMIC SUBSTANCES,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
Y. S. Lee, and R. J. Bartlett.
Soil Science Society of America Journal, Vol 40, No 6, p 876-879, November-December 1976. 1 fig, 6 tab, 15 ref.

Descriptors: *Organic matter, Corn(Field), *Plant growth, Algae, Nutrients, Phosphorus, Iron, *Growth rates, Crop response, *Humus, Decomposing organic matter, Simulation analysis.

Humic substances prepared by different techniques of extraction and from different sources of organic materials were tested for their effects on growth of corn seedlings and algae. Stimulating effects were confirmed with optimum concentrations about 5 ppm C as Na-humate for corn and 60 ppm for algae. With corn, the increase was 30 to 50% in nutrient solution or low organic matter soil; with algae, about 100%. Variation of effects among humic acids derived from different organic materials was not great. The concentrations of elements in corn seedlings did not show any correlation with yield or humic acid level except for P and Fe. Phosphorus concentration was increased with increasing levels of humic acid regardless of the yield response. Higher Fe concentration in the plant tops and lower in roots was observed in the treatments with humic acid. The application of humic acid to a soil low in organic matter or to nutrient solution gave the greatest growth response. Application to a high organic matter soil gave little growth response, or even a slightly negative response, indicating that the natural soil, without extraction, supplied optimum amount of humic substances to the plants. It is suggested that a test be developed to predict whether a given soil can furnish an optimum level of humic substances. (Skogerboe-Colorado State)
W77-09963

NITROGEN, PHOSPHORUS, AND POTASSIUM UTILIZATION IN THE PLANT-SOIL SYSTEM: AN ANALYTICAL MODEL,
Oak Ridge National Lab., Tenn.
O. L. Smith.
Soil Science Society of America Journal, Vol 40, No 5, p 704-714, September-October 1976. 11 fig, 2 tab, 61 ref.

Descriptors: *Nitrogen, *Phosphorus, *Potassium, Model studies, Crop production, Crop response, Absorption, Nutrients, Simulation analysis.

An intermediate-resolution analytical model of nitrogen, phosphorus, and potassium utilization in the plant-soil system was developed and tested. Starting from specified natural or artificial sources in the soil, element transport to root absorption surfaces was modeled in terms of diffusion, mass flow, and soil buffering mechanisms. Element uptake was described by carrier theory formalism, and assimilation was based on four premises about the roles of N, P, K, and photosynthate in cell chemistry. There were three main objectives of the model. The first was to predict the first-order interactive growth response of particular plant species to any combination of these macronutrients supplied in the soil medium. Species parameters required by the model include root absorption rate and certain cell chemistry reaction rates. The second objective was to make the model sufficiently general to describe a broad range of species. It was built upon common denominator principles of physiology condensed from available experimental data on corn, bean, pine, etc. In this generic sense it is a measure of what plants have in common. The third objective was to use the model to test several well-known theories of plant growth. The model was validated against reported experiments on ryegrass, oat, a legume, and rutabaga, in which dry matter yield was measured as a function of factorial application of N, P, and K to the soil. The model shows that much of the deficient, optimal, toxic, and interactive response of plants to N, P, and K can be explained in terms of strong linear response of cell chemistry to low nutrient concentrations and inhibition by N, P, and K at high nutrient concentrations. (Skogerboe-Colorado State)
W77-09964

METHOD OF ANALYZING SOME EXPERIMENTAL DATA ON ZOOPLANKTON, (IN RUSSIAN),
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).
E. N. Ladeishchikova, and G. L. Vasil'Eva.
Gidrobiol Zh 12(3), p 97-103, 1976.

Descriptors: *Zooplankton, Reproduction, Life cycles, Computer models, *Mathematical models, *Data storage and retrieval, Data collections.
Identifiers: *Notholca grandis.

Experimental data on the life cycle, particularly aspects of reproduction, in Notholca grandis females were systematized through unifaction in a multidimensional matrix and subsequent representation in tables and graphs. Results of the analysis of these and similar data using the described method may be applied in the calculation of the general biological characteristics of populations and water bodies. The method provides a convenient form for the generalization, storage and preparation of data for computer analysis and the construction of mathematical models.—Copyright 1977, Biological Abstracts, Inc.
W77-10038

STABILIZATION OF SAND DUNES IN THE WEST SAHARA,
Department of Forestry, Pretoria (South Africa).
For primary bibliographic entry see Field 4A.
W77-10074

2J. Erosion and Sedimentation

STUDIES ON THE RECLAMATION OF STONE LAKE, MICHIGAN,
Notre Dame Univ., Ind.
For primary bibliographic entry see Field 5G.
W77-09605

THE ROLE OF HUMIC ACIDS IN THE UPTAKE AND RELEASE OF MERCURY BY FRESHWATER SEDIMENTS,
For primary bibliographic entry see Field 5B.
W77-09615

AN INVESTIGATION OF THE ROLE OF ORGANIC MATERIALS IN FRESHWATER SYSTEMS,
For primary bibliographic entry see Field 5C.
W77-09618

COMPETITION FOR MERCURY BETWEEN RIVER SEDIMENT AND BACTERIA,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W77-09661

NITROGEN FIXATION IN ARCTIC MARINE SEDIMENTS: EFFECT OF OIL AND HYDROCARBON FRACTIONS,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W77-09676

SHALLOW MARINE SAND BAR SEQUENCES: AN EXAMPLE FROM THE LATE PRECAMBRIAN OF NORTH NORWAY,
Oxford Univ. (England). Dept. of Geology and Mineralogy.
H. D. Johnson.
Sedimentology, Vol. 24, No. 2, p 245-270, April 1977. 15 fig, 1 tab, 67 ref.

Descriptors: *Sandstones, *Sand bars, Europe, *Sedimentation, Sedimentary structures, Geology, Foreign countries, Foreign research, Offshore platforms, Sedimentology.
Identifiers: *Norway, *Shallow marine sand bars, Subtidal sand bars, Late precambrian.

Five coarsening upward shallow marine sandstone sequences (2-10 m thick), were described from the late Precambrian of North Norway, where they occur in a laterally continuous and tectonically undeformed outcrop. The sequences consist of five facies with distinct assemblages of sedimentary structures and palaeocurrent patterns. Each facies is the product of alternate phases of sedimentation during relatively high- and low-energy periods. Facies 1 to 4 were interpreted as representing prograding, subtidal sand bars. Sand bar progradation occurred during the highest energy periods when unidirectional currents flowed to the northwest, depositing trough cross-bedded sandstones (facies 3 and 4) on the bar crests and flanks, and sheet sandstone beds (facies 1 and 2) in the offshore environments. Weaker northwesterly flowing currents continued during moderate energy fair weather periods. Low energy fair weather periods were dominated by wave processes, which formed large-scale, low-angle, westerly inclined surfaces on the bar blanks (facies 4) and wave rippled sandstone beds (facies 2) and flat laminated siltstone layers (facies 1) in the offshore environments. One sand bar was dissected by channels and infilled by tabular cross-bedded sandstones (facies 5). Bipolar palaeocurrent evidence, with two modes separated into two laterally equivalent channel systems, suggests deposition by tidal currents in mutually evasive ebb and flood channels. The inferred processes of the sand bars were compared with those associated with modern storm-generated and tidal current-generated linear sand ridges. Both kinds of ridges are influenced by the interaction of relatively low and high energy conditions. The presence of the tidal channel facies, however, combined with the inferred strong bottom current regime, is more analogous to a tidal current hydraulic regime. (Lee-ISWS)
W77-09699

DEEP DISTRIBUTARY CHANNELS AND GIANT BEDFORMS IN THE UPPER CARBONIFEROUS OF THE CENTRAL PENNINES, NORTHERN ENGLAND,
Keele Univ. (England). Dept. of Geology.
P. J. McCabe.
Sedimentology, Vol 24, No 2, p 271-290, April 1977. 12 fig, 45 ref.

Descriptors: *Channel erosion, Europe, *Sediment sorting, Deltas, Dunes, Channels, *Sedimentation, Geology, Watersheds(Basins), Foreign countries, Foreign research, *Sedimentology.
Identifiers: *Deep distributary channels, *England(Upper Carboniferous), Giant bedforms, Delta slope deposits.

Channels, with maximum depths of over 40 m, have been cut into the top of a coarsening upward sequence in the Upper Carboniferous of northern England. The channels are interpreted as deep, distributaries cut into delta slope deposits. Giant cross-bed sets, up to 40 m thick, are the major channel infilling facies. Internal erosion surfaces occur within the giant cross-beds, and some are draped by micaceous, silty sandstone. Previously interpreted as deltaic sedimentation units, the cross-beds now are thought to have been produced mainly by side attached, alternate bars, and the

drapes are interpreted as low stage deposits. Cosets of medium scale cross-beds overlie the giant cross-beds. The cosets are thought to be deposits of dunes and smaller bars on top of the transverse bars and in the shallower parts of the distributary. The giant cross-beds commonly are underlain by unlaminated sandstone, but the cross-beds may be underlain by undulatory bedding. The latter apparently was produced by ridges, parallel to the current, spaced between 9 and 23 m apart. The north of England appears to have had a major river by present day standards, for at least part of the upper Carboniferous. (Lee-ISWS)
W77-09700

SHORT TERM SEDIMENTATION RESPONSE IN LAKES IN WESTERN UNITED STATES AS MEASURED BY AUTOMATED SAMPLING,
New Mexico Univ., Albuquerque. Dept. of Geology.
R. Y. Anderson.
Limnology and Oceanography, Vol 22, No 3, p 423-433, May 1977. 10 fig, 12 ref. NSF GA13573, DES74-17499, EAR74-17499 A01.

Descriptors: *Sedimentation, *Utah, *New Mexico, *Nevada, *Lake sediments, *Sedimentation rates, Lakes, Sampling, Equipment, Instrumentation, Sediments, Sediment transport, Sediment discharge, Storms, Precipitation(Atmospheric), Diurnal distribution, On-site investigation, Limnology, Sedimentology.
Identifiers: *El Vado Lake(NM), *Morgan Lake(NM), *Lake Powell(Utah), *Pyramid Lake(Nev).

Sediment traps that can greatly amplify the rate of sedimentation and automatically time the depositional process were set out in El Vado Lake and Morgan Lake (New Mexico), Lake Powell (Utah), and Pyramid Lake (Nevada). In El Vado and Morgan lakes, sediment fluctuations on the scale of days were responsive to local weather factors, with the deposition rate in Morgan Lake greater near the bottom of the water column than near the top. Sedimentation in El Vado and Pyramid lakes appeared to have some diurnal control. Sedimentation in Pyramid Lake and Lake Powell, the two lakes fed by large rivers, was strongly influenced by river discharge and showed lag effects proportional to the distance of sediment transport. (Sims-ISWS)
W77-09701

BASAL TILL FABRICS OF MODERN ALPINE GLACIERS,
Washington Univ., Seattle. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2C.
W77-09704

SEDIMENT TRANSPORT AND DEPOSITION AT RIVER MOUTHS: A SYNTHESIS,
Sydney Univ. (Australia). Dept. of Geography.
L. D. Wright.
Geological Society of American Bulletin, Vol 88, No 6, p 857-868, June 1977. 8 fig, 2 tab, 66 ref.

Descriptors: *Sediment transport, *Rivers, *Sediment discharge, *Sediment, Sediment load, Turbulent flow, Geology, Hydraulics, Sediment distribution, Tidal effects.
Identifiers: *River mouths, *Sediment deposition, Outflow inertia, Turbulent bed friction, Outflow buoyancy.

River-mouth process studies and comparisons of river-mouth forms from contrasting environments suggested that sediment dispersal and accumulation patterns are governed by three basic effluent forces and by tide- or wave-induced processes. Neglecting modifications by tides or waves, effluent behavior, and consequent depositional patterns depend on the relative dominance of (1) outflow inertia, (2) turbulent bed friction seaward of the mouth, and (3) outflow buoyancy. Inertia-dominated effluents are characterized by fully turbulent jet diffusion, exhibit low lateral spreading angles and progressive lateral and longitudinal deceleration, and produce narrow-mouth bars. Under most natural circumstances, inertial effects are equaled or exceeded by either turbulent bed friction or effluent buoyancy. Shallow depths immediately basinward of a river mouth enhance the effects of bed friction, causing more rapid deceleration and lateral expansion. Triangular 'middle-ground' bars and frequent channel bifurcation result. Low tidal ranges, fine-grained sediment loads, and deep outlets favor strong density stratification within the lower reaches of the channels. Under such circumstances, effluents are dominated by the effects of buoyancy for at least part of the year. Buoyant effluents produce narrow distributary mouth bars, elongate distributaries with parallel banks, and few bifurcations. In macrotidal environments where tidal currents are stronger than river flow, bidirectional currents redistribute river sediments, producing sand-filled, funnel-shaped distributaries and causing linear tidal ridges to replace the distributary mouth bar. Powerful waves promote rapid effluent diffusion and deceleration and produce constricted or deflected river mouths. (Lee-ISWS)
W77-09705

NORTH ATLANTIC ICE-RAFTING: A MAJOR CHANGE AT 75,000 YEARS BEFORE THE PRESENT,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
W. F. Ruddiman.
Science, Vol 196, No 4295, p 1208-1211, June 10, 1977. 2 fig, 17 ref. NSF GA 14177, GA 10635, GA 19690, ONR N00014-67A-0108-0004.

Descriptors: *Sediments, *Oceans, *Glaciers, *Atlantic Ocean, Ice, Melting, Circulation, Water circulation, Ocean circulation, Cores, Sampling, Sedimentation, Sedimentation rates, Geomorphology, Geology, Glaciology.
Identifiers: *Ice-rafting, *North Atlantic Ocean.

During the last interglacial-to-glacial climatic cycle (127,000 to 10,000 years before the present (B.P.), the fundamental geographic shift in the main axis of ice-rafting deposition occurred at 75,000 years B.P. An earlier meridional depositional maximum along the Greenland-Newfoundland coasts was superseded by a nearly zonal and much stronger axis some 1500 kilometers to the south along 40 deg N to 50 deg N. Both depositional patterns are best explained by cyclonic flow in the subpolar gyre, with the depositional shift related to the retreat of warm, ice-melting North Atlantic drift water from the northwestern half of the gyre. Similar shifts must have characterized preceding interglacial-glacial cycles. (Sims-ISWS)
W77-09706

SEDIMENTATION RATES IN A COASTAL MARSH DETERMINED FROM HISTORICAL RECORDS,
State Univ. of New York at Stony Brook. Dept. of Earth and Space Sciences.
K. W. Flessa, K. J. Constantine, and M. K. Cushman.
Chesapeake Science, Vol 18, No 2, p 172-176, June 1977. 4 fig, 22 ref.

Descriptors: *Sedimentation rates, *Salt marshes, *Peat, *Sediments, *Vegetation, *New York, On-site investigations, Marshes, Wetlands, Coastal marshes, Saline water, Tidal marshes, Sampling, History, Organic matter, Sedimentation, Sedimentation rates, Gravel, Sands, Sedimentology.
Identifiers: *Flax Pond Marsh(NY), *Long Island(NY), *Long Island Sound.

Historical records indicate that Flax Pond, a small Spartina alterniflora marsh located on the north shore of Long Island, New York, was opened to marine waters in 1803. The opening is recorded in the sediments by a sharp transition from sedge (brackish or freshwater) peat to Spartina (salt marsh) peat. The dated horizon was used to calculate an average net rate of vertical accretion of 2.5 mm/yr and a maximum net rate of 4.7 mm/yr. The estimates may serve to predict the rate at which Spartina marshes are able to recover from physical disturbnace. (Sims-ISWS)
W77-09713

A SIMPLE HAND CORER FOR SHALLOW WATER SAMPLING,
Southwest Research Inst., Houston, Tex.
For primary bibliographic entry see Field 7B.
W77-09715

HEAVY METAL CONCENTRATIONS IN WATER, SEDIMENTS, AND FISH FROM MEDITERRANEAN COASTAL AREA, ISRAEL,
Israel Oceanographic and Limnological Research Ltd., Haifa.
For primary bibliographic entry see Field 5A.
W77-09742

A REPORT ON STUDIES OF THE EFFECTS OF DREDGING AND DISPOSAL IN THE GREAT LAKES WITH EMPHASIS ON CANADIAN WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-09794

THE EFFECTS OF GRANITIC SAND ON THE DISTRIBUTION AND ABUNDANCE OF SALMONIDS IN IDAHO STREAMS,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
For primary bibliographic entry see Field 2I.
W77-09797

MATTING FOR THE PREVENTION OF HYDRAULIC EROSION,
For primary bibliographic entry see Field 4D.
W77-09798

THE ORIGIN OF HORIZONTAL LAMINAE IN EPHEMERAL STREAM CHANNEL-FILL,
Birbeck Coll., London (England). Dept. of Geology; and Birbeck Coll., London (England). Dept. of Geology;
L. E. Frostick, and I. Reid.
Sedimentology, Vol. 24, No. 1, p 1-9, February 1977. 4 fig, 31 ref.

Descriptors: *Streams, *Channel morphology, *Sedimentation, *Ephemeral streams, Suspended load, Bed load, Floods, Discharge(Water), Tributaries, Foreign countries, Foreign research, Watersheds(Basins).
Identifiers: *Lamination, *Kenya, *Minerals deposition, Palaeoenvironmental.

Results are presented of an investigation where the sedimentation characteristics in a stream channel from a watershed in Kenya were studied. It was shown that the number of paired horizontal laminae in an ephemeral channel-fill increases systematically down-catchment from stream headwater and is related functionally to tributary confluence. Under moving storm conditions, each tributary subcatchment delivers a sediment-laden discharge pulse that finds sedimentary expression in paired laminae of light and heavy minerals. The lamina differentiation was attributed to a congregational sorting mechanism. The direct relationship between paired laminae and confluencing tributaries permits palaeoenvironmental influence of drainage-net character and palaeoclimatic variability. (Bhowmik-ISWS)
W77-09950

URANIUM OXIDATION AND PROBABLE SUBAERIAL WEATHERING OF PHOSPHATIZED LIMESTONE FROM THE POURTALES TERRACE,
Hawaii Inst. of Geophysics, Honolulu.
W. C. Burnett, and D. N. Gomberg.
Sedimentology, Vol. 24, No. 2, p 291-302, April 1977. 4 fig, 3 tab, 28 ref.

Descriptors: *Uranium radioisotopes, *Oxidation, *Limestones, *Phosphates, *Weathering, *Florida, Marine geology, Diagenesis, Freshwater, Karst, Sedimentary petrology, Terraces(Geologic), Submergence, Continental shelf, Sea level, Sampling, Dredging, Isotope studies, Spectrometers.
Identifiers: *Florida Straits, Emergence, Subaerial exposure.

Phosphatized limestones from the Pourtales Terrace, Straits of Florida, have undergone freshwater diagenesis, as shown by several selective petrologic features such as dissolution of aragonitic skeletal material and preservation and recrystallization of Mg-calcite. This interpretation is supported by the fact that greater than 94% of the uranium in the samples is in the U(VI) oxidation state. On the deeper Pourtales Escarpment, phosphatized Limestones show no alteration features indicative of freshwater diagenesis. The uranium in these samples is a mixture of U(IV) and U(VI) with oxidation-state ratios similar to other seafloor phosphorites. The interpretation of the data was that uranium in the terrace samples was oxidized when that area was emergent. The karsted surface of the terrace, therefore, is a result of subaerial exposure of this portion of the Floridan platform. The escarpment samples were never above sea level, and so more closely retain their original uranium oxidation-state ratios. (Visocky-ISWS)
W77-09951

EFFECT OF SLOPE ON THE THRESHOLD OF MOTION AND ITS APPLICATION TO ORIENTATION OF WIND RIPPLES,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
A. D. Howard.
Geological Society of America Bulletin, Vol. 88, No. 6, p 853-856, June 1977. 3 fig, 21 ref. NASA NGR-47-005-172.

Descriptors: *Sand waves, *Slopes, Movement, Ripple marks, Shear stress, Sediment transport, Wind erosion, Geology, Winds.
Identifiers: *Wind ripples, Sloping sand surfaces, Friction angles.

On sloping sand surfaces, the downwind perpendicular to ripple crests is not, as is commonly believed, an unbiased indicator of current direction. The ripple-forming creep load is deflected downgradient as a function of the surface gradient, the orientation of the surface relative to the wind, and the friction angle of the sand. The force required to initiate motion on sloping surfaces likewise is dependent upon these parameters. The mean direction of sand movement is also deflected downgradient from the applied fluid force, but by a lesser amount than the ripples. (Lee-ISWS)
W77-09955

HYDRAULICS AND DYNAMICS OF NEW CORPUS CHRISTI PASS, TEXAS: A CASE HISTORY, 1973-75,
Texas Univ. at Austin. Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 2L.
W77-09982

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE, SPECIAL REPORT III: A METHODOLOGY FOR INVESTIGATING FRESH WATER INFLOW REQUIREMENTS OF A TEXAS ESTUARY, VOL I,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 2L.
W77-10022

WATER COLOR AND CIRCULATION SOUTHERN CHESAPEAKE BAY. PART I. SOUTHERN CHESAPEAKE BAY WATER COLOR AND CIRCULATION ANALYSIS, PART II. SKYLAB MSS VS. PHOTOGRAPHY FOR ESTUARINE WATER COLOR CLASSIFICATION,
Virginia Inst. of Marine Science, Gloucester Point. Applied Marine Science and Ocean Engineering.
For primary bibliographic entry see Field 2L.
W77-10026

REPORT ON A BIOLOGIC AND SEDIMENTOLOGIC STUDY RELATED TO THE TYBEE ISLAND BEACH NOURISHMENT PROJECT AND THE OFFSHORE AREA FOR DREDGE MATERIAL DISPOSAL,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 2L.
W77-10029

CURRENT DYNAMICS AND SEDIMENT DISTRIBUTION IN THE WEST MISSISSIPPI DELTA AREA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W77-10032

ANIMAL COLONIZATION OF MAN-INITIATED SALT MARSHES ON DREDGE SPOIL,
North Carolina State Univ., Raleigh. Sea Grant Program.
For primary bibliographic entry see Field 2L.
W77-10035

ESTUARINE SHORELINE EROSION IN THE ALBEMARLE-PAMLICO REGION OF NORTH CAROLINA,
East Carolina Univ., Greenville, N.C. Dept. of Biology; and East Carolina Univ., Greenville, N.C. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-10036

THE CAUSES OF EROSION TO SILETZ SPIT, OREGON,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-10039

GRASSING ROADS AND ERODED AREAS IN THE DRAKENSBERG,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Forestry.
For primary bibliographic entry see Field 4D.
W77-10075

2K. Chemical Processes

CONCERNING THE INFLUENCE OF THE HYDROGEN ION CONCENTRATION AND OF THE BICARBONATE CONCENTRATION ON THE STRUCTURE OF BIOCENOSES OF MOUNTAIN BROOKS, (IN GERMAN),
For primary bibliographic entry see Field 2I.
W77-09620

A QUANTITATIVE METHOD FOR TOXAPHENE BY GC-CI-MS SPECIFIC ION MONITORING,
Environmental Research Lab., Athens, Ga. Analytical Chemistry Branch.
For primary bibliographic entry see Field 5A.
W77-09633

INFLUENCE OF CATION CONTENT ON THE BIOLOGICAL ACTIVITY OF FENSULFOTHION IN PLAINFIELD SAND,
Department of Agriculture, London (Ontario). Research Inst.
For primary bibliographic entry see Field 2G.
W77-09639

NITRITE DECOMPOSITION IN FLOODED SOIL UNDER DIFFERENT PH AND REDOX POTENTIAL CONDITIONS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09645

MICROBIAL FORMATION OF VOLATILE SELENIUM COMPOUNDS IN SOIL,
Cornell Univ. Agricultural Experiment Station, Ithaca, N. Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09648

COMMENTS ON NITRATE REDUCTION IN UNSATURATED SOIL,
California Univ., Berkeley. Dept. of Soil Biology.
For primary bibliographic entry see Field 2G.
W77-09650

ADSORPTION OF DODECYLBENZENE SULFONATE ON NA(+)-MONTMORILLONITE: EFFECT OF SALT IMPURITIES,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 2G.
W77-09651

CATION-EXCHANGE CAPACITY OF ACID SOILS USING ALUMINUM CHLORIDE AND BARIUM CHLORIDE-TRIETHANOLAMINE,
Klamath National Forest Yreka, Calif.
For primary bibliographic entry see Field 2G.
W77-09652

INFLUENCE OF IONIC STRENGTH AND INORGANIC COMPLEX FORMATION ON THE SORPTION OF TRACE AMOUNTS OF CD BY MONTMORILLONITE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-09658

THE EFFECT OF EXCHANGE REACTIONS BETWEEN FRASER RIVER SEDIMENT AND SEAWATER ON DISSOLVED CU AND ZN CONCENTRATIONS IN THE STRAIT OF GEORGIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-09707

A DSC (DIFFERENTIAL SCANNING CALORIMETRY) STUDY OF HEAT CAPACITY OF VICINAL WATER IN POROUS MATERIALS,
Miami Univ., Fla.
For primary bibliographic entry see Field 1B.
W77-09734

HEAVY METAL CONCENTRATIONS IN WATER, SEDIMENTS, AND FISH FROM MEDITERRANEAN COASTAL AREA, ISRAEL,
Israel Oceanographic and Limnological Research Ltd., Haifa.
For primary bibliographic entry see Field 5A.
W77-09742

DETERMINATION OF ARSENIC SPECIES IN NATURAL WATERS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W77-09747

DETERMINATION OF FREE AND TOTAL POTENTIAL HALOFORMS IN DRINKING WATER,
Ontario Ministry of the Environment, Rexdale. Lab. Service Branch.
For primary bibliographic entry see Field 5A.
W77-09748

DETERMINATION OF MOLYBDENUM IN SEAWATER BY ELECTRON PARAMAGNETIC RESONANCE SPECTROMETRY,
New Hampshire Univ., Durham. Dept. of Chemistry.
G. Hanson, A. Szabo, and N. D. Chasteen.
Analytical Chemistry, Vol. 49, No. 3, p 461-463, March, 1977. 3 fig, 14 ref.

Descriptors: *Water analysis, *Sea water, *Molybdenum, *Pollutant identification, *Metals, Water pollution sources, Separation techniques, Analytical techniques, *Spectrophotometry.
Identifiers: *Electron paramagnetic resonance.

An electron paramagnetic resonance method for determining molybdenum in saline waters in the microgram/liter range is described. The method, based on the extraction of paramagnetic Mo(SCN)5 into isoamyl alcohol, is relatively rapid, requires only 10 ml of sample, and has a detection limit of 0.46 micrograms/liter molybdenum and a relative precision of 4.7% at the 11 microgram/liter level. (Witt-IPC)
W77-09750

AUTOMATED CATALYTIC ULTRAMICRODETERMINATION OF MANGANESE IN NATURAL WATERS WITH A MINIATURE CENTRIFUGAL ANALYZER,
Illinois Univ. at Urbana-Champaign. School of Chemical Sciences.
T. P. Hadjiioannou, S. I. Hadjiioannou, J. Avery, and H. V. Malmstadt.
Analytica Chimica Acta, Vol 89, No 2, p 231-239, April, 1977. 18 ref, 3 tab.

Descriptors: *Water analysis, *Pollutant identification, *Manganese, Heavy metals, Metals, Water pollution sources, Trace elements, Centrifugation, Analytical techniques, Spectrophotmetry, Water chemistry, Catalysts.

The application of a miniature centrifugal analyzer to trace analysis by kinetic methods has been studied. A spectrophotmetric reaction-rate method based on the potassium periodate-diethylaniline reaction which is catalyzed by manganese has been developed. Manganese in the range 0.13-3.4 ng in 45 microliters of sample were determined with relative errors and relative standard deviation of about 2%. The method was applied to the determination of manganese in natural waters. (Witt-IPC).
W77-09753

THE DETERMINATION OF MOLYBDENUM AND TUNGSTEN IN SEA AND SURFACE WATER,
Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center.
For primary bibliographic entry see Field 5A.
W77-09754

STANDARDIZATION OF METHYLMERCURY ANALYSIS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5A.
W77-09775

GEOCHEMICAL CONTROLS ON TRACE ELEMENT CONCENTRATIONS IN NATURAL WATERS OF A PROPOSED COAL ASH LANDFILL SITE,
Kansas State Univ., Manhattan. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-09928

URANIUM OXIDATION AND PROBABLE SUBAERIAL WEATHERING OF PHOSPHATIZED LIMESTONE FROM THE POURTALES TERRACE,
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 2J.
W77-09951

MICROBIAL INORGANIC POLYPHOSPHATES: FACTORS INFLUENCING THEIR ACCUMULATION,
Ohio Agricultural Research and Development Center, Wooster.
For primary bibliographic entry see Field 2G.
W77-09965

COMPARISON OF FIVE KINETIC MODELS FOR ORTHOPHOSPHATE REACTIONS IN MINERAL SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 2G.
W77-09968

ESTIMATION OF COMPONENTS OF SOIL CATION EXCHANGE CAPACITY FROM MEASUREMENTS OF SPECIFIC SURFACE AND ORGANIC MATTER,
University Coll., Dublin (Ireland). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-09971

POTASSIUM SOURCES AND AVAILABILITY ON A DEEP, SANDY SOIL OF EAST TEXAS,
Texas A and M Univ., College Station. Dept. of Soil Mineralogy.
For primary bibliographic entry see Field 2G.
W77-09972

RELATION BETWEEN THE KINETICS OF NITROGEN TRANSFORMATION AND BIOMASS DISTRIBUTION IN A SOIL COLUMN DURING CONTINUOUS LEACHING,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 2G.
W77-09973

CHANGES IN THE PHYSICAL PROPERTIES OF SOIL CLAYS DUE TO PRECIPITATED ALUMINUM AND IRON HYDROXIDES: II. COLLOIDAL INTERACTIONS IN THE ABSENCE OF DRYING,
Hawaii Univ., Honolulu. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-09975

SOLUBILITY AND SOLUBILITY PRODUCT OF DICALCIUM PHOSPHATE DIHYDRATE IN AQUEOUS SOLUTIONS AND SOIL SOLUTIONS,
Alabama Agricultural Experiment Station, Auburn. Dept. of Soils.
For primary bibliographic entry see Field 2G.
W77-09979

THE SLOW REACTION WHICH CONTINUES AFTER PHOSPHATE ADSORPTION: KINETICS AND EQUILIBRIUM IN SOME TROPICAL SOILS,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W77-09980

WATER QUALITY PROGRAM OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-10006

GEOHYDROLOGY OF MUSCATINE ISLAND, MUSCATINE COUNTY, IOWA,
Geological Survey, Iowa City, Iowa. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10012

2L. Estuaries

EFFECT OF ORGANIC EXCRETION BY BENTHIC ANNELIDA ON THE PRODUCTIVITY OF PHYTOPLANKTON,
Institut Oceanographique, Paris (France). Laboratoire de Physiologie des Etres Marins.
For primary bibliographic entry see Field 5C.
W77-09660

THE TOXICITY OF SODIUM PENTACHLOROPHENOLATE FOR THREE SPECIES OF DECAPOD CRUSTACEANS AND THEIR LARVAE,
Amsterdam Univ. (Netherlands). Pharmacological Lab.
For primary bibliographic entry see Field 5C.
W77-09663

ECOLOGICAL RESPONSES OF PHYTOPLANKTON ON CHRONIC OIL POLLUTION,
Democritus Nuclear Research Center, Athens (Greece). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-09674

NITROGEN FIXATION IN ARCTIC MARINE SEDIMENTS: EFFECT OF OIL AND HYDROCARBON FRACTIONS,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W77-09676

ORGANCHLORINE PESTICIDES AND PCBS DISTRIBUTION IN TISSUES OF PURPLE HERON AND SPOON DUCK FROM THE BIOLOGICAL RESERVE OF DONANA (SPAIN),
Consejo Superior de Investigaciones Cientificas, Madrid (Spain). Instituto de Quimica Organica General.
For primary bibliographic entry see Field 5A.
W77-09677

NOTE ON THE EFFECTS OF LEAD ON OXYGEN PRODUCTION OF SEVERAL LITTORAL SEAWEEDS OF THE ADRIATIC SEA,
Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research.
For primary bibliographic entry see Field 5C.
W77-09682

INDUCTION OF HEPATIC ARYL HYDROCARBON HYDROXYLASE IN SALMON EXPOSED TO PETROLEUM DISSOLVED IN SEAWATER AND TO PETROLEUM AND POLYCHLORINATED BIPHENYLS, SEPARATE AND TOGETHER, IN FOOD,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-09683

SATELLITE-DERIVED GLOBAL OCEANIC RAINFALL ATLAS (1973 AND 1974),
National Aeronautics and Space Administration, Greenbelt. Goddard Space Flight Center.
For primary bibliographic entry see Field 7C.
W77-09693

SHALLOW MARINE SAND BAR SEQUENCES: AN EXAMPLE FROM THE LATE PRECAMBRIAN OF NORTH NORWAY,
Oxford Univ. (England). Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2J.
W77-09699

SHORT TERM VARIABILITY IN VERTICAL CHLOROPHYLL STRUCTURE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
K. L. Denman.
Limnology and Oceanography, Vol 22, No 3, p 434-441, May 1977. 5 fig, 1 tab, 22 ref.

Descriptors: *Chlorophyll, *Surveys, Profiles, *Temporal distribution, Bays, Biomass, Zooplankton, Phytoplankton, Sampling, Tides, Tidal effects, Temperature, Water temperature, Depth, Variability, Estuaries, *Canada.
Identifiers: *St. Margaret's Bay(Nova Scotia), *Vertical profiles(Chlorophyll).

A 26-h series of vertical profiles of chlorophyll a and temperature, one every 15 min, was obtained during 22-23 April 1974 in 35 m of water in St. Margaret's Bay, Nova Scotia. From the original profiles, derived contour plots, and spectral analysis of the series, it appears that the temporal changes in the vertical structure resulted mainly from tidal advection. Of the several simple parameters examined, the average chlorophyll and the maximum chlorophyll over the profile were the best indices of changes in the vertical structure. The most commonly used parameter, chlorophyll concentration at fixed depth, was shown to be readily contaminated by internal waves and, therefore, makes a poor indicator of changes representative of the whole chlorophyll layer. (Sims-ISWS)
W77-09702

SEASONAL VARIATION IN TEMPERATURE, SALINITY, AND DENSITY OVER THE CONTINENTAL SHELF OFF OREGON,
Oregon State Univ., Corvallis. School of Oceanography.
A. Huyer.
Limnology and Oceanography, Vol 22, No 3, p 442-453, May 1977. 9 fig, 1 tab, 27 ref. NSF ID071-04211, OCE76-00594.

Descriptors: *Continental shelf, Hydrography, *Coasts, *Oregon, *Pacific Ocean, *Salinity, Temperature, *Water temperature, *Density, Surveys, Profiles, On-site investigations, Seasonal, Variability, Oceans, Currents(Water), Ocean currents, Upwelling, Oceanography.

Seasonal variations in the hydrography of the waters over the continental shelf off Oregon were observed in a set of hydrographic data collected along 44 deg 39 min N at intervals of a few weeks to a few months from 1961 through 1970. The temperature is determined only partly by the local heating and cooling cycle: at the surface it is low (9 C) in winter, increasing in spring, lowest in summer, highest in early fall, and decreasing in winter; near the bottom, it is highest in winter and lowest in summer. The summer minimum is associated with coastal upwelling and a strong southward geostrophic current. Variations in salinity are governed by runoff, both locally and through the Columbia River effluent, as well as by coastal upwelling and advection. Neither temperature nor salinity is negligible in determining sigma-t. In summer, sigma-t decreases with distance offshore, and isopycnals slope downward from shore; in winter, sigma-t increases with distance offshore, and isopycnals slope upward from shore. Steric sea level also slopes downward from the coast in winter, and upward in summer. Alongshore geostrophic flow is southward in summer and northward in winter. The variations in temperature, salinity, and sigma-t are caused by seasonal cycles in the surface heat balance, precipitation and runoff, the local wind, and the alongshore flow. (Sims-ISWS)
W77-09703

SEDIMENT TRANSPORT AND DEPOSITION AT RIVER MOUTHS: A SYNTHESIS,
Sydney Univ. (Australia). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W77-09705

NORTH ATLANTIC ICE-RAFTING: A MAJOR CHANGE AT 75,000 YEARS BEFORE THE PRESENT,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2J.
W77-09706

THE EFFECT OF EXCHANGE REACTIONS BETWEEN FRASER RIVER SEDIMENT AND SEAWATER ON DISSOLVED CU AND ZN CONCENTRATIONS IN THE STRAIT OF GEORGIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
D. J. Thomas, and E. V. Grill.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 421-427, May 1977. 4 fig, 2 tab, 14 ref.

Descriptors: *Zinc, *Copper, *Dissolved solids, *Estuaries, *Canada, Sediments, Heavy metals, Rivers, Coasts, Sea water, Saline water-freshwater interfaces, Chemical properties, On-site investigations, Sampling, Chemical analysis, Pollutants, Path of pollutants, Water pollution.
Identifiers: *Fraser River, *Strait of Georgia, *British Columbia.

Dissolved Cu and Zn measurements were made on water samples collected in the Strait of Georgia off the mouth of the Fraser River between May 1973 and May 1974. Large increases in the concentration of both metals were observed in the spring and early summer, the period of maximum water and sediment discharge from the river. The increases, which are not attributable to the dissolved metals found in the river water, evidently were caused by the desorptive exchange reactions that occur when Fraser River sediment mixes with seawater. Such a mechanism is consistent with the results of experimental desorption measurements made on the sediment and with the metal distribution patterns observed in the strait. (Sims-ISWS)
W77-09707

A MODEL OF THE ANNUAL CYCLE OF TEMPERATURE IN A FRONTAL REGION OF THE CELTIC SEA,
Institute of Oceanographic Sciences, Birkenhead (England).
I. D. James.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 339-353, May 1977. 8 fig, 2 tab, 22 ref.

Descriptors: *Water temperature, *Oceans, *Model studies, Mathematical models, Meteorological data, Tides, Tidal effects, Temperature, Humidity, Winds, Solar radiation, Eddies, Turbulence, Annual, Currents(Water), Oceanography.
Identifiers: *Celtic Sea, *Irish Sea, Annual cycles.

A numerical model was devised to predict the annual cycle of the temperature structure of the water column given the tidal current and the meteorological variables wind speed, dew point, and solar radiation. The model indicated the occurrence of a front between well-mixed and stratified water which has been observed in the Celtic Sea. (Sims-ISWS)
W77-09708

ESTIMATING THE WATER AND SALT BUDGETS OF A STRATIFIED ESTUARY,
Helsinki Univ. (Finland). Dept. of Geophysics.
J. Virta.
Nordic Hydrology, Vol 8, No 1, p 11-32, 1977. 6 fig, 4 tab, 15 ref.

Descriptors: *Estimating, *Estuaries, *Hydrologic budget, *Salts, *Salt balance, Estuarine environment, Tides, Tidal waters, Salinity, Temperature, Summer, Winter, Foreign countries, Foreign research.
Identifiers: *Baltic Sea, *Finland, *Pohjanpitajanlahti Bay(Finland), *Salt budget, Tidal range, Low salinity, Shallow sill, Salinity stratification.

The characteristic features of some estuaries along the coast of the Baltic Sea are: small tidal range, low salinity, moderate temperature and salinity stratification during summer which become weaker during winter, abundant freshwater inflow, and connection through a shallow sill with the adjacent sea. The flow and transport of salt in the upper and lower layers of the outlet of an estuary of this type was determined. First, the madnitude of the terms of the transport equations were estimated, using the analogy between the transport of salt and heat. Then, the important terms of the transport equation were computed with a model which was based on the measured slope of the water level and on the water budget of the estuary. Testing was carried out by comparing the measured and computed salt contents of the estuary. The operation of the model on Pohjanpitajanlahti Bay in southern Finland was found to be satisfactory. (Roberts-ISWS)
W77-09709

EXPERIENCES WITH THE USE OF THE AEROLOGICAL METHOD IN EVAPORATION STUDIES IN NORTHWESTERN EUROPE,
Helsinki Univ. (Finland). Dept. of Meteorology.
For primary bibliographic entry see Field 2D.
W77-09710

SEDIMENTATION RATES IN A COASTAL MARSH DETERMINED FROM HISTORICAL RECORDS,
State Univ. of New York at Stony Brook. Dept. of Earth and Space Sciences.
For primary bibliographic entry see Field 2J.
W77-09713

A MODEL OF DYNAMICS IN THE LOWER POTOMAC RIVER ESTUARY,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.

R. E. Wilson.
Chesapeake Science, Vol 18, No 2, p 177-187, June 1977. 11 fig, 16 ref.

Descriptors: *Dynamics, *Estuary, *Currents(Water), *Model studies, Mathematical models, Density, Tidal effects, Tides, Equations, Hydrodynamics, Water levels, Hydrostatic pressure, Salinity, Velocity, Flow, Mixing, Rivers, *Virginia.
Identifiers: *Lower Potomac River Estuary(Va).

A simple two-dimensional numerical model was developed to represent the observed vertical structure of tidal and nontidal currents and tidal elevations along a reach of the lower Potomac River Estuary. The model was based on a linearized longitudinal momentum equation and a laterally averaged continuity equation. The model incorporates the effects of a naturally varying channel cross section through the continuity equation, and a seaward increase in density through the pressure gradient term in the momentum equation. The observed distribution of density in the reach is used to evaluate the horizontal pressure gradient relative to the water surface. The model utilized a coefficient of vertical eddy viscosity which varies both vertically and longitudinally. With but two adjustable parameters associated with the eddy viscosity, good agreement was obtained between the computed and observed tidal and nontidal currents. (Sims-ISWS)
W77-09714

A SIMPLE HAND CORER FOR SHALLOW WATER SAMPLING,
Southwest Research Inst., Houston, Tex.
For primary bibliographic entry see Field 7B.
W77-09715

FLUSHING CHARACTERISTICS OF A MISSISSIPPI DEAD-END CANAL SYSTEM,
University of Southern Mississippi, Hattiesburg. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-09721

THREE-LAYER CIRCULATIONS IN ESTUARIES AND HARBORS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences; and Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Materials Science.
R. R. Long.
Journal of Physical Oceanography, Vol. 7, No. 3, p 415-421, May 1977. 6 fig, 10 ref. ONR N00014-75-C-0805.

Descriptors: *Water circulation, *Harbors, *Estuaries, *Model studies, Mathematical models, Hydraulic models, Laboratory tests, Density, Circulation, Salinity, Stratification, Density stratification, Coasts, Tidal waters.
Identifiers: *Three-layer circulation.

A theory was developed for the three-layer circulation in an overmixed estuary (finite freshwater influx) or harbor (zero freshwater influx) accompanying a two-layer structure in the large body of water outside. A determinate set of algebraic equations was derived for the general case, and the form of the equations shows that for zero freshwater influx, the discharge q sub 1 from a harbor is proportional to the square root of the density difference between the two outside fluids. The problem is solved completely when there is a uniform depth H of the fluids inside and outside the harbor, when the freshwater influx is zero, and when the two layers of fluid outside the harbor are of equal thicknesses. The solution showed that the outflowing layer of water has a thickness d=H/2 and a flux q sub 1 = HW sq rt (H Delta b sub o)/8, where W is the width at the constriction and Delta b sub o the buoyancy difference between the two outside layers of water. A laboratory model reproduced the three-layer circulation of the theory. The outflowing fluid was quite turbulent, which made the observation of the layer thickness uncertain, but the thickness appeared to be close to the value d=H/2 of the theory. (Sims-ISWS)
W77-09723

GEOCHEMICAL INTERACTIONS OF HEAVY METALS IN SOUTHEASTERN SALT MARSH ENVIRONMENTS,
Skidway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W77-09767

PETROLEUM HYDROCARBONS: DEGRADATION AND GROWTH POTENTIAL OF DEEP-SEA SEDIMENT BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-09772

MESENCHYMAL TUMORS OF SOME ESTUARINE FISHES IN THE NORTHERN GULF OF MEXICO. II. SUBCUTANEOUS FIBROMAS IN THE SOUTHERN FLOUNDER, PARALICHTHYS LETHOSTIGMA, AND THE SEA CATFISH, ARIUS FELIS,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 5C.
W77-09780

HEAVY METAL TOLERANCE OF MARINE PHYTOPLANKTON. II. COPPER TOLERANCE OF THREE SPECIES IN DIALYSIS AND BATCH CULTURES,
Norwegian Inst. of Seaweed Research, Trondheim.
For primary bibliographic entry see Field 5C.
W77-09781

SUPERSATURATION OF ATMOSPHERIC GASES IN THE COASTAL WATERS OF THE GULF OF MAINE,
National Marine Fisheries Service, West Boothbay Harbor, Maine. Biological Lab.
For primary bibliographic entry see Field 5C.
W77-09793

OCEANOGRAPHIC WATER SAMPLER,
For primary bibliographic entry see Field 7B.
W77-09799

MOTOR POWERED BY WAVE ACTION,
For primary bibliographic entry see Field 8C.
W77-09803

STEROIDS AS SEWAGE SPECIFIC INDICATORS IN NEW YORK BIGHT SEDIMENTS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5A.
W77-09901

A MATHEMATICAL MODEL FOR WATER QUALITY IN A COASTAL REGION IN TERMS OF SEA BOTTOM WASTE DEPOSITS (KAITEI OSENBUSSHITSU NADO NO EIKYO O KORYO SHITA KAIIKI NO SUISHITSU NO YOSOKU-MODERU NO KAIHATSU NI KANSURU KENKYU),
Public Works Research Inst., Tokyo (Japan).
For primary bibliographic entry see Field 5B.
W77-09911

THE EFFECT OF COASTAL HYDRODYNAMICS ON THE ECHINODERM DISTRIBUTION IN THE SUBLITTORAL OF OXWICH BAY, BRISTOL CHANNEL,
University Coll. of Swansea (Wales). Dept. of Geology and Oceanography.
P. A. Tyler, and F. T. Banner.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 293-308, May 1977. 7 fig, 57 ref.

Descriptors: *Benthic fauna, *Bays, *Hydrodynamics, Surveys, Sampling, Sediments, Sands, Particle size, Marine animals, Benthos, Coasts, Tidal waters, Circulation, Water circulation, Waves(Water), Distribution patterns, Biology, Estuaries.
Identifiers: *Oxwich Bay(Wales), *Bristol Channel(Wales), *Echinoderms, Ophiuroids.

The distribution of some benthic echinoderms (particularly ophiuroids) was studied in Oxwich Bay; and approaches, in relation to the dynamic and physical oceanography and the resultant dynamic sedimentology of the Bay also were studied. It was concluded that those species which possess planktonic larvae have an adult distribution which correlates with the distribution of modern (not relict) fine sediment and that both correlate with the energy distribution of the hydrodynamic regime, as the settlements of both fine sediment and newly metamorphosed meroplanktonic echinoderms are subject to the same physical laws. The echinoderm distribution is modified by adult migratory activity and itself exerts an effect on community structure in the Bay. (Sims-ISWS)
W77-09944

TRANSMISSION SPECTROSCOPY EXAMINATIONS OF NATURAL WATERS-C. ULTRAVIOLET SPECTRAL CHARACTERISTICS OF THE TRANSITION FROM TERRESTRIAL HUMUS TO MARINE YELLOW SUBSTANCE,
Copenhagen Univ. (Denmark). Inst. of Physical Oceanography.
For primary bibliographic entry see Field 5A.
W77-09945

ENTRAINMENT VELOCITY IN NATURAL STRATIFIED VERTICAL SHEAR FLOW,
Copenhagen Univ. (Denmark). Inst. of Physical Oceanography.
G. Kullenberg.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 329-338, May 1977. 2 fig, 2 tab, 15 ref, 1 append.

Descriptors: *Mixing, *Entrainment, *Coasts, *Estuaries, On-site investigations, Laboratory tests, Model studies, Turbulence, Winds, Density, Salinity, Flow, Shear, Stratification, Tracers, Tracking techniques, Dye releases, Rhodamine, Dye concentrations, Oceanography.
Identifiers: *Entrainment velocity.

The entrainment velocity was determined from mixing experiments in coastal waters with a well-mixed upper layer separated from a lower layer by a well-defined pycnocline. The experiments were carried out during conditions of strong winds. The dependence of the entrainment velocity upon the wind velocity and the density jump across the pycnocline was found to conform with reported results obtained by means of shear flow laboratory experiments. The essential parameter is an overall type Richardson number. On the other hand, the ratio of the vertical transfer coefficients for mass and momentum is found to depend upon the local Richardson number. The change of potential energy due to the entrainment is related to the energy input from the wind, which leads to an estimate of the critical flux Richardson number which conforms with reported results. (Sims-ISWS)
W77-09946

DEEP WATER RENEWAL AND ASSOCIATED PROCESSES IN NORTH NORWAY,
Tromsoe Museum (Norway). Marine Biological Station.
S. Skreslet, and H. Loeng.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 383-398, May 1977. 11 fig, 7 tab, 13 ref.

Descriptors: *Water circulation, *Fjords, *Inflow, Temperature, Water temperature, Density, Foreign countries, Foreign research, Salinity, Currents(Water), Estuaries, Current meters, Movement, Circulation, Seasonal, Tides, Tidal effects, Water transfer, Coasts.
Identifiers: *Norway.

In Skjomen, a 156 m deep fjord with a 60 m sill depth at the entrance, renewal of the basin water occurs annually, during winter. Dilution and heating of outside waters during summer prevents inflow, but estuarine circulation inside the fjord dilutes the basin water and makes it exchangeable when the density of outside water increases. Dominant seward winds during winter lift deep water outside the sill and cause it to flow into the basin at intervals throughout the winter and spring. Other processes like turbulent diffusion of salt from the basin water towards the surface, cooling of water over the sill, and tidal currents, possibly also bring about and/or enhance inflows. (Sims-ISWS)
W77-09947

THE BOTTOM MIXED LAYER ON THE CONTINENTAL SHELF,
Institute of Oceanographic Sciences, Wormley (England).
R. D. Pingree, and D. K. Griffiths.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 399-413, May 1977. 11 fig, 2 tab, 12 ref.

Descriptors: *Continental shelf, *Water temperature, *Mixing, *Atlantic Ocean, Tides, Tidal effects, On-site investigations, Surveys, Temperature, Profiles, Density, Salinity, Heat transfer, Energy, Oceanography.
Identifiers: *Bottom mixing layers, *English Channel, *Celtic Sea.

The height of the bottom mixed layer of the continental shelf was defined as the height above bottom where the mean potential temperature exceeds the bottom value by 0.01C. Direct measurements of vertical current shear and temperature structure indicated that in this region the production of turbulent energy is much greater than the stabilizing effect of the heat flux down the potential temperature gradient. Detailed temperature profiles with a resolution of 0.001C suggested that the controlling parameters for the potential temperature gradient are the friction velocity and the downward heat flux. (Sims-ISWS)
W77-09948

INTERACTIONS BETWEEN ZINC AND SUSPENDED SEDIMENTS IN THE FRASER RIVER ESTUARY, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W77-09949

URANIUM OXIDATION AND PROBABLE SUBAERIAL WEATHERING OF PHOSPHATIZED LIMESTONE FROM THE POURTALES TERRACE,
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 2J.
W77-09951

EFFECT OF SLOPE ON THE THRESHOLD OF MOTION AND ITS APPLICATION TO ORIENTATION OF WIND RIPPLES,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2J.
W77-09955

HYDRAULICS AND DYNAMICS OF NEW CORPUS CHRISTI PASS, TEXAS: A CASE HISTORY, 1973-75,
Texas Univ. at Austin. Port Aransas. Marine Science Inst.
R. L. Watson, and E. W. Behrens.
U.S. Army Coastal Engineering Research Center, Fort Belvoir, VA, GITI Report 9, September 1976. 175 p, 43 fig, 11 tab, 6 append, 20 ref.

Descriptors: Hydraulics, *Sedimentation, *Sediment transport, *Tides, *Waves(Water), *Texas, Tidal waters.
Identifiers: *Corpus Christi Pass(Tex), *Tidal currents, *Tidal inlets.

A case history of the hydraulics and sedimentation of the Corpus Christi Water Exchange Pass, Texas, primarily from 1973 to 1975 is presented. This pass, and the larger Aransas Pass, connect Corpus Christi Bay with the Gulf of Mexico. Quantitative data on longshore sediment transport, tidal differentials across the pass, flood and ebb tidal discharge, wind waves, and local winds explain most of the bathymetric changes which have occurred in the flood tidal delta, baymouth shoreline, channel, gulf mouth, bar bypassing system, and the adjacent Gulf of Mexico beaches. Dominant onshore winds produce gulf setup and bay setdown such that, with the exception of the duration of anticyclonic events with north winds, the pass is highly flood-dominated. Heavy surf in the pass mouth and the longshore bars sweeping around the short jetties provide the gulf mouth with a large sediment supply which must be flushed by tidal discharge if the pass is to remain open. Flood dominance combined with a long channel require that most of the littoral drift entering the channel be carried through its entire length to be deposited on the flood tidal delta rather than be returned seaward by ebb flow. (WES)
W77-09982

EFFECT OF SOURCE ORIENTATION AND LOCATION IN THE PERU-CHILE TRENCH ON TSUNAMI AMPLITUDE ALONG THE PACIFIC COAST OF THE CONTINENTAL UNITED STATES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
A. W. Garcia.
Research Report H-76-2, September 1976. 44 p, 23 fig, 2 tab, 1 append, 17 ref.

Descriptors: *Earthquakes, *Tsunamis, *Mathematical models, *Pacific Coast region, Coasts, *Pacific Ocean, *South America, Simulation analysis.
Identifiers: *Peru-Chile Trench(So Amer).

An idealized axis of the Peru-Chile Trench was divided into 12 segments of equal length. A hypothetical bottom displacement which generates a tsunami with intensity approximately equal to four was centered in three of the segments. An explicit finite difference numerical code was used to simulate generation and propagation of the resulting tsunami to the west coast of the continental United States. Additionally, the tsunami of 22 MAy 1960 was simulated and comparison made to gage records at selected open coast locations along the U.S. Pacific Coast. Contour plots of surface elevation of the few leading waves of the tsunami at selected times are presented. An analytical technique is used to normalize the amplitude of the leading wave of the tsunami to its amplitude at 600-ft water depth. For purposes of comparison, the amplitudes of the tsunamis generated in each segment are plotted as a function of distance along the Pacific coast from the Mexican to the Canadian border. These plots allow an evaluation of the relative vulnerability of coastal locations to tsunamis generated in different locations of the Peru-Chile Trench. (WES)
W77-09983

STABILITY OF RUBBLE-MOUND BREAKWATER JUBAIL HARBOR, SAUDI ARABIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-09984

COMPUTATION OF UNSTEADY FLOWS IN RIVERS AND ESTUARIES BY THE METHOD OF CHARACTERISTICS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-09993

LOS ANGELES AND LONG BEACH HARBORS MODEL STUDY; REPORT 4, MODEL DESIGN,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10016

CHARLESTON HARBOR NAVIGATION STUDY, SOUTH CAROLINA, VERIFICATION TESTS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10019

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE, SPECIAL REPORT III: A METHODOLOGY FOR INVESTIGATING FRESH WATER INFLOW REQUIREMENTS OF A TEXAS ESTUARY, VOL I,
Texas Univ. at Austin. Center for Research in Water Resources.
W. P. Lambert, and E. G. Furh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 182, Price codes: A21 in paper copy, A01 in microfiche. National Science Foundation, Research Applied to National Needs (RANN) Report No NSF/RA-760258, 1976. 479 p. AEN7413590A01.

Descriptors: Water resources, *Estuaries, *Water quality control, *Texas, *Methodology, Ecology, Management, *Inflow.
Identifiers: *Coastal zone management, *Freshwater inflow.

The water resource management problem of determining fresh water inflow requirements for a Texas estuary were studied. A computer-oriented methodology was developed for assessing those requirements. The methodology provided a general, rational approach to the inflow problem without being dependent upon specific machines and computer programs. Viability of the methodology was demonstrated using existing computer models within an estuarine management scenario developed for Corpus Christi Bay, Texas. The methodology has a two-step structure. STEP 1 translates qualitative, ecologically-oriented management policy goals for an estuary into a set of net fresh water inflow requirements. STEP 2 produces the set of upstream fresh water release schedules required to satisfy those net inflow requirements. Execution of STEP 1 depends on the identification of a set of indicator organisms which characterize the desired estuarine environment. Control parameter behavior within the estuary is modeled on a computer. Inputs to STEP 2 include legal, sociological, physical, hydrologic, and meteorologic characteristics of the upstream region and surface water user community. (Sinha-OEIS)
W77-10022

THE GEORGIA COASTAL ENVIRONMENT. A COMPILATION OF RESOURCE MATERIALS COVERING THE COASTAL PLAIN, ESTUARIES AND OFFSHORE WATERS.
Army Engineer District, Wilmington, N.C.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-033 176, Price codes: A08 in paper copy, A01 in microfiche. 1975. 162 p, 838 ref. H. W. Dubach (Compiler).

Descriptors: *Georgia, *Coasts, *Bibliographies, *Estuaries, Water resources, Baseline studies, Resources development, Southeast US, Estuarine environment.
Identifiers: *Outer continental shelf.

This bibliography represents an effort on the part of the Wilmington District Corps of Engineers to facilitate the availability of information relating to the coastal environment. Although efforts are concentrated on Georgia, references to North Carolina, South Carolina and Florida are frequent. It is recognized that environments conform to the boundaries of nature more than to the boundaries of man's institutions. Information relating to the Georgia coastal environment can be effectively utilized in other areas of the Atlantic Coast either by gaining regional perspective or through application of relevant principles contained in the work. (Sinha-OEIS)
W77-10025

WATER COLOR AND CIRCULATION SOUTHERN CHESAPEAKE BAY. PART I. SOUTHERN CHESAPEAKE BAY WATER COLOR AND CIRCULATION ANALYSIS, PART II. SKYLAB MSS VS. PHOTOGRAPHY FOR ESTUARINE WATER COLOR CLASSIFICATION,
Virginia Inst. of Marine Science, Gloucester Point. Applied Marine Science and Ocean Engineering.
M. M. Nichols, and H. H. Gordon.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA CR-141404, Price codes: A07 in paper copy, A01 in microfiche. Special Report No 96, October 1975. 134 p, 25 ref.

Descriptors: *Color, *Circulation, Water resources, *Baseline studies, *Water quality, *Water properties, *Chesapeake Bay, Aerial photography, Sediment transport, Satellites(Artificial), Estuaries, Remote sensing.
Identifiers: Satellite imagery, Coastal zone, Bottom topography.

Satellite imagery from two EREP passes over the Rappahannock Estuary of the Chesapeake region are analyzed to chart colored water types to delineate color boundaries and define circulatory patterns. Surface observations from boat and helicopters concurrently with Skylab overpass, define the distributions of suspended sediment, transparency, temperature, salinity, phytoplankton, color of suspended material and optical ratio. Important features recorded by the imagery are a large-scale turbidity maximum and massive red tide blooms. Water movement is revealed by small-scale mixing patterns and tidal plumes of arrarent sediment-laden water. The color patterns broadly reflect the bottom topography and the seaward gardient of suspended material between the river and the Bay. Analyses of red, green and natural color photos by microdensitometry demonstrates the utility of charting water color types of potential use for managing estuarine water quality. The Skylab imagery is superior to aerial photography and surface observations for charting water color. The imagery acquired is a valuable contribution to the study of coastal zone processes and management. (Sinha-OEIS)
W77-10026

REPORT ON A BIOLOGIC AND SEDIMENTOLOGIC STUDY RELATED TO THE TYBEE ISLAND BEACH NOURISHMENT PROJECT AND THE OFFSHORE AREA FOR DREDGE MATERIAL DISPOSAL,
Skidaway Inst. of Oceanography, Savannah, Ga.
G. F. Oertel.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-025 221, Price codes: A06 in paper copy, A01 in microfiche. Final Report to the Savannah District of the Corps of Engineers, December 1975. 121 p, 12 fig, 8 tab, 6 append. DACW-21-75C-0007.

Descriptors: *Georgia, *Beaches, *Sediment transport, *Environmental effects, *Baseline studies, *Aquatic life, Sedimentation.
Identifiers: *Beach nourishment, Dredge spoil, Spoil banks.

The Tybee Island beach nourishment project produced two major physical changes at the foreshore. At the north end of the island, adjacent to Fort Screven, an 800 foot terminal groin was constructed. Before groin construction currents were approximately shore parallel. After groin construction, currents were directed toward the groin at decreased velocities. The nourishment project also produced a complete burial of the eroding foreshore surface of Tybee Island. The quantity of sediment transport in the nearshore zone is dependent upon the velocity of the longshore tidal current and the quantity of sand suspended by wave activity. In an offshore area for the disposal of dredged material, nektonic and benthic surveys were made before, during and after the 1974 disposal operation. The benthic infauna illustrated communities associated with a coarse grained ridge and a finegrained trough or swale. Fish that were feeding at or on the bottom were affected to a greater extent by seasonal changes than they were by the deposition of dredged material. In fact, during the disposal operation, the number of bottom feeding fish was higher at the disposal area than in the control. The turbidity associated with the disposal operation may have had an apparent attractive effect on the fish with bottom associated feeding characteristics. (Sinha-OEIS)
W77-10029

THREE-LAYER CIRCULATIONS IN ESTUARIES AND HARBORS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Materials Science; and Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
R. R. Long.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 282, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No 8 (Series C), September 1976. 23 p, 6 fig, 10 ref. N00014-75-C-0805.

Descriptors: *Estuaries, *Circulation, *Model studies, Water resources, *Water circulation, *Harbors, Salinity, *Mixing.

A theory is developed for the three-layer circulation in an overmixed estuary (finite fresh-water influx) or harbor (zero fresh-water influx) accompanying a two-layer structure in the large body of water outside. A determinate set of algebraic equations is derived for the general case and the form of the equations shows that for zero fresh-water influx the discharge from a harbor is proportional to the square root of the density difference between the two outside fluids. The problem is solved completely when there is a uniform depth of the fluids inside and outside the harbor, when the fresh-water influx is zero and when the two layers of fluid outside the harbor are of equal thicknesses. A laboratory model reproduced the three-layer circulation of the theory. The outflowing fluid was quite turbulent and this made the observation of the layer thickness uncertain but it appeared to be close to the value of the theory. (Sinha-OEIS)
W77-10030

EVALUATION OF UTILITY EQUIPMENT FOR HARBOR OIL SPILL REMOVAL/RECOVERY SYSTEMS,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
For primary bibliographic entry see Field 5G.
W77-10031

CURRENT DYNAMICS AND SEDIMENT DISTRIBUTION IN THE WEST MISSISSIPPI DELTA AREA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S. P. Murray, and W. J. Wiseman, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-025 547, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No 208, June 1976. 9 p, 2 ref. Also as: Reprint from Conference on Marine and Freshwater Research in Southern Africa, July, 1976, Port Elizabet, South Africa. N00014-75-C-0192.

Descriptors: *Deltas, *Sedimentation, *Settling velocity, *Gulf of Mexico, *Mississippi River, Tidal effects, Winds, Seasonal, River flow.

The dynamical oceanography (currents, waves, tides, density structure) of the coastal bight west of Southwest Pass, an area extending roughly 50 km offshore and 70 km alongshore, was studied intensively during the hydrologic year 1973-1974. The sediment pattern appears to be largely controlled by the mean current field produced by seasonal wind and river discharge effects. For example, distinct zones of (1) low wood-fiber content, (2) high percentage of occurrence of silt, and (3) low percentage of occurrence of clay are associated with the region affected by the intrusion of Gulf water. These sediment distributions can be explained in terms of the interaction of particle settling velocities with the tidal current dispersion and a topographically induced clockwise vortex in the near-surface layer overriding an intrusion of heavy Gulf water in the central core. (Sinha-OEIS)
W77-10032

OIL AND GAS SEEPS IN ALASKA. ALASKA PENINSULA, WESTERN GULF OF ALASKA,
Bureau of Mines, Anchorage, Alaska. Alaska Field Operation Center.
For primary bibliographic entry see Field 5B.
W77-10033

SIMULATION FACTORS INVOLVED IN OCEAN THERMAL POWER PLANTS,
Naval Academy, Annapolis, Md. Dept. of Naval Systems Engineering.
For primary bibliographic entry see Field 5B.
W77-10034

ANIMAL COLONIZATION OF MAN-INITIATED SALT MARSHES ON DREDGE SPOIL,
North Carolina State Univ., Raleigh. Sea Grant Program.
L. M. Cammen, E. D. Seneca, and B. J. Copeland.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-028 345, Price codes: A04 in paper copy, A01 in microfiche. U.S. Army Coastal Engineering Research Center, Technical Paper No 76-7, June 1976. 60 p, 12 fig, 11 tab, 50 ref.

Descriptors: *Salt marshes, *Stabilization, *North Carolina, Dredging.
Identifiers: *Dredge spoils, *Spartina alterniflora, Animal colonization, Smooth cordgrass.

Dredge spoil (sand and mud scooped from the bottom of navigation routes and piled high on channel edges) has been successfully stabilized with plantings of North Carolina's dominant marsh grass, Spartina alterniflora. Benefits of stabilizing spoil with Spartina, commonly known as smooth

cordgrass, appear to be twofold. In the short term, marsh grass slows erosion of spoil back into the waterways, thereby reducing the need for frequent and costly dredging with its wear and tear on the environment. In the long term, areas covered with Spartina come to look like natural marshlands. Marsh provides a vital source of nutrients and food for many young fish and shellfish and is, therefore, important to fishery resources. Research shows that planting Spartina on dredge spoil can lead to the creation of salt marsh that resembles marsh built by nature. How long this takes depends on how closely spoil resembles the natural marsh sediment, the natural sedimentation rate of the area, the elevation and the maturity of the natural marsh compared to the area of spoil deposition. (Sinha-OEIS)
W77-10035

ESTUARINE SHORELINE EROSION IN THE ALBEMARLE-PAMLICO REGION OF NORTH CAROLINA,
East Carolina Univ., Greenville, N.C. Dept. of Biology; and East Carolina Univ., Greenville, N.C. Dept. of Geology.
V. Bellis, M. P. O'Connor, and S. R. Riggs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 257, Price codes: A04 in paper copy, A01 in microfiche. North Carolina State University, Raleigh, Sea Grant Program, Publication no UNC-SG-75-69, December 1975. 76 p, 40 fig, 4 tab, 15 ref. Sea Grant 04-3-158-40.

Descriptors: *Estuaries, *Shore protection, *Erosion, *Bank erosion, *North Carolina, Bank stability.
Identifiers: *Albermarle-Pamlico region(NC).

Shoreline erosion within the estuaries of North Carolina is a continuing process which has been in operation for several thousand years. Actual rates of erosion range up to twenty feet per year but average 2-3 feet per year. Variables affecting rate of shoreline erosion are: bank height and composition, vegetative cover, exposure to prevailing winds and fetch, offshore topography, and various human activities. Three major shoreline types are identified on the basis of these parameters. These are: sand and clay banks, swamp forest, and grass marsh. Of these shoreline types only the sand and clay banks can be easily developed. All types, however, can be protected by shoreline modification structures, utilization of natural protective features, or appropriate setback regulation. (Sinha-OEIS)
W77-10036

A DYNAMIC WATER QUALITY MODEL FOR THE NEUSE ESTUARY, N.C.,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-10037

THE CAUSES OF EROSION TO SILETZ SPIT, OREGON,
Oregon State Univ., Corvallis. Dept. of Oceanography.
P. D. Komar, and C. C. Rea.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 663, Price codes: A02 in paper copy, A01 in microfiche. Sea Grant College Program Publication No ORESU-T-75-001, December 1975. 20 p, 15 fig.

Descriptors: *Oregon, *Erosion, *Rip currents, Coastal engineering, Landfills.
Identifiers: *Siletz Spit(Ore).

Severe erosion occurred on Siletz Spit on the central Oregon coast in the winter of 1972-73. No jetties are present at the Siletz Bay inlet. Instead, the erosion is associated with rip currents, strong narrow currents that flow across the surf zone to out beyond the breakers. Rip currents erode embayments on the beach, at time cutting back into the dunes on which the houses were built. Because conditions similar to Siletz Spit occur elsewhere on the Oregon coast, such episodes of erosion could be repeated. Documenting the erosion to Siletz Spit and explaining its causes may help prevent this. (Sinha-OEIS)
W77-10039

LONG BEACH HARBOR NUMERICAL ANALYSIS OF HARBOR OSCILLATIONS; REPORT 2, ALTERNATE PLANS FOR PIER J COMPLETION AND TANKER TERMINAL PROJECT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10040

LONG BEACH HARBOR NUMERICAL ANALYSIS OF HARBOR OSCILLATIONS; REPORT 4, ALTERNATE PLANS FOR PIER J COMPLETION AND TANKER TERMINAL PROJECT (NO LANDFILL),
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10041

LOS ANGELES HARBOR NUMERICAL ANALYSIS OF HARBOR OSCILLATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10042

THE EFFECT OF COPPER ON COMPETITION BETWEEN MARINE ALGAE,
Manchester Polytechnic (England). Dept. of Chemistry and Biology.
For primary bibliographic entry see Field 5C.
W77-10051

OLIGOCHAETA OF THE DENIESTER RIVER MOUTH REGION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
T. G. Moroz, and N. R. Pavlova.
Zool Zh 54(4), p 613-616, 1975.

Descriptors: *Oligochaetes, *Estuaries, *Salinity, *Population, Benthic fauna, Biomass, Benthos.
Identifiers: Dniester River estuary, River mouth, USSR, Euryhaline species, Population density.

The oligochaete fauna in the Dniester estuaryis represented by freshwater freshwater-euryhaline, brackish-water and marine species, their ratios being different in different parts of the estuary and dependent on salinity. The increase of insalinity of the Dniester River mouth region (USSR) will probably decrease the population density of oligochaetes and diminish their role in the total benthic biomass.
W77-10065

PARTIAL ANALYSIS OF THE MICROPLANKTON IN THE LAGOON OF PUEBLO VIEJO, STATE OF VERA CRUZ, MEXICO, (IN SPANISH),
Instituto Nacional de Pesca, Mexico City.
R. Mirna Cruz.
Rev Soc Mex Hist Nat 34, p 327-368, 1973 (1975).

Descriptors: *Lagoons, *Oysters, *Plankton, *Food abundance, *Diets, Estuaries, Reproduction, Phototropism, Oxygen requirements, Diatoms, Foods, Larvae, Chlorella, Aquatic microorganisms, Aquatic productivity, Bacteria.
Identifiers: Balanus sp, Biddulphia sp, Cocconeis sp, Coscinodiscus sp, Crassostrea virginica, Mexico, Pueblo viejo, Rhizosolenia, Synedra sp, Veracruz.

This lagoon is considered an estuary with environmental conditions favoring oysters, among other species of commercial importance. A study was made using 125 samples of plankton and 1250 water samples. Information on the season of reproduction of the oyster, Crassostrea virginia Gm., and the extent of the period of fixation of its larvae is presented. Larvae of the oyster and of Balanus sp. are present almost throughout the year. For both species maximal values were present from June-Sept. There is another short season during part of Dec. and Jan. Studies of fixation of larvae on tiles indicated that oyster larvae have a negative phototropism and apparently thrive under low O2 concentrations; hence bottom fixation is most abundant. The larvae of Balanus sp. show positive phototropism requiring high O2 concentrations, which is why they were most abundant near the surface. The stomach contents of the oysters include fragments of Cosinodiscus sp., Syneda sp., Cocconeis sp. and Biddulphia sp. Oysters larvae fed on various organisms like Chlorella, small flagellates 2-3 micros in size, and bacteria. Also 32 genera of diatoms were identified, including Coscinodiscus sp., Biddulphia sp., Rhizosolenia and others.
W77-10066

WISSELWERKING TUSSEN LAND EN SEE, OF, DIE EKOLOGIE VAN DIE KUSWATERS VAN NATAL (THE INTER-ACTION BETWEEN LAND AND SEA, OR, THE ECOLOGY OF THE COASTAL WATERS OF NATAL),
Natal Univ., Durban (South Africa).
A. E. Heydorn.
Tegnikon, Vol. 24, No. 3, p 3-7, September 1976. 5 ref.

Descriptors: Ecology, Estuaries, Marine biology, Coastal structures, Currents(Water), Sea water.
Identifiers: *Natal(South Africa).

The ecology of the coastal waters of Natal is characterized by a large variety of environmental parameters such as a dominant southward flowing current of tropical origin, a cooler and less pronounced inshore counter-current from the south, a land mass which slopes steeply from the Drakensberg to the coast, a large number of rivers and estuaries entering the sea, high summer rainfall etc. A situation of pronounced inter-action between land and sea exists and the biota of the coastal waters are closely adapted to this specialized environment. Sensitivity in the utilization of the coastal region is vital, particularly with regard to harbor-, industrial-, property-, and agricultural development, if damage to the environment upon wich the sea's natural resources depend, is to be avoided. If adequate care is not taken, the danger of development of one facet at the expense of another is substantial, and to avoid this danger effective communication between developers and engineers on the one hand and biologists and ecologists on the other, must be given high priority. (So. African Water Info Ctr)
W77-10072

A CHECK LIST AND NOTES ON THE BIRDS OF SANDVIS, SOUTH WEST AFRICA,
South African Div. of Nature Conservation and Tourism, Etosha. Ecological Inst.
H. H. Berry, and C. U. Berry.
Madoqua, Vol. 9, No. 2, p 5-18, 1975. map, 6 fig, 11 ref, 2 tab.

Descriptors: *Water birds, Taxonomy, Population, *Estuarine environment, Ecosystems, Migration, Breeding, Saline water, Salt marshes, Limnology, Algae, Food chains, Africa.
Identifiers: Flamingoes, Pelicans, Sea-birds, Palaearctic waders, Cormorants, *Sandvis Bay, Sandwich Harbour, South West Africa, South Africa.

Sandvis (23 deg 20'S, 14 deg 30E') covers an area of 20 sq km and is approximately 10 km north-

south by a maximum of 3 km east-west. It is isolated from the interior of South West Africa by the great sand dunes of the coastal Namib Desert and bounded by the Atlantic Ocean on the west. The nearest other vegetation of any consequence is in the delta of the Kuiseb River, 25 km NE. During the course of two years of bird population counts at Sandvis (previously also known as Sandwich Harbour) from July 1970 to June 1972 it was possible to compile a systematic list of the species. In addition, confirmed sightings made by visitors to the area since 1968 have been included. A previous record of species found at Sandvis exists and it has been referred to when a species seen or collected at that time was not encountered during the period 1970-1972. Dixon (1970) has also collected some hitherto unrecorded species in the area. Prozesky recorded 66 species of birds during the course of two visits to the area (May 1959 and January 1960). To date the number of species recorded is 113 and represents an exceptionally wide taxonomic variety when the isolated nature of the area is taken into account. (So African Water Info Center)
W77-10089

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DISTILLATION APPARATUS AND METHOD,
J. E. Pottharst, Jr.
U. S. Patent No. 4,002,538, 9 p, 8 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 952, No 2, p 769, January 11, 1977.

Descriptors: *Patents, *Distillation, *Vapor compression distillation, *Desalination, Brackish water, Sea water, Water purification, Water quality control, Separation techniques, Equipment, Water pollution treatment.

A vapor compression type distillation apparatus and method is provided for distilling brackish water or seawater so that increased efficiency can be achieved by virtue of an arrangement and operation which maximizes the average effective temperature differential between steam being condensed and the water being vaporized. Thus a vertical shell and tube vaporizer is provided which includes an array of tubes which has a width substantially greater depth. The liquid discharged from the upper ends of the tubes is caused to flow downward in a downtake passage into a body of water at the lower end of the vaporizer along the entire width of the array. Feed water is fed into the body of water at the lower end of the vaporizer at one end of the array and blowdown is taken from the other end of the array. (Sinha - OEIS)
W77-09804

REGULAR COPOLYAMIDES AS DESALINATION MEMBRANES,
Department of the Interior, Washington, D.C. Office of the Secretary.
O. F. Vogl, and D. R. Stevenson.
U.S. Patent No. 4,002,563, 5 p, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 954, no 2, p 777, January 11, 1977.

Descriptors: *Patents, Desalination, *Desalination processes, *Reverse osmosis, Separation techniques, Water purification, *Membrane processes, Chemical reactions, *Membranes.
Identifiers: Aliphatic copolyamides membranes.

Efficiency of the reverse osmosis process depends to a large extent on the nature of the membrane. Superior desalination membranes may be prepared from regular copolyamides. It has been found that aliphatic regular copolyamides can be prepared by reacting an aliphatic diester with an excess of an aliphatic diamine, and subsequently reacting the intermediate diamine diamide product with an aliphatic diacid chloride. Or, the diamine diamide may be reacted with an aromatic diacid chloride to form a product in which R in the formula is an aromatic radical. Reactions involved in preparation of the copolyamides of the invention are illustrated, in which the reactants are ethylene diamine, diethyloxalate and an aliphatic or aromatic diacid chloride. (Sinha-OEIS)
W77-09806

SEMIPERMEABLE MEMBRANES AND THE METHOD FOR THE PREPARATION THEREOF,
Department of the Interior, Washington, D.C. Office of the Secretary.
W. J. Wrasidlo.
U.S. Patent No. 4,005,012, 6 p, 3 ref; Official Gazette of the United States Patent Office, Vol 954, no 4, p 1656, January 25, 1977.

Descriptors: *Patents, *Membrane processes, *Semipermeable membranes, *Reverse osmosis, Water treatment, Water purification, Chlorine, *Desalination, Waste water treatment, Filtration.

When utilizing the semipermeable membranes in the treatment of brackish water, and particularly in the treatment of waste effluent, it is often necessary to treat the feed material with chlorine or other oxidizing agents so as to guard against bacterial growth. However it has also been found that when chlorine has been included in the feed there is a substantial deterioration in the performance of the membrane. This invention relates to semipermeable membranes which are useful in reverse osmosis or ultra-filtration processes which possess desirable characteristics of being resistant to deterioration due to the presence of chlorine in the feed fluid. A composite semipermeable membrane is comprised of a microporous substrate and an ultra-thin film having semipermeable properties deposited on one surface of the microporous substrate. The ultra-thin film is formed by contacting an aqueous solution of an amine modified polyepihalohydrin with a solution of a polyfunctional agent which is capable of reacting with the amine groups. (Sinha-OEIS)
W77-09817

EVALUATION OF CELLULOSE ACETATE MEMBRANES FOR REVERSE OSMOSIS SEPARATION,
National Environmental Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 5D.
W77-09863

APPLICATION OF MEMBRANE PROCESSES,
Permutit Co., Paramus, N. J.
H. B. Sliger, and R. Quinn.
Desalination, Vol 19, p 573-586, December 1976. 3 fig, 5 tab.

Descriptors: *Membrane processes, *Desalination plants, *Reverse osmosis, *Desalination processes, *Operation and maintenance, *Economic efficiency, Operating costs, Capital costs, Pumps, Fouling, Systems analysis.
Identifiers: Hollow fiber permeator, Spiral wound membrane, Tubular membrane, In-line coagulation.

Factors to consider in selecting the optimum membrane and assembling it in an efficient hardware system are outlined. Operating and application parameters for the three basic membrane configurations (spiral wound, hollow fiber and tubular systems) are presented, including information on specific trade products. All three membrane systems have advantages and drawbacks, and the job of a membrane systems application engineer is to select the appropriate membrane for a given application. The size of the element assembly and the limits imposed by the recovery levels determine the economics for a particular system. The system must be single-staged if the water to be treated has a high solids content or has saturation limits for a given constitutent. The system used in most applications involves two stages in which the reject from the first stage is the feed to the second. The choice of pump is also important. To optimize the economics of pretreatment, some form of in-line coagulation should be used, if possible. Some examples are given to demonstrate the variety of options for membrane installations. (Jahns-Arizona)
W77-09929

COLORADO RIVER BASIN SALINITY CONTROL PROJECT--TITLE I,
Bureau of Reclamation, Yuma, Ariz. Yuma Projects Office.
For primary bibliographic entry see Field 5D.
W77-09931

3B. Water Yield Improvement

ICE NUCLEATION BY MICAS,
Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.
For primary bibliographic entry see Field 2B.
W77-09956

3C. Use Of Water Of Impaired Quality

CHANGE OF SALINITY WITH DIFFERENT DISTANCES BETWEEN DRAINS UNDER CONDITIONS OF NORTHERN MUGAN, (IN RUSSIAN),
A. A. Mamedov.
Izv Akad Nauk Az SSR SER Biol Nauk 3, p 69-73. 1975.

Descriptors: *Saline soils, *Drainage, *Drains, Agriculture, *Land reclamation, Salinity, Desalination.
Identifiers: *USSR(Northern Mugan), Azerbaijan SSR, Kura River(USSR), Araks River(USSR).

In the northern Mugan, a plain south of the confluence of the Kura and Araks rivers in the Azerbaijan SSR (USSR) the saline soils are improved by different intensities of draining. Distances between drains are 200, 300, 400, 500, 600, 700, 800 and more meters. Under the actual conditions of reclamations and development of the saline lands the rate of desalinization of the soils does not depend on the distance between drains within 200-700 m. Consequently, in the given case with consideration of actual farming practice, greater distances between drains, up to 600-700 m, can be used in the collector-drainage network.--Copyright 1976, Biological Abstracts, Inc.
W77-09630

INFLUENCE OF CATION CONTENT ON THE BIOLOGICAL ACTIVITY OF FENSULFOTHION IN PLAINFIELD SAND,
Department of Agriculture, London (Ontario). Research Inst.
For primary bibliographic entry see Field 2G.
W77-09639

SULFUR-COATED FERTILIZERS FOR SUGARCANE: I. PLANT RESPONSE TO SULFUR-COATED UREA,
Florida Univ. Belle Glade. Dept. of Plant Nutrition.
For primary bibliographic entry see Field 3F.
W77-09640

SULFUR-COATED FERTILIZERS FOR SUGARCANE: II. RELEASE CHARACTERISTICS OF SULFUR-COATED UREA AND KC1,
Florida Univ. Belle Glade. Dept. of Plant Nutrition.
For primary bibliographic entry see Field 3F.
W77-09641

AMMONIA VOLATILIZATION AND NITROGEN UTILIZATION FROM SULFUR-COATED UREAS AND CONVENTIONAL NITROGEN FERTILIZERS,
Texas A and M Univ., Corpus Christi. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 3F.
W77-09642

EFFECT OF LEACHING FRACTION ON RIVER SALINITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 5G.
W77-09697

THE EFFECTS OF WATER CONTENT OF THE TOPSOIL ON MICRONUTRIENT AVAILABILITY AND UPTAKE IN A SILICEOUS SANDY SOIL,
Adelaide Univ. (Australia). Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09930

LONG-TERM EVALUATION OF SLOW-RELEASE NITROGEN SOURCES OF TURFGRASS,
Community Coll. of the Finger Lakes, Canandaigua, New York.
D. V. Waddington, E. L. Moberg, J. M. Duich, and T. L. Watschke.
Soil Science Society of America Journal, Vol. 40, No. 4, p 593-597, July-August 1976. 5 fig, 2 tab, 3 ref.

Descriptors: *Turf grasses, *Kentucky bluegrass, *Ureas, *Nitrogen, Nutrients, Fertilization, Crop response, Crop production.
Identifiers: Slow-release nitrogen, Turfgrass yield.

Short-term studies with slow-release nitrogen sources have not provided information on the changes in response that may occur with continued use of a given material. In this study eight nitrogen sources were used to fertilize 'Merion' Kentucky bluegrass for 7 consecutive years to obtain long-term results. Fertilizers used were urea, Uramite (urea form), IBDU (isobutylidene diurea), Urex (urea-paraffin matrix), ADM (plastic coated urea), Milorganite (activated sewage sludge), and two complete (NPK) fertilizers, with two-thirds of the nitrogen from ureaform or IBDU and the remainder soluble. Urea was applied every other week and the other fertilizers were applied one, two or three times per season to obtain total N of 1.46, or 2.44 kg/100 sq m. Weekly clipping yields and color ratings were used to evaluate turfgrass response to the fertilizer treatments. Milorganite, Uramite, and IBDU produced more uniform growth than Urex, ADM, and the complete fertilizers. Response to Urex, ADM, and the complete fertilizer with IBDU was similar, and was often characterized by excessive growth after application. The greatest increase in response with continued use occurred with Uramite, which was the least efficient fertilizer in the first two years. At the end of the 7-year period, determinations of yield, color, and total soil N indicated that Uramite had the greatest residual effect. (Skogerboe-Colorado State)
W77-09978

3D. Conservation In Domestic and Municipal Use

URBAN RUNOFF POLLUTION CONTROL--TECHNOLOGY OVERVIEW,
Municipal Environmental Research Lab., Cincinnati, Ohio. Wastewater Research Div.
For primary bibliographic entry see Field 5D.
W77-09823

STORM WATER MANAGEMENT MODEL: LEVEL I--COMPARATIVE EVALUATION OF STORAGE-TREATMENT AND OTHER MANAGEMENT PRACTICES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Science.
For primary bibliographic entry see Field 5D.
W77-09824

AN APPROACH TO REDUCE WATER CONSUMPTION IN NEIGHBORHOODS THROUGH REUSE,
Sir Venkateswara Univ., Tirupati (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-09855

NATIONWIDE EVALUATION OF COMBINED SEWER OVERFLOWS AND URBAN STORMWATER DISCHARGES. VOLUME II: COST ASSESSMENT AND IMPACTS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W77-09874

3E. Conservation In Industry

A UNIQUE MEANS OF OBTAINING SEAWATER,
South West African Consolidated Diamond Mines Ltd., Oranjemund.
For primary bibliographic entry see Field 8E.
W77-09692

TREATMENT OF DENIM TEXTILE MILL WASTEWATERS: NEUTRALIZATION AND COLOR REMOVAL,
Noonan (R.S.), Inc. of South Carolina, Greenville.
For primary bibliographic entry see Field 5D.
W77-09724

RELATIONSHIP OF EFFLUENT LIMITATIONS TO FUTURE PULP MILL CLOSURES,
Environmental Protection Agency, Seattle, Wash.
For primary bibliographic entry see Field 5D.
W77-09727

FIBERBOARD MILL RECYCLES WATER.
For primary bibliographic entry see Field 5D.
W77-09728

BROWN (CO.) RECYCLES DE-INKING WATER ON TISSUE-GRADE PRODUCTS,
For primary bibliographic entry see Field 5D.
W77-09732

APPLICATION OF REVERSE OSMOSIS AND ULTRAFILTRATION TO THE PURIFICATION OF PULP AND PAPER INDUSTRY EFFLUENTS (ZASTOSOWANIE ODWROCONEJ OSMOZY I ULTRAFILTRACJI DO OCZYSZCZANIA SCIEKOW Z PRZEMYSLU CELULOZOWO-PAPIERNICZEGO),
Instytut Inzynierii Ochrony Srodowiska Politechniki Slaskiej, Fliwice (Poland).
For primary bibliographic entry see Field 5D.
W77-09733

HOW TO REDUCE WATER AND RAW MATERIAL CONSUMPTION IN PAPERMAKING (COME RIDURRE I CONSUMI D'ACQUA E DI MATERIE PRIME IN CARTIERA),
Cartiere Ambrogio Binda S.p.A., Milan (Italy).
D. Corbetta, and G. Testori.
Industria della Carta, Vol. 14, No. 12, p 528-545, December, 1976. 7 fig, 13 ref, 5 tab.

Descriptors: *Pulp and paper industry, *Water conservation, Industrial water, Water consumption(Except consumptive use), Costs, *Water pollution control.
Identifiers: Paper machines.

After a brief introduction to data concerning the cost of process water supplies and the specific water consumption involved in the production of various grades of pulp and paper, criteria for the selection of measures to be used in reducing process water consumption in papermaking are outlined. Examined in particular is the conservation of process in water in the primary, secondary, and tertiary water circulation systems of paper machines, as well as reductions in the consumption of wash water, cooling water, general-services water, and sanitary water. (Speckhard-IPC)
W77-09738

CLOSED-CYCLE MILL ELIMINATES POLLUTION WHILE ALSO SAVING MONEY,
C. F. Cornell.
In: Evaluating New Paper Technology from a Capital Budgeting Viewpoint (Seminar sponsored by First Manhattan Co., N.Y.), p 14-20, September 21, 1976. 1 tab.

Descriptors: *Water conservation, *Pulp and paper industry, *Water pollution control, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Foreign countries, *Canada, *Costs, Water consumption, Industrial water, Pollution abatement, Economics, Capital costs, *Water pollution treatment, Discharge(Water), *Recycling, *Water reuse.
Identifiers: *Kraft mills, Closed systems, Chemical recovery.

The closed-cycle 250,000 ton/year bleached market kraft pulp mill of Great Lakes Paper Co. Ltd. in Thunder Bay, Ontario, is the first practical installation utilizing Envirotech's salt recovery process (SRP). Estimated annual operating cost savings of nearly $4,500,000 are expected to accrue from heat savings (including decreased steam consumption and increased steam production from reclaimed organics), fiber and chemical savings, water savings, reduced effluent treatment costs, and yield increases. Within 2-3 years these economies are expected to pay for the about $8,000,000-9,000,000 greater capital investment compared to a conventional new kraft mill without external effluent treatment (which could, however, equal or double this amount). Only 4000 gallons of water are used per ton of pulp, ca. 85% less than in conventional kraft mills. Countercurrent reuse of filtrates plus other modifications reduce steam demands in the bleachery to ca. 10-15% of those normally required. Clean clear cooling water is the only liquid discharge from the mill, and water pollution is no longer a problem. (Brown-IPC)
W77-09740

ACTIVATED CARBON ADSORPTION PROCESS FOR PURIFICATION OF TEXTILE WASTE WATERS,
McGill Univ., Montreal (Quebec). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W77-09744

CHARACTERIZATION AND TREATMENT OF TEXTILE DYEING WASTEWATERS,
Crompton and Knowles Corp., Reading, Pa.
For primary bibliographic entry see Field 5D.
W77-09745

WATER REUSE IN A PAPER REPROCESSING PLANT,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 5D.
W77-09757

PAPER MILL WASTEWATER TREATMENT BY MICROSTRAINING,
Strathmore Paper Co., Turners Falls, Mass.
For primary bibliographic entry see Field 5D.
W77-09758

TREATING WOOD PRESERVING PLANT WASTEWATER BY CHEMICAL AND BIOLOGICAL METHODS,
Environmental Science and Engineering, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5D.
W77-09759

IMPACT OF MUNICIPAL WATER AND SEWAGE CHARGES ON INDUSTRY,
Packard and Anderson Engineers, Auburn, N. Y.
For primary bibliographic entry see Field 5G.
W77-09921

3F. Conservation In Agriculture

SULFUR-COATED FERTILIZERS FOR SUGARCANE: I. PLANT RESPONSE TO SULFUR-COATED UREA,
Florida Univ. Belle Glade. Dept. of Plant Nutrition.
G. J. Gascho, and G. H. Snyder.
Soil Science Society of America Journal, Vol. 40, No. 1 p 119-122, January-February 1976. 1 fig, 2 tab, 14 ref.

Descriptors: *Fertilizers, *Fertilization, *Sugarcane, Ureas, Nutrients, *Crop response, Crop production, Nitrogen, Soils, Plant growth, Growth rates, Florida.
Identifiers: Sulfur-coated ureas(Soils).

Crop growth and yield on sand soils is often limited by low N availability due to leaching losses from soil. This study was initiated to determine if sulfur-coated urea (SCU) could supply adequate N nutrition and eliminate the need for repeated N applications for sugarcane grown on previously uncropped Immokalee fine sand in southern Florida. Single applications of two SCU's were compared with split applications of (NH4)2SO4(AS), each at three N rates, 56, 112, and 168 kg/ha. Application of SCU at planting in November resulted in excellent growth and high leaf N concentrations in the spring but did not provide optimum N throughout the growing season. Leaf N concentrations in late summer and tonnages of sugarcane and sugar for SCU plots approached, but did not equal, those attained with four applications of AS. Higher tonnages were recorded for the slower releasing SCU than for the faster releasing source but both SCU sources released large amounts of N before the warm summer months when N is required in the highest quantities. The data indicate that SCU's which release N more slowly and/or later application date should provide better N nutrition and eliminate the need for several split applications of soluble sources. (See also W77-09641) (Skogerboe-Colorado State)
W77-09640

SULFUR-COATED FERTILIZERS FOR SUGARCANE: II. RELEASE CHARACTERISTICS OF SULFUR-COATED UREA AND KC1,
Florida Univ. Belle Glade. Dept. of Plant Nutrition.
G. H. Snyder, and G. J. Gascho.
Soil Science Society of America Journal, Vol. 40, No. 1, p 122-126, January-February 1976. 4 fig, 2 tab, 11 ref.

Descriptors: *Nitrogen, *Potassium, *Fertilizers, *Fertilization, Leaching, Nutrients, Soils, Crop production, Florida, Chlorides.
Identifiers: *Sulfur-coated ureas(Soils).

Nitrogen release from sulfur-coated urea and K release from S-coated KC1 were examined by several techniques under field conditions in three south Florida sand soils in order to assist in the interpretation of plant response data and to provide insight into the use of three slow-release fertilizer materials. Decreased thickness of S coating, higher temperatures and higher moisture generally favored nutrient release. However, considering the range of field conditions involved in the studies, variations in N and K release were comparatively small. Release was rapid during the first 6 months, averaging 70-80% of that applied, but was much slower thereafter. (See also W77-09640) (Skogerboe-Colorado State)
W77-09641

AMMONIA VOLATILIZATION AND NITROGEN UTILIZATION FROM SULFUR-COATED UREAS AND CONVENTIONAL NITROGEN FERTILIZERS,
Texas A and M Univ., Corpus Christi. Agricultural Research and Extension Center.
J. E. Matocha.
Soil Science Society of America Journal, Vol. 40, No. 4, p 597-601, July-August 1976. 2 fig, 2 tab, 17 ref.

Descriptors: *Ammonia, *Nitrogen, *Ureas, Nutrients, *Fertilization, Calcareous soils, Acidic soils, Cation exchange, Corn(Field), Lime, Fertilizers.
Identifiers: *Ammonia volatilization, *Sulfur-coated ureas(Soils).

Ammonia volatilization was measured on acid and calcareous soils receiving sulfur-coated ureas (SCU) and highly soluble N fertilizers. Surface and mixed applications of SCU-30 (30% dissolution rate), SCU-20 (20% dissolution rate), uncoated (NH2)2CO, NH4NO3, and (NH4)2SO4 were made with and without lime to a fallowed acid fine sand. Without lime, top dressed NH4NO3, SCU-20, SCU-30, and (NH4)2SO4 lost < 1% while (NH2)2CO lost 18.5% of added N in 14 days. Topdressing lime with N caused more NH3 loss from (NH4)2SO4 than from (NH2)2CO during the initial 48 hours. However, accumulative losses for 14 days were 51.5 22.5, 9.0, and 1.7% from (NH2)2CO, (NH4)2SO4, SCU-30 and SCU-20, respectively. Incorporating the lime with the soil prior to N addition reduced NH3 loss > 50% as compared to surface application, but mixing N with the limed acid soil did not reduce NH3-N losses. Mixing SCU with the soil appeared to increase release rate of N over topdressing, but this effect was not detected in plant response. Nitrogen uptake by corn on the acid soil substantiated some of the conclusions regarding measured NH3-N losses. Ammonia losses from N mixed with the finer textured calcareous clay loam were generally insignificant. Surface applied (NH2)2CO and (NH4)2SO4 lost significant amounts of NH3-N while losses from SCU and NH4NO3 were negligible. (Skogerboe-Colorado State)
W77-09642

EFFECT OF PRETREATMENT ON LOSS OF NITROGEN-15-LABELLED FERTILIZER NITROGEN FROM WATERLOGGED SOIL DURING INCUBATION,
Prairie View A and M Coll., Tex.
For primary bibliographic entry see Field 2G.
W77-09643

EVALUATION OF THE PARAMETERS OF SOIL PHOSPHORUS AVAILABILITY FACTORS IN PREDICTING YIELD RESPONSE AND PHOSPHORUS UPTAKE,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 2G.
W77-09646

EFFECTS OF BORON AND NITROGEN ON GRAIN YIELD AND BORON AND NITROGEN CONCENTRATIONS OF BARLEY AND WHEAT,
Department of Agriculture, Charlottetown (Prince Edward Island). Research Station.
U. C. Gupta, J. A. MacLeod, and J. D. E. Sterling.
Soil Science Society of America Journal, Vol. 40, No. 5, p 723-726, September-October 1976. 5 tab, 12 ref.

Descriptors: *Boron, *Nitrogen, *Wheat, *Barley, Crop production, Crop response, Grains(Crops), Soils, Water pollution sources, Toxicity.

In field experiments, 4.48 kg B/ha added to soil decreased the grain yield of barley and wheat. Under greenhouse conditions, 0.5 ppm, added B reduced wheat yields while 1.0 ppm added B reduced barley yields. The B toxicity in wheat in 1974 and barley and wheat in 1975 at 2.24 kg B/ha as associated with reduced yield was alleviated somewhat by the additions of N to the soil in field experiments, but the effect was not significant. Under greenhouse conditions, additions of 50 ppm N or more reduced B uptake and alleviated B toxicity. In general, the B toxicity symptoms on the foliage under field conditions were associated with > 11 ppm B in wheat boot stage tissue (BST) and > 14 ppm B in BST of barley. Added B increased the N concentration of grain where yields were decreased due to B toxicity. Wheat yields increased with increased rates of N application in all field experiments, while barley yields increased with increased rates of N in 2 of the 3 years. In field experiments the highest B value was 34 ppm. Concentrations as high as 312 ppm B were found in greenhouse experiments. In the presence of added B under greenhouse conditions, the barley tissue B concentration was much lower when the moisture level near the fertilizer band was low than when it was high. (Skogerboe-Colorado State)
W77-09655

PHOSPHORUS-ZINC INTERACTION IN RELATION TO ABSORPTION RATES OF PHOSPHORUS, ZINC, COPPER, MANGANESE, AND IRON IN CORN,
Haryana Agricultural Univ., Hissar (India). Dept. of Soils.
N. M. Safaya.
Soil Science Society of America Journal, Vol. 40, No. 5, p 719-722, September-October 1976. 4 tab, 24 ref.

Descriptors: Nutrients, Fertilization, *Phosphorus, *Zinc, *Copper, *Manganese, *Iron, Corn(Field), Crop production, Crop response, *Absorption, Fertilizers, Soils.

The effects of P and Zn on growth, nutrient content in tops and roots, and the rates of absorption of P, An, Cu, Mn, and Fe per unit fresh weight of roots for two growth periods of corn were studied in soil culture under greenhouse conditions. Visual symptoms of Zn deficiency appeared in plants when the level of applied P was raised to 75 micro g P/g soil. Phosphate decreased tissue-Zn concentration and Zn flux through roots. Zinc deficient plants had higher concentration of P in their tissues. Phosphate flux was mostly reduced with Zn, but during 27-48 days growth, Zn-supplied plants retained near identical rates of P absorption

(approximately 14 micro g/g fresh root/day) irrespective of the level of P supplied. The rate of Cu absorption was reduced with both P and Zn as the plants aged. Manganese flux was initially stimulated by P but later on drastically reduced by Zn. Iron concentration in plants decreased with Zn application but significant reduction in Fe flux with Zn occurred during early growth of 25 ppm P-supplied plants only. In general, nutrient fluxes diminished with plant age. (Skogerboe-Colorado State)
W77-09656

CALCIUM AND STRONTIUM ABSORPTION BY CORN ROOTS IN THE PRESENCE OF CHELATES,
Minnesota Univ., Minneapolis. Dept. of Soil Science.
G. L. Malzer, and S. A. Barber.
Soil Science Society of America Journal, Vol. 40, No. 5, p 727-731, September-October 1976. 3 fig, 3 tab, 13 ref.

Descriptors: *Strontium, *Calcium, *Corn(Field), Crop production, *Absorption, Plant growth, *Chelation, Root development, Root systems, Soils.
Identifiers: *Cation absorption(Plants), *Chelate absorption(Plants).

While chelates have been shown to increase the flux of metal cations into roots, the mechanism has been subject to question. The objective of this research was to characterize the action of chelates on metal cation absorption. Calcium and Sr rather than micronutrient metals were used because some plant roots do not discriminate in their absorption, hence, relative flux of Ca vs. Sr could be used to evaluate uptake mechanisms. The chelates used were: EDTA, DPTA, and HEDTA. Flux into corn roots was determined by monitoring Ca, Sr, and chelate depletion from solution with time. Double labeling of Ca and Sr with Ca-45 and Sr-85 was used. Ligand concentrations were measured using Cd titration, C-14-labeling, and UV-absorption measurements of Cu-ligand complexes. Calcium and Sr were removed from solution more rapidly than the chelate. Only 11 to 16% of the chelating ligand was absorbed over a 5-day period, whereas 90% or more of each of Ca and Sr was absorbed. The Ca/Sr ratio of uptake indicated that some of the Ca and Sr was absorbed directly from the chelate. However, where Ca(2+) was maintained by continual addition, chelated Ca appeared relatively unavailable to the plant. (Skogerboe-Colorado State)
W77-09657

THROUGH THE ANDES.
For primary bibliographic entry see Field 8A.
W77-09687

TEMPORALLY AND AREALLY DISTRIBUTED RAINFALL,
Agricultural Research Service, Athens, Ga. Southeast Watershed Lab.
For primary bibliographic entry see Field 2B.
W77-09696

THE FUNCTIONAL AND AESTHETIC USES OF TWO CACHE VALLEY, UTAH, CANALS,
Utah State Univ., Logan. Dept. of Landscape Architecture and Environmental Planning.
For primary bibliographic entry see Field 6B.
W77-09796

GROVE IRRIGATION SYSTEM,
E. A. McLeod.
U. S. Patent No. 4,002,294, 8 p, 8 fig, 17 ref; Official Gazette of the United States Patent Office, Vol 954, no 2, p 690, January 11, 1977.

Descriptors: *Patents, *Irrigation, *Distribution systems, *Irrigation systems, *Irrigation efficiency, Application equipment, Filters, Water distribution(Applied).

In an irrigation system for use in a citrus grove, water is pumped from a well into a chamber of an elongated filter which has an outer casing and an inner treating unit defining the chamber. The filter also has a spiggot and valve for flushing the filter. Irrigation water goes in one end, through the filter, passing from the chamber into the treating unit and out the other end to a main line. The main line supplies sub-main and branch lines to T-shaped pipes which terminate in posts. Each post has a vertical pipe which emerges from the post and has a spraying head designed to be just above the post. The T-shaped pipes are placed so that the posts will emerge on both sides of a tree trunk and spray water from both sides onto the tree trunk to feed the roots. (Sinha - OEIS)
W77-09800

SELF-REGULATING SPRINKLER,
M. Drori.
U. S. Patent No. 4,002,295, 4 p., 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 954, no 2, p 690-691, January 11, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Water delivery, Application equipment, Flow control, Irrigation efficiency.

A pressure-regulated water sprinkler includes a sprinkler head carrying a nozzle at one end through which the water discharges in the form of a jet. A housing defines an internal chamber connected at one end with the nozzle and having an inlet at another end. The nozzle end of the housing is formed with internal ribs spaced circumferentially and extending longitudinally to a point within the chamber intermediate the nozzle and inlet ends. The ribs are formed with a first annular shoulder adjacent to the nozzle end of the chamber and with a second annular shoulder of larger diameter. An annular ring within the chamber has one side bearing against the second annular shoulder and its opposite side facing the housing inlet. A regulator is placed within the chamber between the ring and first annular shoulder. A pressure-sensing means automatically moves the regulator member towards and away from one side of the annular ring to regulate the flow to the nozzle. (Sinha - OEIS)
W77-09801

ROTARY SPRINKLER PARTICULARLY FOR USE WITH LOW-ENERGY WATER JETS,
M. Drori.
U. S. Patent No. 4,002,296, 4 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 954, no 2, p 691, January 11, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation practices, *Irrigation efficiency, Jets, Application equipment, Water delivery(Applied).

A rotary sprinkler particularly for use with low-energy water jets comprises an arrangement where the forward stroke of its oscillating arm is used to rotate the sprinkler head, the oscillating arm being returned to its normal position during the return stroke without applying sufficient force against the sprinkler head to rotate it. (Sinha - OEIS)
W77-09802

UNDERGROUND IRRIGATION POROUS PIPE,
Ballas (George C.), Houston, Tex. (Assignee).
J. E. Turner.
U.S. Patent No. 4,003,408, 7 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 954, no 3, p1064, January 18, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation effects, *Subsurface irrigation, Soil-water-plant relationship, Irrigation efficiency, *Pipes.
Identifiers: *Porous pipes.

Underground irrigation falls under the general category of drip irrigation used in the daily maintenance of an adequate section of the root zones of plants with moisture somewhere between dampness and saturation or field capacity throughout the growing season. This system enables the attainment of an optimized soil-water-plant relationship that is conductive to much better growth and substantially better yields, with less water applied. Evaporation is substantially eliminated, pipes are out of the way and water, along with fertilizer is applied where it does the most good. Water seeps from the underground pipe, and by capillary action and absorption spreads through the root system, maintaining a constant moisture level throughout the area of treatment. This invention relates to an irrigation porous pipe processed primarily of reclaimed material from rubber tires, ground to small granular size, mixed with a binder, mainly of polyethylene, with walling sized to withstand soil loading in an underground irrigation environment. The pipe is formed in the process through the extruder. Labyrinth passageways between rubber tire granular material and polyethylene binder mix, and through the binder mix, are also formed with the steam and gas foaming, or blowing, as the pipe is extrusion process formed. (Sinha-OEIS)
W77-09810

TRAVELING IRRIGATION SPRINKLER,
AG-Rain Inc., Havana, Ill. (Assignee).
F. V. Kruse, and D. O. Behrends.
U.S. Patent No. 4,003,519, 10 p, 9 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 954, no 3, p 1099, January 18, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Water delivery(Applied).
Identifiers: *Traveling sprinkler.

A traveling irrigation sprinkler has a water-powered radial inflow turbine for driving a winch that pulls the sprinkler along a path of travel. Water is supplied to a sprinkler gun either directly from an inlet conduit, or indirectly by passing it through the turbine. A diverter valve proportions the direct and indirect flows and provides a means of controlling the travel speed of the sprinkler. A transmission interconnects the turbine and the winch and provides a means of controlling travel speed. The turbine includes a vaned runner and a scroll which surrounds the runner to deliver water at a uniform velocity to the periphery of the runner. (Sinha-OEIS)
W77-09811

REMOTE CONTROL FOR LARGE-AREA SPRINKLER SYSTEMS,
F. Hummel, Jr.,, and E. B. King.
U.S. Patent No. 4,004,612, 10 p, 11 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 954, no 4, p 1525, January 25, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Sprinkler irrigation, *Remote control, Irrigation efficiency, Electrical design, Electrical equipment.

A remote control for a large-area sprinkler system operates the sprinklers in a sequential manner according to a specified program. The sprinklers are hydraulically operated and are controlled by a four-way latch valve whose piston, or core, will shift to either a sprinkler-open state or a sprinkler-closed state, the shifting being by energizing opposing solenoids. The electrical system to power the solenoids is a low voltage - low amperage control circuit permitting the use of small diameter wires to be extended from a central power supply

source to each sprinkler. A capacitor in the circuit adjacent to latch valves builds up a charge sufficient for one of the solenoids to be energized to shift the latch valve to either open or close the sprinkler. Each solenoids is connected in the circuit by a connective lead which includes an electronic gate such as an NPN transistor which will normally prevent a flow of current through the lead but which may receive a signal voltage, as at the base of the transistor to permit current to flow, as from the capacitor to the solenoid. A coded signal will permit any one of a large number to sprinklers to be selectively operated, and a computer can be used and programmed to control any selected operative sequence. (Sinha-OEIS)
W77-09814

CROP TEMPERATURE MODIFICATION AND YIELD POTENTIAL IN A DWARF SPRING WHEAT,
International Maize and Wheat Improvement Centre, Londres (Mexico).
R. A. Fischer, and O. R. Maurer.
Crop Science, Vol 16, p 855-859, November-December 1976. 1 fig, 4 tab, 14 ref.

Descriptors: *Crop response, *Temperature control, *Plant growth, *Planting management, *Wheat, Crop production, Soil-water-plant relationships, Air temperature, On-site investigations, Dry farming, Irrigation effects, Growth chambers, Plant morphology, Mexico.

The effects of crop temperature modification were studied using a high yielding dwarf spring wheat (Triticum aestivum L. em Thell 'Yecora 70') grown under conditions of high fertility and irrigation in northwest Mexico during winter cropping cycles of 1972-73 and 1973-74. The influence of temperature was studied with respect to crop development, dry matter production and grain yield and its components. Portions of the crop were enclosed in transparent chambers ventilated with hot or cool air; chamber air temperatures averaged 1-2C below or 2-7C above outside temperatures. The irrigation interval was reduced by about 25% in these experiments to avoid significant soil water differences due to temperature modification. Crop development was retarded slightly by cooling and increased considerably by heating. Grain yield and total dry weight at maturity were reduced by higher temperatures at every stage after the first; effects on yield were greatest in the second and third periods (end of tillering to start of grain filling). Grains/spikelet was the component most affected by temperature (reduced by heating, increased by cooling), although effects were only in period 2. Heating in the fourth or grain-filling period sometimes reduced kernel weight. Under dryland conditions, high wheat grain number may not lead to high grain yield, and post-anthesis temperature, which is inevitably linked to humidity, evaporation and plant water status, may be more important. (Jahns-Arizona)
W77-09939

EVALUATION OF AN EVAPOTRANSPIRATION MODEL FOR CORN,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W77-09941

EFFECT OF INCREASING FOLIAGE REFLECTANCE ON THE CO2 UPTAKE AND TRANSPIRATION RESISTANCE OF A GRAIN SORGHUM CROP,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Div. of Agricultural Meteorology.
For primary bibliographic entry see Field 2D.
W77-09942

RELEASE OF CADMIUM FROM CLAYS AND PLANT UPTAKE OF CADMIUM FROM SOIL AS AFFECTED BY POTASSIUM AND CALCIUM AMENDMENTS,
Ohio Agricultural Research and Development Center, Wooster.
For primary bibliographic entry see Field 2G.
W77-09962

SIMULATION OF PLANT GROWTH BY HUMIC SUBSTANCES,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2I.
W77-09963

NITROGEN, PHOSPHORUS, AND POTASSIUM UTILIZATION IN THE PLANT-SOIL SYSTEM: AN ANALYTICAL MODEL,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2I.
W77-09964

INFLUENCE OF LONG TERM TILLAGE, CROP ROTATION, AND SOIL TYPE COMBINATIONS ON CORN YIELD,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy and Agricultural Engineering.
D. M. Van Doren, Jr., G. B. Triplett, Jr., and J. E. Henry.
Soil Science Society of America Journal, Vol 40, No 1, p 100-105, January-February 1976. 5 tab, 12 ref.

Descriptors: *Till, *Crop production, Crop response, Corn(Field), Crops, Soybeans, Ohio, Soils, *Cultivation, *Rotations.
Identifiers: *Tillage practices, Crop rotation, Corn yield.

Studies to compare the relative ability of a wide range of tillage and crop rotation combinations (3 miltiplied by 3 factorial) to sustain corn production on several soils typical of Ohio were initiated in 1962. Soils were a well-drained Wooster silt loam, an imperfectly drained Crosby silt loam, a very poorly drained Hoytville silty clay loam; and a very poorly drained Toledo clay. Tillage treatments were no-tillage; plow and then plant; and plow, disk, and plant. Rotations were continuous corn, corn-soybeans, and corn-oats with each crop appearing each year in each rotation. Results are reported only for plots having equal plant density within a site-year combination, and adequate weed control. Corn yields were remarkably insensitive to tillage. The two plowed treatments had equal yield for virtually all years at each site within the same rotation. (Skogerboe-Colorado State)
W77-09969

UPTAKE OF CADMIUM BY SOYBEANS AS INFLUENCED BY SOIL CATION EXCHANGE CAPACITY, PH AND AVAILABLE PHOSPHORUS,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 2G.
W77-09977

SCIENTIFIC BASES OF A SYSTEM FOR AVERTING UNFAVORABLE CONSEQUENCES OF STEPPE SOIL IRRIGATION, (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 2G.
W77-10021

IRRIGATION REQUIREMENTS OF MATURE PEACH TREES UNDER MICROJETS (BESPROEIINGSBEHOEFTES VAN VOLWASSE PERSKEBOME ONDER MIKROSPUITE),
Soils and Irrigation Research Inst., Pretoria (South Africa).
J. Piaget, J. Pienaar, and J. Van Zyl.
The Deciduous Fruit Grower, Vol 26, No 4, p 144-146, 1976. Illus, 1 tab.

Descriptors: *Irrigation efficiency, Deciduous trees, Nutrient requirements, Fertilizers, Tensiometers, *Peaches, Fruit crops, Jets, Africa.
Identifiers: South Africa, Stellenbosch.

An experiment in controlled irrigation was carried out during the 1975/76 season in a block of four hectares of 12-year-old Dr Black clingstone peaches, planted 6,1x6,1 metres, on a soil of the Hutton farm situated on the upper slopes of the Devon Valley near Stellenbosch. The crop of 25 tons per hectare of good quality peaches obtained from the orchard was produced with an application of 245 mm/ha. Each tree was irrigated with 9 142 litres of water. It is recommended that 20 irrigations, each of 9 hours duration, should be assured in order to calculate the minimum yearly irrigations requirement of this orchard. Such an irrigation program would then need 306 mm/ha. This figure represents approximately 65% of the quantity of water at present estimated to be necessary for irrigation with conventional sprinkler systems. (So African Water Info Center)
W77-10079

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE TUGELA-VAAL STATE WATER SCHEME AS A BILHARZIA RISK (DIE TUGELA-VAAL-STAATSWATERSKEMA AS 'N BILHARZIARISIKO),
South African Medical Research Council, Potchefstroom.
For primary bibliographic entry see Field 5G.
W77-09690

A LABORATORY MODEL TO INVESTIGATE THE SOIL MOISTURE CONDITIONS ON A DRAINING SLOPE,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2G.
W77-09712

DESIGN AND OPERATION OF RAIN SPILLWAYS AND RAIN OVERFLOW CATCHMENT (ENTWURF AND BETRIEB VON REGENUBERLAUFEN (RU) UND REGENUBERLAUFBECKEN (RUB),
For primary bibliographic entry see Field 8B.
W77-09822

CHICAGO PLAN DESIGNED FOR POLLUTION AND FLOOD CONTROL.
Water and Sewage Works, Vol. 124, No. 5, p 50-51, May, 1977.

Descriptors: *Tunnels, *Reservoirs, *Pollution abatement, *Flood control, Storm water, Water purification, Storage, Urban runoff, Conveyance structures, Tunneling, Costs, Illinois.
Identifiers: Chicago(IL).

Construction has begun on a Chicago, Illinois, tunnel and reservoir plan for pollution and flood control. Phase one comprises storm water and sewage conveyance, storage, and purification. Ninety-one miles of 9 to 35-foot diameter tunnels at 150 to 300 feet below ground will be drilled through dolomitic rock. Phase two will provide flood control. It will involve 21.2 miles of 30 and 35-foot diameter tunnels, and storage reservoirs with a volume of 127,000 acre-feet of runoff water from a tributary area of 363.8 square miles. Total costs for the project were estimated as $1,912.4 million. The present interceptors are subject to runoff volumes 15 to 30 times that of design capacities. The

planned expansions will allow storage in the tunnel system and three open-pit quarries. Combined sanitary/storm water flows would be pumped from storage and treated at the present facilities during dry weather to prevent flooding of low-lying areas and the discharge of untreated sewage into waterways. Drop shafts will interrupt sewer flow for diversion into the tunnels. Portions of the system which have been completed were described. (Collins-FIRL)
W77-09838

OPTIMAL OPERATION OF FLOOD CONTROL SYSTEMS, (FINAL REPORT; V.II),
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering.
C.-J. Feng, and T. L. Morin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 454, Price codes: A10 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 122, March 1977. 194 p, 40 fig, 28 tab, 91 ref. OWRT A-079-Ill(2).

Descriptors: *Flood control, *Dynamic programming, *Reservoir operation, *Stochastic processes, Methodology, *Multiple-purpose reservoirs, Management, Model studies, *Illinois, Markov processes, Flood damage, Flood peak, Optimization.
Identifiers: *Optimal operation(Reservoirs).

The management and control of multiple-reservoir flood control systems is studied. The objective is to devise operating policies which minimize flood damages as determined by the flood peaks. Methodologies are presented that employ dynamic programming and stochastic dynamic programming for the optimal operation of multiple-reservoir flood control systems with deterministic and stochastic inflows, respectively. The methodologies are applied to a number of real-world problems involving river basins in Illinois and elsewhere. The effects of parametrically varying a number of the input parameters were studied. A Markov renewal flood synthesis model and a methodology for determining the optimal capacity of a new flood control reservoir are also presented. (See also W77-10263)
W77-09927

THE SHORE AND THE WATER-THE LOCALIZATION OF DAMAGE AND THE REGULATION OF FISH MANAGEMENT IN CONTROLLED LAKES, (IN SWEDISH),
T. Lindstrom.
Fauna Flora (Stockh) 70(2), p 56-59, 1975.

Descriptors: *Fish management, Lakes, Regulation, Lake shores, Plankton, Water level fluctuations, Fish diets, Energy budget, Aquatic life, Productivity.

In lakes used as reservoirs there is often much damage to plankton and other plant and animal life due to fluctuations in water level. Productivity of such lakes may be increased by the addition of plant material but it will probably be cheaper to use artificial fish food. There is a serious lake of data on the whole energy budget in these lakes.--Copyright 1976, Biological Abstracts, Inc.
W77-09935

WATER SUPPLY FROM SHELBYVILLE AND CARLYLE LAKES AND THEIR OPTIMAL JOINT OPERATION,
Illinois State Water Survey, Urbana. Hydrology Section.
K. P. Singh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 444, Price codes: A05 in paper copy, A01 in microfiche. ISWS Report of Investigation 84, 1977. 76 p, 18 fig, 39 tab, 21 ref.

Descriptors: *Multiple-purpose projects, *Reservoir operation, *Illinois, *Computer models, *Operations research, Lakes, Model studies, Computer programs, Reservoirs, Water supply, Data processing, Flood control, Navigation, Water policy, Evaporation, Precipitation(Atmospheric), Systems analysis, Hydrologic systems, Simulation analysis, Statistical methods, Synthetic hydrology, Streamflow, Optimization, Recreation.
Identifiers: *Carlyle Lake(Ill), *Shelbyville Lake(Ill).

The U. S. Army Corps of Engineers, St. Louis District, has been regulating Lake Shelbyville and Carlyle Lake on the Kaskaskia River in Illinois for recreation and flood control since completion of the dams in 1969 and 1967, respectively. The navigation channel below Fayetteville to the Mississippi River has been completed. The demand for water supply by the industries and towns in the Kaskaskia River basin below Shelbyville and Carlyle has been increasing during the last 2 years. These lakes will soon have to be regulated for the multiple purposes for which they were built, that is, recreation, flood control, water supply, and navigation. The state of Illinois has a reserve storage capacity of 25,000 ac-ft in Shelbyville and 33,000 ac-ft in Carlyle for meeting future water supply requirements. Analyses of the weekly flows, precipitation on and evaporation from the lakes, and navigation flow requirements for the 24-year (1942-1965) historical period and a 499-year period of synthetic data indicated that under the terms of the agreement between federal and state governments, 100 cubic feet per second (cfs) or 65 million gallons per day (mgd) water supply withdrawal can be made from the system with an average deficit frequency of 1 in 50 years. Optimal operating policies for the joint regulation of Shelbyville and Carlyle lakes for various levels of navigation and water supply requirements have been derived from more than 10,000 system simulation runs made with historical and synthetic data. The optimal operation rules indicate a rise in rule levels with increase in navigation and water supply requirements. The joint regulation can be updated with development of navigation and water supply to obtain the maximum benefits. When state and federal storages are considered separate and distinct, and the total storage is regulated in the best interest of all purposes as done in deriving the optimal operating rules, the minimum lake levels reached are higher than the dead storage pool elevations even with 200 cfs (130 mgd) water supply withdrawal and full navigation. (Humphreys-ISWS)
W77-09943

LAKE DARDANELLE, ARKANSAS RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-09988

WATER-RESOURCES APPRAISAL OF THE CARSON RIVER BASIN, WESTERN NEVADA,
Geological Survey, Carson City, Nev. Water Resources Div.
P. A. Glancy, and T. L. Katzer.
Nevada Division of Water Resources, Carson City, Water Resources--Reconnaissance Series Report 59, 1976. 126 p, 6 fig, 1 plate, 40 tab, 90 ref.

Descriptors: *Water resources, *Water supply, *Water utilization, *Water demand, *Water quality, Nevada, Urbanization, Water pollution sources, Sewage disposal, Available water, Surface waters, Groundwater, Aquifer characteristics, Hydrogeology, Hydrologic data, Evaluation.
Identifiers: *Carson River basin(Western Nev).

Water-resource development in Nevada has increased substantially in recent years. Current increases relate strongly to urban and suburban population growth. The growing interest in ground-water development has created a substantial demand for information on ground-water resources throughout the State. The study area lies at the western edge of the Great Basin, and encompasses six major hydrographic areas and one hydrographic subarea, but excludes most of the Carson River drainage in California. Five of the hydrographic areas are part of the Carson River drainage basin; the sixth, White Plains, is the terminus of the Humboldt River basin and connects that drainage to Carson Desert. Packard Valley is tributary to Carson Desert, but not directly to Carson River. In addition to the established hydrologic-investigation programs this study evaluates (1) present trends of water use, compared to traditional historical uses, (2) inter- and intra-basin sewage disposal problems, (3) problems related to water quality, (4) geohydrologic hazards. (Woodard-USGS)
W77-09992

COMPUTATION OF UNSTEADY FLOWS IN RIVERS AND ESTUARIES BY THE METHOD OF CHARACTERISTICS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-09993

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1976 WATER YEAR,
Geological Survey, Little Rock, Ark. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09997

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1975--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, Ohio. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10000

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1975--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey Columbus, Ohio. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10001

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1975.
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10002

COMPUTATION OF RECORDS OF STREAMFLOW AT CONTROL STRUCTURES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-10003

APPLICATION OF THE U.S. GEOLOGICAL SURVEY RAINFALL RUNOFF SIMULATION MODEL TO IMPROVE FLOOD-FREQUENCY ESTIMATES ON SMALL TENNESSEE STREAMS,
Geological Survey, Nashville, Tenn. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-10004

THE GREAT DISMAL SWAMP: MANAGEMENT OF A HYDROLOGIC RESOURCE WITH THE AID OF REMOTE SENSING,
Geological Survey, Reston, Va. Water Resources Div.; and Great Dismal Swamp National Wildlife Refuge, Suffolk, Va.; and National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2H.
W77-10007

VARIATION OF WIDTH AND DISCHARGE FOR NATURAL HIGH-GRADIENT STREAM CHANNELS,
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-10009

WATER RESOURCES OF THE UMATILLA INDIAN RESERVATION, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
J. B. Gonthier, and D. D. Harris.
Water-Resources Investigations 77-3, 1977. 112 p, 23 fig, 1 plate, 14 tab, 36 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Indian reservations, *Oregon, Streamflow, Flow rates, Aquifer characteristics, Water wells, Water yield, Water analysis, Chemical analysis, Hydrologic data, Irrigation, Water supply.
Identifiers: *Umatilla Indian Reservation(Ore), Umatilla River basin, Umatilla County.

Water resources of the Umatilla Indian Reservation are poorly distributed in space and time. Only the Umatilla River and one of its principal tributaries, Meachum Creek, have significant perennial flows. Surface-water outflow from the reservation averages about 600 cubic feet per second, the total stream inflow is about 540 cubic feet per second. Runoff of the principal streams is largely from snowmelt in the Blue Mountains and is highly variable. The principal aquifers are the Columbia River Basalt Group and Quaternary alluvium. The basalt underlies the entire reservation to a depth of a few thousand feet and most wells tap this source. Yields of wells in the basalt range from less than 1 to more than 1,200 gallons per minute. Quaternary alluvium averages about 12 feet thick in the Umatilla River valley, where it has the greatest extent. It is generally thinner and of smaller extent in other valleys. Surface water is soft and generally contains less than 120 mg/liter of dissolved solids. Ground water is generally moderately hard or hard, and dissolved solids range between 200 and about 250 mg/liter. The water is suitable for most uses. (Woodard-USGS)
W77-10011

1976 WATER-QUALITY DATA IN BEAR CREEK BASIN, MEDFORD, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-10015

NORTH FORK LAKE SPILLWAY SAN GABRIEL RIVER, TEXAS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10017

OLD RIVER EXISTING LOW-SILL CONTROL STRUCTURE, LOUISIANA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10018

CONVEX CHUTES IN CONVERGING SUPERCRITICAL FLOW,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10020

DIVIDE CUT DRAINAGE STRUCTURES TENNESSEE-TOMBIGBEE WATERWAY MISSISSIPPI AND ALABAMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10046

ENTRANCE TO UPSTREAM APPROACH CANAL, GAINESVILLE LOCK, TOMBIGBEE RIVER, MISSISSIPPI AND ALABAMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10047

BUTOXYETHANOL ESTER OF 2,4-D FOR CONTROL OF EURASIAN WATER MILFOIL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. O. Gangstad, F. Fish, R. A. Stanley, T. Duke, and C. A. Rodgers.
Available from the National Technical Information Service as AD-A024 105, Price codes: A07 in paper copy, A01 in microfiche. Aquatic Plant Control Program, Technical Report 12, March 1976. 139 p, 18 fig, 25 tab, 42 ref.

Descriptors: *Aquatic weed control, *Herbicides, *2,4-D, North Carolina, *Tennessee Valley Authority, Environmental effects, *Plant growth, *Pesticide residues, Biota, Application methods, Solubility, Tennessee, Fish, *Rooted aquatic plants.
Identifiers: *Myriophyllum spicatum water milfoil, 2-4D registration.

A report is made on activities which constitute the third phase of a program for herbicidal control of Myriophyllum spicatum L., the growth of which has become serious in Tennessee Valley Authority reservoirs and in other locations. The first two phases of the program included defining a suitable herbicide--2,4-D--and a method of application, along with the development of toxicological and residue data. The present phase consists of developing a suitable level and a program of application. The report includes: (1) a summary of the Army Corps of Engineers Aquatic Plant Control Research Program; (2) a description of the proposed registration label, areas of intended use and nomenclature of physical and chemical properties of the herbicide; (3) an environmental impact statement for control of the Eurasian Water Milfoil in certain North Carolina waters; (4) an overview of the plant in the Tennessee Valley; (5) a description of the effects of 2,4-D on estuarine organisms; (6) a discussion of 2,4-D butoxyethanol ester uptake distribution and elimination in organs of rainbow trout, channel catfish and bluegills; (7) changes in the structure and metabolism in a Eurasian Water Milfoil community following 2,4-D treatment. (Harris-Wisconsin)
W77-10057

DESTRUCTION OF VEGETATION ON DAMS OF THE GORKY HYDROELECTRIC POWER PLANT WITH HERBICIDES,
A. A. Anisimov, T. A. Bulatova, and V. A. Valutina.
ORNL Technical Translation 2931. 5 p. Translated from Uchenye Zapiski Gor'kovskogo Gosudarstvennogo Universiteta, No. 98, p 110-114, 1970. 4 ref. (In Russian).

Descriptors: *Fouling, *Herbicides, *Aquatic weed control, Aquatic weeds, Vegetation effects, Soil filters, Foreign research.
Identifiers: *Gorky Hydroelectric Powerplant(USSR), Filter clogging.

Results are described of tests made with various dilutions of a number of herbicides, selected to evaluate their applicability to eradicate grassy and shrubby plant growth on the gravel filters of the earth dam of the hydroelectric station at Gorky, USSR. Because of the 7 km length of the dam, manual rinsing of the filters was judged impractical and attempts to destroy the growth by burning did not give good results. The testing was carried out in stages from 1966-68. During the first year, the action of four herbicide applications was tested: (1) 6% suspension of simazin; (2) 18% suspension of simazin; 10% suspension of diuron; (3) 8% dalapone mixed with 0.6% butyl ester of 2,4-D. In 1967, various strengths of simazine and diurno were again tested, along with atrazine and sodium trichloroacetate with borax. Finally, in 1968, simazine was tested again in comparison with 'radocore', a chloroaminotriazine base herbicide. Based on recommendations of the study, the manager of the Gorky electric power station in 1968 treated the slopes of the dam for 4 km with 3% radocore, using a GAN-15 sprayer, for a 3-week period. The gravel covering of the filters remained free of plants until the end of the vegetation period. (Harris-Wisconsin)
W77-10059

PROPOSED PIPELINE SYSTEM WILL LINK WATER SCHEMES DWA'S R24 MILLION BALANCING ACT.
For primary bibliographic entry see Field 8B.
W77-10069

STABILIZATION OF SAND DUNES IN THE WEST SAHARA,
Department of Forestry, Pretoria (South Africa).
G. Alvarez de Benito, and P. J. le Roux.
South African FOrestry Journal, No 97, p 36-43, June, 1976. 11 ills, 6 tab.

Descriptors: Desert plants, Dunes, *Dune sands, *Stabilization, Africa, Arid climates, Deserts.
Identifiers: Spanish Sahara, Launea arborescens, Zygophyllum waterlotti, *Sahara desert.

The methods employed in stabilizing dune sand in the Spanish Sahara, to protect a conveyor belt, are described, as well as the supply, storage and use of the fuel oil and the erection of fences used in stabilizing the sand. Mention is made of the indigenous plants occurring in this area and of those plants which established themselves naturally on the oil-sprayed dunes. A brief description is given of the climatic conditions prevailing in the area and how plants probably survive in such an area with an annual rainfall of 43 mm. (So African Water Info Ctr)
W77-10074

SMALL CATCHMENT FLOOD MODELLING,
South African Dept. of Water Affairs, Pretoria. Div. of Hydrology.
For primary bibliographic entry see Field 2E.
W77-10083

4B. Groundwater Management

AN ELECTRIC ANALOG AND DIGITAL COMPUTER MODEL OF THE CHIPUXET GROUND WATER AQUIFER, KINGSTON, RHODE ISLAND,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W77-09637

THE FATE OF POLLUTANTS IN SUBSURFACE ENVIRONMENTS,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5B.
W77-09915

CARBON ISOTOPIC STUDY OF THE FATE OF LANDFILL LEACHATE IN GROUNDWATER,
Indiana Univ., Bloomington. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-09917

GROUNDWATER POLLUTION HAZARD NEAR SANITARY LANDFILLS ON THE GLACIATED PLAINS, NORTH DAKOTA - A STUDY OF THE LANGDON, NORTH DAKOTA SANITARY LANDFILL,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 5B.
W77-09925

GEOCHEMICAL CONTROLS ON TRACE ELEMENT CONCENTRATIONS IN NATURAL WATERS OF A PROPOSED COAL ASH LANDFILL SITE,
Kansas State Univ., Manhattan. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-09928

STATISTICAL ANALYSIS OF THE IMPACT OF GROUND WATER PUMPAGE ON LOW-FLOW HYDROLOGY,
Wisconsin Univ., Oshkosh. Dept. of Geology.
C. W. Fetter, Jr.
Water Resources Bulletin, Vol. 13, No. 2, p 309-323, April 1977. 7 fig, 1 tab, 8 ref.

Descriptors: *Pumping, *Groundwater, *Interbasin transfers, *Low flow, *Diversion, *Wisconsin, Hydrology, Water table, Withdrawal, Forecasting, Regression analysis.
Identifiers: *Yahara River(Wisc), Low-flow hydrology.

Heavy groundwater pumpage in the Yahara River basin has resulted in lowering of the water table. As a means of preserving surface water quality, treated wastewater was diverted from the upper basin in 1958. The two mentioned factors have acted together to produce a depletion in Yahara River streamflow of more than 50% during periods of low flow. Regression analyses showed that the annual 7-day and 60-day low flows have a statistically significant correlation with mean annual flow. Using predictions of future mean annual discharge of the river with increasing interbasin transfers, it was shown that by 1990 there is a significant probability that in some years the 60-day low flow in the river will be zero. The drainage area of the upper basin is 328 sq mi above McFarland, Wisconsin. (Singh-ISWS)
W77-09952

THE COCKFIELD AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09991

WATER-RESOURCES APPRAISAL OF THE CARSON RIVER BASIN, WESTERN NEVADA,
Geological Survey, Carson City, Nev. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-09992

MODELING CHLORIDE MOVEMENT IN THE ALLUVIAL AQUIFER AT THE ROCKY MOUNTAIN ARSENAL, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-09994

GROUND-WATER RESOURCES OF THE LEXINGTON, KENTUCKY, AREA,
Geological Survey, Louisville, Ky. Water Resources Div.
R. J. Faust.
Water-Resources Investigations 76-113 (open-file report), February 1977. 24 p, 6 fig, 3 plates, 5 tab, 18 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, Water utilization, Water pollution sources, Runoff, Bacteria, Limestones, Infiltration, Karst, *Kentucky.
Identifiers: *Lexington area(KY).

Ground water in the Lexington, Kentucky, area occurs in Ordovician Limestones in which cavity development is generally limited to about 100 feet below land surface. Some wells produce about 300 gallons per minute in some of the large stream valleys, about 50 gallons per minute in the rolling upland and small stream valleys, and about 5 gallons per minute on hilltops and steep slopes. Many wells throughout the area do not furnish adequate water for domestic supplies because no significant water-bearing openings are penetrated during drilling. Ground-water use is limited mostly to domestic and stock supplies and a few small public supplies. Ground water is generally a calcium bicarbonate type and in places contains sodium chloride and (or) hydrogen sulfide. Bacterial pollution of ground water is widespread because of direct recharge of polluted runoff and streamflow to cavernous limestones. (Woodard-USGS)
W77-09996

SELECTED WATER-LEVEL RECORDS FOR WESTERN OKLAHOMA, 1975-1976,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09998

GROUND-WATER LEVELS IN OBSERVATION WELLS IN OKLAHOMA, 1975,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09999

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1975--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, Ohio. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10000

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1975--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey Columbus, Ohio. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10001

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1975.
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10002

ANNUAL WATER-RESOURCES REVIEW WHITE SANDS MISSILE RANGE, 1976 - A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
R. R. Cruz.
Open-file report 77-330, April 1977. 27 p, 7 fig, 4 tab, 2 ref.

Descriptors: *Hydrologic data, *Water wells, *Water level fluctuations, *Water quality, *Water supply, Military reservations, Hydrogeology, Observation wells, Test wells, Chemical analysis, Water yield, Pumping, Basic data collections, *New Mexico.
Identifiers: *White Sands Missile Range(N Mex).

Information is presented on the water resources of the White Sands Missile Range, N. Mex., that was collected during the period December 1975 to December 1976 by personnel of the U.S. Geological Survey, Water Resources Division. Data on ground-water pumpage and resulting water-level fluctuation, chemical quality and precipitation, and miscellaneous items of interest are summarized. Water-level observations were made in 63 borehole, supply, test, and observation wells on the Range. Water samples were collected and analyzed for chemical quality from 8 test wells. (Woodard-USGS)
W77-10005

A METHOD OF ESTIMATING PARAMETERS AND ASSESSING RELIABILITY FOR MODELS OF STEADY STATE GROUNDWATER FLOW 1. THEORY AND NUMERICAL PROPERTIES,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-10008

WATER RESOURCES OF THE UMATILLA INDIAN RESERVATION, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-10011

GEOHYDROLOGY OF MUSCATINE ISLAND, MUSCATINE COUNTY, IOWA,
Geological Survey, Iowa City, Iowa. Water Resources Div.
R. E. Hansen, and W. L. Steinhilber.
Iowa Geological Survey, Iowa City Water-Supply Bulletin No 11, Published by State of Iowa, 1977. 60 p, 28 fig, 4 plates, 6 tab, 9 ref.

Descriptors: *Hydrogeology, *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, Flood plains, *Mississippi River basin, *Iowa, Water supply, Water utilization, Water level fluctuations, Groundwater movement, Groundwater recharge.
Identifiers: *Muscatine County(Iowa).

Muscatine Island is a wide segment of the west bank of the Mississippi River flood plain that covers about 50 square miles in Muscatine and Louisa Counties; the project area encompasses the 30 square miles in Muscatine County, Iowa. The aquifer consists principally of sand and gravel, interbedded with lenses of silt and clay. Its saturated thickness ranges from about 40 to 140 feet. The transmissivity and storage coefficients of the aquifer range from bout 20,000 sq ft/day and 0.15, respectively, in the western part of the Island to about 39,500 sq ft/day and 0.24 in the eastern part. The amount of water stored in the aquifer, under normal conditions, is about 100 billion gallons. Discharge from the aquifer is principally by pumpage, which has increased from about 1 mgd in 1906 to about 37 mgd in 1970. About 2.5 mgd is normally lost to seepage and evapotranspiration along a 9-mile reach of Muscatine Slough in Muscatine County. About 0.9 mgd is discharged by evaporation from gravel pits. The chemical constituents of water from the aquifer are generally within the recommended limits established by the U.S. Public Health Service for drinking water. (Woodard-USGS)
W77-10012

FLUCTUATIONS OF GROUND-WATER LEVELS IN LEE COUNTY, FLORIDA, IN 1975 WATER YEAR,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-10014

ELECTRICAL WATER PROSPECTING.
Council for Scientific and Industrial Research, Pretoria (South Africa). Geophysics Div.
For primary bibliographic entry see Field 2F.
W77-10100

4C. Effects On Water Of Man's Non-Water Activities

LOGGING ROADS AND PROTECTION OF WATER QUALITY.
Arnold, Arnold and Associates, Seattle, Wash.; and Dames and Moore, Seattle, Wash.
For primary bibliographic entry see Field 5G.
W77-09725

WATER TRANSPORT OF WOOD (IN CANADA): THE CURRENT SITUATION,
Environmental Protection Service, Regina (Saskatchewan). Water Pollution Control Branch.
For primary bibliographic entry see Field 5C.
W77-09755

EFFECTS OF LOG HANDLING AND STORAGE ON WATER QUALITY,
Corvallis Environmental Research Lab., Oreg.
For primary bibliographic entry see Field 5C.
W77-09760

THE FUNCTIONAL AND AESTHETIC USES OF TWO CACHE VALLEY, UTAH, CANALS,
Utah State Univ., Logan. Dept. of Landscape Architecture and Environmental Planning.
For primary bibliographic entry see Field 6B.
W77-09796

THE EFFECT OF STRIP-CUTTING ON STREAM TEMPERATURES IN THE HUBBARD BROOK EXPERIMENTAL FOREST, NEW HAMPSHIRE,
Cornell Univ., Ithaca, N.Y. Section of Ecology and Systematics.
T. M. Burton, and G. E. Likens.
Bioscience. Vol. 23, No. 7, p 433-435 1973.

Descriptors: *Clear cutting, *Forest management, Streams, Temperature, Aquatic life, Eutrophication, Light, New Hampshire.
Identifiers: Hubbard Brook(New Hampshire), *Strip cutting.

A series of observations were made in 1971 to determine the effect of forest canopy removal on the temperature of a stream passing through the cut strips in a New Hampshire forest. Temperature measurements were made with a glass Hg thermometer. Stream temperatures prior to cutting were fairly constant over the 625 m study section; after cutting, fluctuations of 4-5C were apparent in passing from cut to uncut zones. Cut sections were warmer in the daytime on sunny days and cooler at night than the uncut sections. Possible effects of the altered conditions on aquatic communities (vertebrates, invertebrates) are considered; the only observation was an algal bloom thought to be the result of increased light more than temperature.--Copyright 1974, Biological Abstracts, Inc.
W77-09807

VEGETATION MANIPULATION--A CASE STUDY OF THE PINYON-JUNIPER TYPE,
Utah State Univ., Logan. Coll. of Natural Resources.
G. F. Gifford.
In: Watershed Management on Range and Forest Lands, Proceedings of the Fifth Workshop of the U.S./Australia Rangelands Panel, Boise, Idaho, p 141-148, March 1976. 2 tab, 41 ref.

Descriptors: *Vegetation establishment, *Range management, *Vegetation effects, *Pinyon pine trees, *Juniper trees, *Land clearing, Interception, Infiltration, Runoff, Soil-water-plant relationships, Soil moisture, Sediment discharge, Sediments, Erosion control.
Identifiers: *Vegetation manipulation.

Principles and effects of converting pinyon-juniper woodland to a grass or grass-shrub vegetation are presented. Of the techniques used for clearing trees, chaining is the most common. Grass and browse seed are usually drilled or broadcast-seeded, depending on the debris disposal methods. Observed watershed impacts are outlined for various techniques of tree removal. Studies are reported of interception losses and infiltration on pinyon-juniper rangelands under various site factors, grazing and burning. Infiltration rates are only slightly decreased on chained sites; grazing impact is cumulative, and burning depresses the rates. Vegetation manipulation appears to have little effect on soil moisture patterns or runoff; the greatest runoff will occur on sites chained with debris windrowed. Sediment discharges do not usually increase; minimum sediment yields (equal to those from undisturbed woodland) occur when surface soil disturbance is minimized or where debris is left in place. Increased forage is likely from the pinyon-juniper type. Impacts on wildlife and economic considerations are also discussed. (Jahns-Arizona)
W77-09959

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 17-4, NUMERICAL MODEL FEASIBILITY STUDY,
Army Engineer Waterway Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10048

IMPACT OF ECONOMIC RISKS ON BOX CULVERT DESIGNS--AN APPLICATION TO 22 VIRGINIA SITES,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 8B.
W77-10067

4D. Watershed Protection

RATES OF TRANSPORT OF TOTAL PHOSPHORUS AND TOTAL NITROGEN IN MACKENZIE AND YUKON RIVER WATERSHEDS, N.W.T. AND Y.T., CANADA,
For primary bibliographic entry see Field 5C.
W77-09617

LOGGING ROADS AND PROTECTION OF WATER QUALITY.
Arnold, Arnold and Associates, Seattle, Wash.; and Dames and Moore, Seattle, Wash.
For primary bibliographic entry see Field 5G.
W77-09725

FOREST HARVEST, RESIDUE TREATMENT, REFORESTATION, AND PROTECTION OF WATER QUALITY.
Montgomery (James M.), Inc., Boise, Idaho.
For primary bibliographic entry see Field 5G.
W77-09756

MATTING FOR THE PREVENTION OF HYDRAULIC EROSION,
W. Muhring, and E. Gossling.
U.S. Patent No. 4,002,034, 8 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 954, no 2, p 603, January 11, 1977.

Descriptors: *Patents, *Erosion, *Erosion control, Bank protection, Bank erosion, Beach erosion.
Identifiers: *Fiber matting(Erosion control).

Hydraulic erosion is prevented through the use of matting having a number of layers of felt with different pore spaces or pore volumes and fibers of different thicknesses, and a woven backing of synthetic fiber. The matting is anchored to the ground surface of an embankment adjacent a body of water for preventing erosion due to the action of the water. This invention provides a matting so constructed that it does not become blocked by fine particles, that a stable connection between the matting and the ground is ensured, and that after a certain time stable mechanical and hydraulic conditions of the fiber matting and bank are established. The upper side, which faces towards the water, is provided with a layer in which the resistance to the flow of fluid through it is substantially less in the direction from ground to water than in the opposite direction. The uppermost layer of the matting consists of a flexible sheet having holes which can be closed by means of flaps arranged to cover the holes. The flaps are pressed against the edges of the holes when the water flows from the upper side of the matting toward the ground and are lifted from the holes by a flow in the opposite direction, i.e., from the ground side. The flexible cover sheet can be fabricated in two superposed layers, with the upper one being provided with flaps and the lower one with holes. (Sinha-OEIS)
W77-09798

VEGETATION MANIPULATION--A CASE STUDY OF THE PINYON-JUNIPER TYPE,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 4C.
W77-09959

GRASSING ROADS AND ERODED AREAS IN THE DRAKENSBERG,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Forestry.
H. Haigh.
South African Forestry Journal, No 97, p 63-66, June 1976. 8 fig, 1 ref.

Descriptors: *Soil erosion, Grasses, Fertilizers, *Erosion control, Africa.
Identifiers: *South Africa, *Drakensberg, Cynodon dactylon, Eragrostis curvula, Spartium junceum.

Aspects of erosion control are described. Using fertilizer, good success has been achieved in grassing three types of exposed soil. Bare road surfaces planted to Cynodon dactylon were soon covered with a mat of runners and the strip between the wheel tracks has been colonised by local grasses. Road cuttings and vertical erosion faces were sloped to 45 deg and successfully sown to Eragrostis curvula. Lines of broom (Spartium junceum) were successfully sown in the steep sides of deep gulleys, but mechanical sloping of the sides to a more gentle slope and seeding to Eragrostis is recommended. (So African Water Info Ctr)
W77-10075

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

EVALUATION OF PROCESS DESIGN PARAMETERS FOR PHOSPHORUS REMOVAL FROM DOMESTIC WASTE WATERS BY CHEMICAL CLARIFICATION,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5D.
W77-09602

A METHODOLOGY FOR COMPARATIVE EVALUATION OF WATER QUALITY INDICES,
Worcester Polytechnic Inst., Washington, D. C. Project Center.
W. E. Booth, P. C. Carubia, and F. C. Lutz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 572, Price codes: A08 in paper copy, A01 in microfiche. Report to Council on Environmental Quality, Washington, D. C. 1976. 161 p. 36 fig., 15 tab., 9 ref., 5 append.

Descriptors: *Water quality, *Evaluation, *Methodology, Measurements, Analytical techniques, Physicochemical properties, Pollutants, Assessments, Theoretical analysis, Indicators, Bioindicators, *Pollutant identification.
Identifiers: *Water quality indices.

The relative usefulness of water quality assessment indices is examined by use of a methodology that compares and evaluates their performance characteristics. The method so devised demonstrates the evaluation of two indices by identifying their assumptions and limitations. Evaluation of the National Sanitation Foundation (NSaF) index shows that it is only suitable to assess the overall water quality as characterized by nine physicochemical parameters. It is somewhat insensitive to pollution problems exhibited in only one of the parameter's values. Since the parameters, quality ratings, and weights that are used are fixed, they cannot vary to account for the ultimate use of the index, data availability, new discoveries, or conditions associated with different geographic locations. Applications of the NSaF index are extremely limited when attempting to identify or analyze specific pollution problems as they may affect a water use. Conversely, the Harkins' index is best used when assessing trends in a specific pollution problem area. The index has no set parameter requirements and is therefore very flexible in application since only those parameters of interest to the user need be included in the computations. (Auen-Wisconsin).
W77-09632

A QUANTITATIVE METHOD FOR TOXAPHENE BY GC-CI-MS SPECIFIC ION MONITORING,
Environmental Research Lab., Athens, Ga. Analytical Chemistry Branch.
A. D. Thruston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 931, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/4-76-010, March 1976. 28 p. 10 fig., 9 ref., 1 append. 1BD612.

Descriptors: *Pollutant identification, *Analytical techniques, *Pesticides, *Chlorinated hydrocarbon, *Measurement, Gas chromatography, Mass spectrometry, *Pesticide residues, Monitoring.
Identifiers: *Toxaphene, Chemical ionization.

The Specific Ion Monitoring (SIM) method with gas chromatography-chemical ionization-mass spectrometry (GC-CI-MS) rapidly identifies and quanitifies a chlorinated hydrocarbon pesticide (toxaphene) and distinguishes it from strobane. Interferences from DDTs and Arochlor 1260 are eliminated or minimized. The procedure uses the SIM program and System 150 which compile data for toxaphene analysis, showing the effects of various interfering compounds and backgrounds. A 60-cm GC column condensed the range of toxphene retention times while maintaining the characteristic 'toxaphene' pattern. The analysis takes 9 minutes. The entire run is normalized to the strongest spectral signal of two masses. The CI-MS of toxaphene is characterized by the major ion fragments, which reflect the substitution patterns of the taxaphene chlorine isomers. Both the m/e 307 and m/e 343 curves five similar intensities and either can be used for quantification, but the m/e width the least background interference should be used. The sensitivity of the mass spectrometer increased fourfold after cleaning. Application of this procedure in the New Orleans Drinking Water Survey is illustrated. (Auen-Wisconsin).
W77-09633

CLASSIFYING AND MONITORING WATER QUALITY BY USE OF SATELLITE IMAGERY,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
J. P. Scherz, D. R. Crane, and R. H. Rogers.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-23663, Price codes: A03 in paper copy, A01 in microfiche. Bendix Aerospace Systems Div. Report BSR 4197, September 1975. 26 p. 12 fig, 5 ref. NGL 50-002-127, NAS 5 20942.

Descriptors: *Trophic level, Reflectance, *Remote sensing, *Lake, *Satellites, *Water quality, Spectroscopy, *Monitoring, Wisconsin, Methodology, Turbidity, Color, Algae, Plant pigments, Analytical techniques, Pollutant identification.
Identifiers: LANDSAT.

The technique developed by Bendix Aerospace Systems Division for application to LANDSAT signals to define lake water quality is described. By use of distilled water samples in the laboratory and very clear lakes in the field, atmospheric and surface noise effects can be removed, allowing the residual signal to indicate only the material in the water. When this material is living algae or weeds, its concentration is related to the trophic level of the lake. The Bendix Multispectral Data Analysis System provided a color categorized image of several hundred Wisconsin lakes. These lakes were categorized for tannin or non-tannin waters, and for the degrees of algae, silt, weeds, and bottom effects. The optimum time to categorize lakes was found to be late August, when the algae and weed biomass is at a maximum. (Auen-Wisconsin).
W77-09634

CONTINUOUS ON-LINE MONITORING OF TOTAL ORGANIC CARBON,
Air Force Civil Engineering Center, Tyndall AFB, Fla.
B. D. Bennett.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 175, Price codes: A02 in paper copy, A01 in microfiche. Report No. AFCEC-TR-75-16, August 1975. 23 p, 7 fig, 8 ref.

Descriptors: *Waste water treatment, *Monitoring, *Organic matter, *Carbon, *Oxygen demand, Equipment, Technology, Analytical techniques, Sewage treatment, *Florida, *Pollutant identification.
Identifiers: *Total organic carbon analyzer, Tyndall AFB(Fla).

Field evaluation of the Ionics, Inc., Model 1218 Total Organic Carbon Analyzer at a military post sewage treatment plant as an on-line monitoring of total organic carbon (TOC) in the wastewater stream in lieu of the usual BOD or COD analysis demonstrated the analyzer's ability to measure TOC in domestic wastewater at 5-minute intervals. However, a significant degree of servicing was required to maintain the filtration system thus restricting its continuous operation. The filter was incapable of handling the level of suspended solids in the sample, resulting in filter clogging and loss of sample flow to the analyzer. Continuous on-line operation required frequent maintenance of compressed nitrogen, hydrochloric acid wash, and recording paper. Also periodic catalyst regeneration, infrared analyzer alignment, and valve block resurfacing require expertise and equipment not normally available at sewage treatment facilities. The frequent analysis of TOC is probably excessive for monitoring domestic wastewater, as an analysis at 30-60 minute intervals would suffice and reduce operational costs and maintenance requirements. The list price of the Ionics analyzer is $12,250; the costs of related laboratory analysis varies widely. Its use at military base was not recommended. (Auen-Wisconsin)
W77-09635

WATER SYSTEM VIRUS DETECTION,
Organon Diagnostics, El Monte, Calif.
A. S. Fraser, A. F. Wells, and H. J. Tenoso.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-19782, Price codes: A08 in paper copy, A01 in microfiche. Report No. NASA-CR-147491, November 1975. 167 p, 40 fig, 36 tab, 7 ref. Prepared for NASA Lyndon B. Johnson Space Center, Houston, Texas. NAS 9-14102.

Descriptors: *Water purification, *Monitoring, *Viruses, Equipment, Automatic control, *Bioindicators, Viricides, Bacteriophage, Reclaimed water, Analytical techniques, Waste water treatment, *Pollutant identification.
Identifiers: *Space capsules(Virus detection), Space flights, Interplanetary travel.

A viral contamination detection system monitors waste water reclamation during long space flights by testing the capability of the reclamation system to reject the passage of viruses into the recovered water. A non-pathogenic marker virus, bacteriophage F2, is fed into the process stream before the recovery unit and the reclaimed water is assayed for its presence. The marker virus provides for a 'worst-case' condition and thus supplies and equal, if not greater, challenge to the water purification process than any naturally occurring human pathogenic viruses. Detection of the marker virus in downstream reclaimed water consists of two major components--concentration and isolation of the bacteriophage, and detection of the marker virus. The concentration system involves adsorption of the virus to cellulose acetate filters in the presence of trivalent cations and low pH with subsequent virus desorption using small volumes of high pH buffer. Detection of the virus is performed by a passive immune agglutination test utilizing specially prepared polystyrene particles. Engineering schematics and drawings present a preliminary instrument design of a functional prototype capable of zero-gravity operation. The instrument consists of a reagent pump/metering system, reagent storage containers, a filter concentrator, an incubation/detector system, and an electronic readout and control system. (Auen-Wisconsin)
W77-09636

MICROBIAL FORMATION OF VOLATILE SELENIUM COMPOUNDS IN SOIL,
Cornell Univ. Agricultural Experiment Station, Ithaca, N. Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09648

EFFECT OF ORGANIC EXCRETION BY BENTHIC ANNELIDA ON THE PRODUCTIVITY OF PHYTOPLANKTON,
Institut Oceanographique, Paris (France). Laboratoire de Physiologie des Etres Marins.
For primary bibliographic entry see Field 5C.
W77-09660

RENAL EXCRETION IN CHANNEL CATFISH FOLLOWING INJECTION OF QUINALDINE SULPHATE OR 3-TRI-FLUOROMETHYL-4-NITROPHENOL,
Fish and Wildlife Service, La Crosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 5C.
W77-09662

THE EFFECT OF TRICAIN METHANESULPHONATE (MS-222) ON THE MICROHAEMATOCRIT OF FISH BLOOD,
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-09665

THE EFFECT OF PARASITISM ON THE TOXICITY OF CADMIUM TO THE THREE-SPINED STICKLEBACK, GASTEROSTEUS ACULEATUS L.,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5C.
W77-09666

TOXICITY OF HYDROGEN SULFIDE TO VARIOUS LIFE HISTORY STAGES OF BLUEGILL (LEPOMIS MACROCHIRUS),
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-09668

THE TOXICITY OF MALATHION AND ITS HYDROLYSIS PRODUCTS TO THE EASTERN MUDMINNOW, UMBRA PYGMAEA (DEKAY),
Rutgers - The State Univ., New Brunswick, N. J.
For primary bibliographic entry see Field 5C.
W77-09670

TOXIC ACTION OF SEVERAL LETHAL CONCENTRATIONS OF AN ANIONIC DETERGENT ON THE GILLS OF THE BROWN TROUT (SALMO TRUTTA L.),
Aston Univ., Birmingham (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-09672

THE EFFECT OF MIREX ON THE BURROWING ACTIVITY OF THE LUGWORM (ARENICOLA CRISTATA),
Environmental Research Lab., Gulf Breeze, Fla.
For primary bibliographic entry see Field 5C.
W77-09675

ORGANCHLORINE PESTICIDES AND PCBS DISTRIBUTION IN TISSUES OF PURPLE HERON AND SPOON DUCK FROM THE BIOLOGICAL RESERVE OF DONANA (SPAIN),
Consejo Superior de Investigaciones Cientificas, Madrid (Spain). Instituto de Quimica Organica General.
G. Baluja, M. A. Murado, and L. M. Herrandez.
Bulletin of Environmental Contamination and Toxicology, vol. 17, no. 5, p 603-612, 1977. 3 tab., 1 fig., 15 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Aroclor, Bird eggs, Birds, Water pollution effects, Path of pollutants, Laboratory tests, On-site-investigation, *DDE, *DDT, *Dieldrin, Animal pathology, Animal disease, Animal populations, Marshes, *Ducks(Wild), *Pesticide residues, *Pollutant identification.
Identifiers: *Purple heron, *Spoon duck, *Spain, Ardea, Anas, *Organochlorine pesticides, Eggs.

From each specimen of purple heron and spoon duck, samples of muscle, liver, kidney, brain and gonad were obtained for individual analysis. DDT content was higher than the other pesticide residues found. DDE accumulation was particularly high in gonads and in eggs. A rapid build-up of residues in the heron species was observed in the course of 27 months. (Katz)
W77-09677

CONTINUOUS-FLOW APPARATUS FOR USE IN PETROLEUM BIOASSAY,
Battelle Pacific Northwest Labs., Sequim, Wash. Marine Research Labs.
J. R. Vanderhorst, C. I. Gibson, L. J. Moore, and P. Wilkinson.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 5, p 577-584, 1977. 2 tab, 5 fig, 19 ref.

Descriptors: *Bioassay, *Methodology, *Laboratory tests, *Laboratory equipment, Laboratories, Aquaria, Oil, *Oil pollution, Sea water, Water pollution effects, Statistical tests, Pollutant identification.
Identifiers: Long-term bioassays, Continuous-flow apparatus, *Crude oil, No 2 fuel oil, *Dispersed petroleum derivatives, Petroleum bioassay, Mariotte bottle, Stable concentration.

A continuous flow system for the long-term bioassay of dispersed petroleum derivatives in sea water was devised and tested. The possible application of the system to crude oils is discussed. (Katz)
W77-09681

USING O(XYGEN) D(EMAND) I(NDEX), COD, AND BOD TESTS TO CHARACTERIZE KRAFT MILL EFFLUENT,
Saint Mary's Univ., Halifax (Nova Scotia). Dept. of Chemistry.
E. R. Hayes, V. G. Munroe, and J. Spurr.
Water and Pollution Control, Vol 114, No 9, p 22, 25, 38-39, September, 1976. 2 fig, 9 ref.

Descriptors: *Pulp wastes, *Oxygen demand, *Chemical oxygen demand, *Biochemical oxygen demand, Water quality standards, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, *Effluents, Water quality, Water analysis, Testing, *Pollutant identification, *Waste identification.
Identifiers: Kraft mills.

BOD, COD, and oxygen demand index (ODI) measurements were made on a total kraft mill effluent, and COD and ODI tests were made on alkaline sewer, acid sewer, and woodroom effluents. The data suggest that ODI tests can be used to quickly predict COD values once a COD:ODI ratio has been established for the particular waste water. (Buchanan-IPC)
W77-09729

CHARACTERIZATION OF SPENT BLEACHING LIQUORS. PART 1, SPENT LIQUORS FROM THE CHLORINE AND ALKALI EXTRACTION STAGES IN THE PREBLEACHING OF PINE KRAFT PULP,
Swedish Forest Products Research Lab., Stockholm.
H. L. Hardell, and F. de Sousa.
Svensk Papperstidning, Vol. 80, No. 4, p 110-120, March 10, 1977. 7 fig, 20 ref, 6 tab.

Descriptors: *Bleaching wastes, *Waste identification, *Water analysis, Biodegradation, Wastes, *Industrial wastes, Water pollution sources, Chlorine, Carbon, Color, Carbohydrates, Organic compounds, Pulp and paper industry, Waste water(Pollution), Water pollution, Pine trees, Effluents, *Pulp wastes.
Identifiers: Kraft pulp, Kraft mills, Galactose, Chlorine compounds.

Spent chlorination liquor (SCL) and spent alkaline extraction liquor (SEL) were examined for total dry content, inorganic Cl, organically bound Cl, organic C, color, and carbohydrate composition. Distributions of relative molecular mass in both liquors were studied by ultrafiltration. About 24 kg organic matter per metric ton of bleached pulp was dissolved in the SCL, 52 kg in the SEL; about 60% of the former and 20% of the latter was relatively low-molecular weight material, indicating that the average molecular weight of dissolved organic material was much higher in the SEL than in the SCL. Most (84%) of the color formed during the 2 prebleaching stages was found in the SEL, derived mainly from higher-molecular weight materials. During bleaching, 63 kg of active Cl per ton of pulp was charges, of which ca. 44 kg was found as chloride and 3 kg as organically bound Cl in the SCL, compared with 9 kg and 3 kg, respectively, in the SEL, which made the weight percentage of organically bound CL ca. 16% and 18% of the total organic matter in the SCL and SEL, respectively. The SCL contained ca. 0.4 kg and the SEL ca. 2.8 kg of carbohydrates per ton of bleached pulp. Most of them were found in the relatively high-molecular weight fractions. Galactose content was particularly high. When the liquors were treated with air to stimulate degradation in the recipient waters, organic C decreased ca. 50% and color ca. 20% in both SCL and SEL after 5 months. The major changes occurred during the first 40-50 days, showing that much of the material is relatively resistant to natural degradation. No enrichment of Cl-containing organic matter was noted. (Brown-IPC)
W77-09731

STUDIES AND COMPARISONS OF DETERMINATIONS OF PHENOLS IN WATER: APPLICATION TO THE EXAMINATION OF A PAPER MILL EFFLUENT (ETUDES ET COMPARAISONS DES DETERMINATIONS DES PHENOLS DANS LES EAUX: APPLICATION A L'EXAMEN D'UN REJET DE PAPETERIE),
Besancon Univ. (France). Institut de Chimie.
R. Jacquemain, F. Remy, and C. Guinchard.
Journal Francais d'Hydrologie, Vol. 16, p 25-32, 1975. 10 ref. 5 tab.

Descriptors: *Pollutant identification, *Water analysis, *Phenols, *Pulp wastes, *Analytical techniques, Wastes, *Industrial wastes, Water pollution sources, Colorimetry, Chromatography, Spectroscopy, Pulp and paper industry, Aromatic compounds, Organic compounds, Water properties, Water chemistry.

Colorimetric, chromatographic, and IR-spectroscopic methods for determining phenols in water were compared. IR spectroscopy was found to be the most reliable method, but requires considerable equipment. The two colorimetric methods (4-aminoantipyrine and p-nitroaniline) gave greatly different results. The chromatographic studies showed that 4-aminoantipyrine reveals only the simple phenols while p-nitroaniline also discloses a large group of complex phenols. The effluent from a sulfite pulp mill was analyzed qualitatively for phenols using thin-layer chromatography and quantitatively using the two colorimetric methods and IR spectroscopy. The 4-aminoantipyrine method showed 2.5 mg/liter of simple phenols; the p-nitroaniline method, 90 mg/liter of simple and complex phenols. (Speckhard-IPC)
W77-09736

HEAVY METAL CONCENTRATIONS IN WATER, SEDIMENTS, AND FISH FROM MEDITERRANEAN COASTAL AREA, ISRAEL,
Israel Oceanographic and Limnological Research Ltd., Haifa.
I. Roth, and H. Hornung.
Environmental Science and Technology, Vol 11, No 3, p 265-269, March, 1977. 44 ref, 8 tab.

Descriptors: *Water analysis, *Heavy metals, *Pollutant identification, Sediments, Fish, *Copper, *Lead, *Nickel, *Zinc, *Chromium, Water pollution sources, Trace elements, Metals, Spectrophotometry, Cadmium.
Identifiers: *Mediterranean Sea(Israel), *Israel.

Water, sediment, and fish were collected along the northern part of the Mediterranean coast of Israel and analyzed for cadmium, lead, copper, zinc, nickel, and chromium by atomic absorption spectrophotometry. The obtained values showed no significant heavy metal pollution in the studied area, compared with values found in the literature for metal concentrations in other parts of the world. (Witt-IPC)
W77-09742

CHARACTERIZATION AND TREATMENT OF TEXTILE DYEING WASTEWATERS,
Crompton and Knowles Corp., Reading, Pa.
For primary bibliographic entry see Field 5D.
W77-09745

GAS STRIPPING, SORPTION, AND THERMAL DESORPTION PROCEDURES FOR PRECONCENTRATING VOLATILE POLAR WATER-SOLUBLE ORGANICS FROM WATER SAMPLES FOR ANALYSIS BY GAS CHROMATOGRAPHY,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
P. P. K. Kuo, E. S. K. Chian, F. B. DeWalle, and J. H. Kim.

Descriptors: *Water analysis, *Organic compounds, *Pollutant identification, *Gas chromatography, Water pollution sources, *Analytical techniques, Sorption, Trace elements, Water chemistry, Water quality, Separation techniques.

The efficiencies of (1) the removal of organic compounds from aqueous solution by gas stripping, (2) the adsorption of the stripped organics on Tenax-GC adsorbent, and (3) the thermal desorption of the organics from the adsorbent were determined using volatile polar water-soluble organics as the principal model compounds. Good mixing between the stripping gas and the liquid phase being stripped, as provided by the Bellar and Lichtenberg stripping apparatus, results in the effective removal of organics. Stripping the compounds at an elevated temperature is suggested. Breakthrough and displacement of lower alcohols occurs on the Tenax-GC under the experimental conditions. The adsorption and the desorption efficiencies are better than 75% and 80%, respectively, for the majority of the compounds studied. The procedures for gas stripping, sorption, and thermal desorption are discussed to achieve a reliable analytical method for determining volatile polar water-soluble organics in water by gas stripping/gas chromatographic analysis. The detection limits are at the ppb level or lower for most of the compounds studied. (Witt-IPC)
W77-09746

DETERMINATION OF ARSENIC SPECIES IN NATURAL WATERS,
Scripps Institution of Oceanography, La Jolla, Calif.
M. O. Andreae.
Analytical Chemistry, Vol 49, No 6, p 820-823, May, 1977. 4 fig, 9 ref, 1 tab.

Descriptors: *Water analysis, *Arsenic compounds, *Pollutant identification, Natural streams, Water pollution sources, *Analytical techniques, *Gas chromatography, Separation techniques, *Trace elements, Water chemistry, *Methodology.

A method is described for the determination of arsenate, arsenite, mono-, di-, and trimethyl arsine, monomethylarsonic and dimethylarsinic acids, and trimethylarsine oxide in natural waters with detection limits of several nanograms/liter. The arsines are volatilized from the sample by gas stripping; the other species are then selectively reduced to the corresponding arsines and volatilized. The arsines are collected in a cold trap cooled with liquid nitrogen. They are then separated by slow warming of the trap or by gas chromatography, and measured with atomic absorption, electron capture, and/or flame ionization detectors. Four arsenic species have been found and measured in natural waters. (Witt-IPC)
W77-09747

DETERMINATION OF FREE AND TOTAL POTENTIAL HALOFORMS IN DRINKING WATER,
Ontario Ministry of the Environment, Rexdale. Lab. Service Branch.
A. A. Nicholson, O. Meresz, and B. Lemyk.
Analytical Chemistry, Vol. 49, No. 6, p 814-819, May 1977. 11 fig, 23 ref, 9 tab.

Descriptors: *Water analysis, *Potable water, *Halogens, *Pollutant identification, Water pollution sources, *Analytical techniques, Organic compounds, *Trace elements, *Water chemistry, Methodology, *Halides.

A convenient easily automated method is presented for the anlysis of haloforms and some other volatile organohalides in drinking water. This direct aqueous injection (DAI) method has a detection limit at or below 1 microgram/liter for haloforms. Simultaneous analysis of finished drinking water samples with the DAI and the gas sparging methods revealed hitherto unknown aspects of water treatment chemistry. While the gas sparging techniques measures only the free haloforms present in the drinking water, the DAI method measures the total potential haloforms that can form after chlorination. (Witt-IPC)
W77-09748

CHROMATOGRAPHY OF CHLORINATED BIPHENYLS ON AN ION-EXCHANGE RESIN,
Colorado Univ., Boulder. Dept. of Chemistry.
T. Hanai, and H. F. Walton.
Analytical Chemistry, Vol. 49, No. 6, p 764-766, May 1977. 6 fig, 6 ref, 1 tab.

Descriptors: *Water analysis, *Pollutant identification, *Ion exchange, *Polychlorinated biphenyls, Trace elements, Water pollution sources, Chromatography, Resins, Calcium, Water chemistry, Cation exchange, Separation techniques.
Identifiers: Polystyrene.

A calcium form crosslinked polystyrene-type cation-exchange resin is a suitable stationary phase for the chromatography of chlorinated biphenyls, using aqueous acetonitrile as the eluent. Substitution of chlorine atoms in the 2 position lessens the retention, but substitution in other positions increases it. Seventeen substituted biphenyls were studied over a range of temperatures and solvent compositions, and their ultraviolet absorption spectra are shown. The method is applicable to traces of byphenyls in contaminated water. (Witt-IPC)
W77-09749

DETERMINATION OF MOLYBDENUM IN SEAWATER BY ELECTRON PARAMAGNETIC RESONANCE SPECTROMETRY,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W77-09750

DETERMINATION OF NITRILOTRIACETATE IN ENVIRONMENTAL WATER BY GAS CHROMATOGRAPHY OF THE TRIMETHYLSILYL ESTER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
R. J. Stolzberg, and D. N. Hume.
Analytical Chemistry, Vol. 49, No. 3, p 374-378, March, 1977. 1 fig, 19 ref, 5 tab.

Descriptors: *Water analysis, *Pollutant identification, *Gas chromatography, *Nitrilotriacetic acid, Trace elements, Analytical techniques, Water chemistry, Water pollution sources, Separation techniques.

A rapid simple method for the determination of trace levels of nitrilotriacetate (NTA) is aqueous samples is based on gas chromatography of the trimethylsilyl derivative. The 1 ml sample is evaporated directly in the reaction vial with an excess of the ammonium salt of ethylenediamine tetraacetic acid to mask interfering cations and convert NTA to a reactive form. After evaporative drying with methylene chloride, derivatization is carried out with bis(trimethylsilyl) trifluoroacetamide in dimethylformamide. Chromatography on OV-17 columns gives good separation from all common anions, organic acids, and aminopolycarboxylate chelating agents. The method is suitable for samples containing 1-100 micrograms/ml NTA without a prior concentration step. A minor modification permits simultaneous determination of iminodiacetate and glycine which are produced in the photodegradation of NTA. (Witt-IPC)
W77-09751

ENRICHMENT OF TRACE METALS IN WATER BY ADSORPTION ON ACTIVATED CARBON,
Antwerp Univ., Wilrijk (Belgium). Dept. of Chemistry.
B. M. Vanderborght, and R. E. Van Grieken.
Analytical Chemistry, Vol. 49, No. 2, p 311-316, February, 1977. 5 fig, 17 ref, 7 tab.

Descriptors: *Water analysis, *Trace elements, *Metals, *Activated carbon, *Pollutant identification, *Adsorption, Water pollution sources, Analytical techniques, Chemical analysis, Inorganic compounds, Chelation.

A combination of multielement chelation by 8-hydroxyquinoline with subsequent adsorption on activated carbon was developed for trace metal preconcentration. Adsorption characteristics of 8-quinolinol and metal quinolates on activated carbon were investigated in order to optimize the enrichment procedure. Interferences from alkali and alkaline earth ions were minimized, and working conditions for preconcentration from very differing samples were calculated. An enrichment factor of 10,000, a precision of 5-10%, and a recovery from 85 to 100% were demonstrated for about 20 elements simultaneously. (Witt-IPC)
W77-09752

AUTOMATED CATALYTIC ULTRAMICRODETERMINATION OF MANGANESE IN NATURAL WATERS WITH A MINIATURE CENTRIFUGAL ANALYZER,
Illinois Univ. at Urbana-Champaign. School of Chemical Sciences.
For primary bibliographic entry see Field 2K.
W77-09753

THE DETERMINATION OF MOLYBDENUM AND TUNGSTEN IN SEA AND SURFACE WATER,
Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center.
H. A. Van der Sloot, G. D. Wals, and H. A. Das.
Analytica Chimica Acta, Vol 90, No 1, p 193-200, May, 1977. 3 fig, 10 ref, 5 tab.

Descriptors: *Water analysis, *Pollutant identification, *Molybdenum, *Sea water, Heavy metals, Surface waters, Water pollution sources, Trace elements, Activated carbon, Hydrogen ion concentration, Analytical techniques, *Water chemistry, Metals.
Identifiers: *Tungsten.

A simple method for the determination of molybdenum and tungsten in sea and surface water is presented. Molybdenum and tungsten are concentrated on activated charcoal by adsorption as the ammonium pyrrolidine dithiocarbamate complex; the optimal pH for adsorption is 1.3. Molybdenum and tungsten are then determined by thermal neutron activation. The detection limits are 0.05 micrograms Mo/liter and 0.05 micrograms W/liter (or 0.001 micrograms W/liter after a simple chemical separation). (Witt-IPC)
W77-09754

CATALYTIC DEOXYGENATION OF AQUEOUS SOLUTIONS BY HYDRAZINE,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 5B.
W77-09766

EVALUATION OF A LABORATORY MICROCOSM FOR STUDY OF TOXIC SUBSTANCES IN THE ENVIRONMENT: FINAL TECHNICAL REPORT, JULY 1, 1973-DECEMBER 31, 1975,
Illinois Univ. at Urbana-Champaign.
R. L. Metcalf.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 982, Price Codes: A04 in paper copy, A01 in microfiche. National Science Foundation, RANN Report NSF-RA-E-75-116, 1975. 66 p., 10 tab., 9 fig., 17 ref.

Descriptors: Environment, *Environmental effects, *Bioassay, *Toxicity, Pesticides, Model studies, *Methodology, Laboratory technique, Laboratory equipment, Trace elements, Path of pollutants, *Degradation(Decomposition), Public health, Pollutant identification.
Identifiers: Environmentally congenial products, *Environmental fate, *Degradation pathways, Ecological magnification, Biodegradability, Laboratory microcosm.

A simple model ecosystem technology is described, which can yield, at modest expense, a wealth of valuable information about pesticides, drugs, plasticizers, industrial chemicals, carcinogens, and trace metals. Described is the value of the laboratory microcosm in (1) prescreening new chemicals at an early stage in their development; (2) developing environmentally congenial products; (3) tracing environmental fate and degradation pathways, toxicity, ecological magnification, biodegradability index and unextractable radioactivity. (Katz)
W77-09769

STANDARDIZATION OF METHYLMERCURY ANALYSIS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
P. A. Krenkel, and W. D. Burrows.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-75-10673, Price codes: A05 in paper copy, A01 in microfiche. Final Report for NOAA National Marine Fisheries Service, Contract N-042-56-72(NFA), RC-2052-11, February 1975. 70 p, 9 tab, 16 fig, 59 ref.

Descriptors: *Mercury, *Metals, *Water analysis, Laboratory tests, *Methodology, Chlorides, *Chromatography, Organic compounds, Halides, Spectrophotometry, Enzymes, Water quality standards.
Identifiers: *Methylmercury analysis, *Benzene, Papain, Gas-liquid chromotography, Proteolytic enzymes, Colorimetric metals, Atomic absorption spectrophotometry, Thin layer chromotography, Standard curve preparation.

In order to develop a simple, concise analytical technique for methylmercury, an investigation was made of existing methods; experiments were conducted to refine analysis by gas-liquid chromotography; and the resulting method was put forward in a form for easy use by laboratory technicians. A review of recent literature includes description of the use of colorimetric, gas-liquid chromotographic, atomic absorption spectrophotometric and thin layer chromatographic methods of measuring methylmercury and explains the extensive sample preparation necessary. It was found that simple treatment with papain had no effect on methylmercury recovery and benzene was the organic solvent preferred. Other reagents which proved most efficient were the bromide form of halide reagents and sodium thiosulfate for extracting the methylmercury into the aqueous phase. Peak height was proportional to peak area when samples of 0 to 5 ng were injected. Methylmercury bromide and chloride were both more stable for use as standards than was the iodide. Distillation of the final benzene extract was a practical means of increasing the methylmercury concentration, with about 10% of the mercury lost during distillation. (Katz)
W77-09775

COMPUTER INTERPRETATION OF POLLUTANT MASS SPECTRA,
Cornell Univ., Ithaca, N.Y.
F. W. McLafferty.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 341, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Monitoring Series, Report EPA 600/4-76-046, October, 1976. 59 p, 12 tab, 6 fig, 22 ref.

Descriptors: *Chemical analysis, *Methodology, Laboratory tests, Laboratory equipment, *Computer programs, Computers, *Mass spectrometry, Algorithms, *Information retrieval, Organic compounds, Water pollution, *Pollutant identification, Chemicals, *Organic wastes.
Identifiers: Chemical pollutants, Environmental protection.

The objective was to improve systems for computer examination of the mass spectra of unknown pollutants. For this a new probability based matching (PBM) system was developed for the retrieval of mass spectra from a large data base, and the interpretation of unknown mass spectra using the self-training interpretive and retrieval system (STIRS) was substantially improved. PBM was designed as a prefilter to STIRS; if an unknown mass spectrum can be identified with a sufficiently high confidence by PBM, interpretation of the spectrum using STIRS is not necessary. The PBM system provides more efficient retrieval than presently accepted systems; it incorporates a 'reverse search' algorithm, and through the use of weighted mass and abundance data provides a statistically valid prediction of the confidence of the matches found. STIRS has been improved to give a confidence-level prediction of the presence of 200 particular substructural features in the unknown molecule. Extensive studies have been made to improve the data selection for most data classes used by STIRS, resulting in a much higher level of overall system performance. Operation efficiencies of both PBM and STIRS have been improved dramatically so that both require less than 1 minute on a laboratory PDP-11/45 computer. (Katz)
W77-09776

WATER QUALITY: WESTERN FISH TOXICOLOGY STATION AND WESTERN OREGON RIVERS,
Corvallis Environmental Research Lab., Oreg. Western Fish Toxicology Station.
D. F. Samuelson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 914, Price codes: A04 in paper copy, A01 in microfiche. EPA Ecological Research Series, Report EPA-600/3-76-077, September 1976. 55 p, 14 tab, 19 fig, 21 ref.

Descriptors: Water quality, Seasonal, *Oregon, Rivers, River basins, Water temperature, Oxygen, Dissolved oxygen, Hydrogen ion concentration, Alkalinity, *Water properties, Water sampling, *Iron, *Manganese, *Zinc, Anions, Cations, *Pollutant identification.
Identifiers: Seasonal variation, Well waters, *Willamette River discharges(Ore), Corvallis(Ore).

Seasonal variation in water quality was compared for the Western Fish Toxicology Station (WFST), Corvallis, OR, the adjacent Willamette River and approximately 40 major western Oregon rivers from 1972 through 1974. Water temperature patterns of the Willamette River and the WFTS well were similar (range, 4.6-20.0C). While both displayed seasonal trends, well water lagged 7-10 days behind the river in both temperature increases and decreases. Dissolved oxygen values in both the river and well water were inversely related to temperature. Average dissolved oxygen concentrations were higher in the river (10.4 mg/l) than in the well water (4.1 mg/l). Hydrogen ion concentration (ph) was low in the well water (range, 6.6-7.0), compared to the river (range, 7.0-7.8). River water had a mean hardness and alkalinity of 22 mg/l and 23 mg/l respectively, while well water ranged between 'soft to moderately hard' (mean hardness, 34 mg/l; mean alkalinity, 31 mg/l). High Willamette River discharges (above Corvallis) were followed by a 7-10 day lag in corresponding sharp peaks of total hardness, alkalinity, and certain cations and anions in the well water. Major cation and anion concentrations were low overall. Trace metals were at or near detection limits. River iron and manganese concentrations were approximately 10 times greater than those found in the well. River zinc had a mean of 9.4 ug/l, while the well water mean concentration was 5.1 ug/l. (Katz)
W77-09777

ANALYSIS OF DATA FROM BIOLOGICAL SURVEYS OF STREAMS: DIVERSITY AND SAMPLE SIZE,
Kansas Univ., Lawrence. Dept. of Geology; and Kansas Univ., Lawrence. Museum of Invertebrate Paleontology.
R. L. Kaesler, and E. E. Herricks.
Water Resources Bulletin, Vol 12, No 6, p 125-135, December 1976. 2 tab, 5 fig, 25 ref. OWRT C-6007(5200)(4).

Descriptors: Analytical techniques, *Biological communities, Streams, *Surveys, *Statistical methods, *Benthic fauna, Water pollution effects, On-site data collections, Benthos, Sampling, Ecological distribution, Pollutant identification.
Identifiers: Brillouin's Equation, Shannon's diversity index, *Species diversity index.

Brillouin's equation (H) for species diversity from information theory is to be preferred for the purposes of applied ecology over the equation of Shannon (H') or the more commonly used approximate equation (H''). By its use, the difficult

problem of delimiting the extent of the community being sampled in a stream survey can be avoided. Moreover, Brillouin's equation gives the exact diversity of the fully censused collection, whereas Shannon's diversity can only be approximated with a biased estimator. If a sample is regarded as a message from the environment to the ecologist, Brillouin's equation is the proper one for computing its diversity. The product moment correlation coefficient between Brillouin's H for the total number of individuals from a group of samples and for randomly chosen subsets of 100 individuals from each sample was nearly as high as the correlation between H and H'' based on the total samples. This indicates that small sample sizes may give a useful diversity index. Replicated subsamples show that much smaller samples than are normally used can discriminate between communities from polluted and unpolluted environments. The use of smaller samples should reduce the cost of stream surveys. (Katz)
W77-09778

LEAD AND FRESHWATER FISHES: PART 2--IONIC LEAD ACCUMULATION,
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
For primary bibliographic entry see Field 5C.
W77-09779

ENVIRONMENTAL APPLICATIONS OF ADVANCED INSTRUMENTAL ANALYSES: ASSISTANCE PROJECTS, FY 75,
Environmental Research Lab., Athens, Ga. Analytical Chemistry Branch.
A. L. Alford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 425, Price codes: A03 in paper copy, A01 in microfiche. EPA Environmental Monitoring Series, Report EPA-600/4-77-004, January, 1977. 37 p., 9 tab., 14 ref.

Descriptors: *Methodology, *Chemical analysis, *Water analysis, *Organic compounds, *Mass spectrometry, Gas chromatography, *Trace elements, Laboratory tests, Laboratory equipment, On-site investigations, *Water pollution, *Pollutant identification, Instrumentation, *Analytical techniques.
Identifiers: *Multielement analysis, *Spark source mass spectrometry.

The EPA Athens Environmental Research Laboratory identified and measured aquatic pollutants under eight projects in response to requests for assistance from other EPA organizations and other government agencies. In most cases these analyses helped to solve, or at least to understand more clearly, the related pollution incident, and in some cases the analyses provided evidence for enforcement of regulatory legislation. Under an additional project, analytical consultations were held as requested by various organizations concerned with pollution incidents. (Katz)
W77-09782

EFFECTS OF AROCLOR (R) 1254 ON BROOK TROUT, SALVELINUS FONTINALIS,
Environmental Research Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W77-09783

ESTIMATION OF PERMISSIBLE CONCENTRATIONS OF POLLUTANTS FOR CONTINUOUS EXPOSURE,
Research Triangle Inst., Research Triangle Park, N.C.
R. Handry, and A. Schindler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 959, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-155, June 1976. 136 p, 31 fig, 33 tab, 19 ref, 3 append.

Descriptors: *Toxins, Pollutants, *Standards, *Air pollution, *Potable water, *Estimating, Hazards, Safety, Human diseases, Public health, Toxicity, Lethal limit.
Identifiers: *Continuous pollutant exposure, *Permissible levels, Carcinogens, Tolerance levels.

Pollutant hazard criteria are developed for toxic materials in ambient air and drinking water for which no safe concentration levels have been established, to serve as a guide in assessing potential hazards in lieu of official standards. The methodology for estimating permissible pollutant levels is presented. Hazard criteria are expressed as a ratio (actual pollutant concentration/permissible pollutant concentration). When this quotient is equal to or greater than one, a pollution hazard is judged to exist. Several approaches were used to estimate safe concentration values. Estimates for air pollution were based on episodes of continuous exposure and on total volume to body weight relationships of infants, to take into consideration the higher pulmonary intake perunit weight of young children. Permissible pollutant concentrations in drinking water were developed along the same lines. Final expressions were used to treat multipollutants in both air and drinking water. A means for estimating lung cancer mortality risk as a function of carcinogen concentrations in ambient air is presented; it allows determination of carcinogen air levels to which nonsmokers are exposed and to estimate the lung cancer mortality for nonsmokers exposed to any carcinogen concentration in air. The results are expressed as risk vs. carcinogen concentration. (Auen-Wisconsin)
W77-09788

ANNOTATED EXTRACTS OF SOME PAPERS DEALING WITH THE MEASUREMENT AND SOLUBILITY OF DISSOLVED ATMOSPHERIC GASES, WITH NITROGEN GAS SUPERSATURATION, AND WITH GAS BUBBLE DISEASE IN FISH,
British Columbia Water Resources Service, Victoria.
For primary bibliographic entry see Field 5C.
W77-09792

METHOD FOR DETECTING OIL IN WATER,
P. T. Thyrum.
U.S. Patent No. 4,004,453, 5 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 954, no 4, p 1472, January 25, 1977.

Descriptors: *Patents, *Oil pollution, Water quality control, *Water pollution control, *Pollutant identification, Measurement, Dispersions, Dyes, Filters, *Oil wastes.

Simple and economical methods accurately determines low concentrations of particulate oil in water. In one method a sample of water is first filtered at a controlled rate. A dye-impregnated pad is pressed against the upstream surface of the filter element and then removed. The upstrea, surface of the filter element may now be observed with the eye against colorations of known concentrations for variations in color intensity clearly discernible within the range of 0 and 30 ppm by volume of oil-in-water. The dye-impregnated pad is prepared by submerging a white absorbent material in a saturated solution of an oil-soluble, water-insoluble dye, and drying them in a rack under vacuum. In another method, where the sample also contains discoloring pigmented contaminants, an intermediate pad is pressed between the filter element and the dye-impregnated pad, and its coloration compared to known standards. In lieu of the intermediate pad method, a thin prefilter is placed on the upstream surface of the filter element during filtering, then discarded, and the filter element is processed as described in the first method. (Sinha-OEIS)
W77-09813

EXPERIENCES WITH THE ORGANIC CARBON ANALYZER (TOC) BY MERZ FOR ROUTINE MONITORING AT THE BASF PURIFICATION PLANT (ERFAHRUNGEN MIT DEM TOC-SCHNELLBESTIMMER NACH MERZ IN DER ROUTINEUEBERWACHUNG DER BASF),
L. Buechs, and W. Merz.
Vom Wasser, Vol. 47, p 267-274, 1977. 3 fig, 3 tab, 3 ref.

Descriptors: *Pollutant identification, *Organic carbon, Analytical techniques, Monitoring, Effluents, Chemical oxygen demand, Water pollution control, Automation, Water purification, Cooling water, Organic matter, *Waste water treatment.

The analysis of treatment plant effluent and river water by the use of Merz's rapid TOC analyzer was discussed. TOC (total organic carbon) as a measure of the concentration of organic substances is more effective in monitoring received water than COD, which only measures chemical oxidizability. Methods were compared for measuring both TOC and COD in potable water, non-contaminated cooling water, and effluents with various levels of contamination. Rapid TOC analysis was more accurate and less prone to interference than COD methods. The TOC method can be completely automated. (Collins-FIRL)
W77-09894

IDENTIFICATION OF THE VIRUCIDAL AGENT IN WASTE WATER SLUDGE,
Sandia Labs., Albuquerque, N. Mex.
R. L. Ward, and C. S. Ashley.
Applied and Environmental Microbiology, Vol. 33, No. 4, p 860-864, April, 1977. 3 fig, 3 tab, 4 ref.

Descriptors: *Viricides, *Viruses, *Ammonia, *Sludge treatment, Hydrogen ion concentration, Anaerobic digestion, Organic compounds, Chemical analysis, *Waste water treatment.

Experiments were conducted to determine the identity of a viricidal agent in sludge. Raw and anaerobically digested sludge samples were mixed with a 10-fold dilution of virus and incubated. Sodium dodecyl sulfate was added to break up viral aggregates. General properties of the agent were determined. It was found to be small and heat stable. Attempts at isolation by distilling digested sludge recovered more than 95% of viricidal activity in the first 15% of the distillate. A fraction of the first 10% of the distillate was treated with activated charcoal since the agent was thought to be a small, volatile, organic compound. Ammonia was recovered from this process and tested, as ammonium chloride, to determine its viricidal activity. The results proved that ammonia was the source of poliovirus inactivation. Viricidal activity was evidenced by ammonia only at a pH greater than 8, and increased with increasing pH values. Viricidal activity in raw sludge was similarly pH-dependent. These results applied to poliovirus type 1 strain CHAT. Further tests showed that ammonia was an effective viricide for the picornavirus group, but that reovirus was insensitive to ammonia under these conditions. It was suggested that raising the pH of sludge would be effective in inactivating sludge viruses. (Collins-FIRL)
W77-09897

STEROIDS AS SEWAGE SPECIFIC INDICATORS IN NEW YORK BIGHT SEDIMENTS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
P. G. Hatcher, L. E. Keister, and P. A. McGillivary.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 4, p 491-498, April, 1977. 2 fig, 22 ref.

Descriptors: *Bioindicators, *Indicators, *Water pollution sources, *Sediments, *Analysis, Sludge

disposal, Waste disposal, Analytical techniques, Water quality, *Pollutant identification, Human wastes.
Identifiers: *New York Bight, *Steroids, Coprostanol, 24 Beta-ethyl coprostanol.

Steroids associated with human fecal matter were suggested as sewage pollution indicators in marine sediments. Some of these, such as coprostanol, have not been detected in unpolluted marine sediments and would be useful as indicators. An analysis of the New York Bight sediment was conducted to evaluate this theory. Steroids were determined in freeze-dried sediments and in sewage sludge. The major steroids found in two sediment samples, one taken from a near-shore site and the other from a sewage sludge dumpsite, were coprostanol, cholesterol, beta-sitosterol, and 24 beta-ethyl coprostanol. Of these, cholesterol and beta-sitosterol were present in significant quantities. These steroids are usually dominant in marine sediments. coprostanol and 24 beta-ethyl coprostanol in the bight sediment linked the major organic component of the muds to sewage. Coprostanol concentrations in the two sediments were 4.8 and 5.2 ppm, which indicated a similar level of sewage contamination. Thus the near-shore sample indicated as much contamination as the sample from a basin heavely impacted by sewage. Analysis of a New York City treatment plant's sludge revealed large amounts of coprostanol and 24 beta-ethyl coprostanol. This confirmed the results of the sediment analysis. It was concluded that coprostanol or 24 beta-ethyl Coprostanol could be used to identify sediment sewage contamination on a horizontal or vertical sedimentary profile. (Collins-FIRL)
W77-09901

CHEMICAL COMPOSITION OF SEWAGE SLUDGES AND ANALYSIS OF THEIR POTENTIAL USE AS FERTILIZERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
L. E. Sommers.
Journal of Environmental Quality, Vol 6, No 2, p 225-232, April-June, 1977. 7 fig, 6 tab, 26 ref.

Descriptors: *Sludges, *Fertilizers, Chemical properties, *Carbon, *Nitrogen, *Phosphorus, *Potassium, Metals, Sludge treatment, Waste disposal, Evaluation, Analysis.

A regional study was conducted to determine the fertilizer values of various sludges. These values are based on sludge nitrogen, potassium, and phosphorus concentrations as well as on trace metal content. Comparisons were based on common treatment processes because of the variability in sources of treated effluent and treatment plants. Major consideration was given to sludges treated by anaerobic and aerobic processes. The study evaluated thirty chemical components of sludges. The median values of the components were used to summarize the data. Total N, NH4, and metals were the prime parameters for land application rates, and the most variable. Organic carbon was 20-30% of total carbon; 1-4% was identified as inorganic carbon. Anaerobic treatment produced lower organic carbon. Total nitrogen varied 2-4%, with a significant amount identified as NH4. Storage of anaerobic sludges may produce nitrates. Liquid sludges may contain 50-90% nitrogen in organic combinations. The sludge handling system affects the type of inorganic nitrogen in sludge. Total phosphorus was about 1.2-3.0% with 10-30% of this present as organic phosphorus. Sludge handling had no effect upon phosphorus content. Nitrogen, phosphorus, and potassium concentrations were in a narrow range, whereas that of lead, zinc, copper, nickel, and cadmium were extremely variable. It was concluded that N, P, and K were present in the approximate ratio of 11:7.6:1. About 1% of agricultural lands would be needed for sludge application at the rate of 100 kilograms of available nitrogen/hectare in most of the states evaluated. A knowledge of the chemical composition of individual sludges must be obtained before land application. (Collins-FIRL)
W77-09904

ZETA POTENTIAL MEASUREMENT,
H. G. Swope.
Water and Sewage Works, Reference Issue, p 64-67, April, 1977. 6 fig, 8 ref.

Descriptors: *Zeta potential, *Measurement, *Flocculation, *Coagulation, Electrical properties, Colloids, Turbidity, Alkalinity, Hydrogen ion concentration, Polymers, Polyelectrolytes, Corrosion control, *Waste water treatment.
Identifiers: Alum.

Zeta potential measurement aids the determination of proper flocculation agents and amounts to remove particulate matter and colloids for the complete clarification of water or waste water. The zeta potential describes the movement of suspended particles in water towards the anode or cathode after establishment of an electrical potential gradient. This movement is known as electrophoresis or ionic migration. The development of the Zeta-Meter has increased the usefulness of this phenomenon. Experimentation has been applied to alum coagulation to control the coagulation of raw water colloids. Colloid removal is only possible with a reduction of the zeta potential. Raw water turbidity consists of finely divided silt and clay and organic matter undergoing microbial decomposition. The turbidity is of a fine fraction and a coarse fraction. The first cannot be removed by usual alum coagulation. Both floc and colloid zeta potential should be reduced to zero plus or minus 5 mV, by use of an inorganic coagulant and an appropriate organic polyelectrolyte. Floc produced by minimum dosages is too electronegative to produce colloid removal. Water alkalinity depletion is a problem which can result in severe corrosion problems, especially below 6 mg/liter. Such a point may be reached before alum addition has become sufficient to achieve the proper zeta potential. The addition of unreacted aluminum sulfate can ingibit corrosion. Polyelectrolytes produce large zeta potential changes without disturbing pH or alkalinity. Jar tests should be conducted to determine the amounts of coagulants which will produce a zeta potential of -7 to -10 mV, and maintain the proper alkalinity. Various examples illustrated the applicability of zeta potential for determining treatment dosages. (Collins-FIRL)
W77-09908

ATOMIC ABSORPTION IN WATER AND WASTE WATER ANALYSIS,
Perkin-Elmer Corp., Lombard, Ill.
R. D. Ediger.
Water and Sewage Works, Reference Issue, p 112, 115-118, April, 1977. 4 fig.

Descriptors: *Pollutant identification, *Analytical techniques, *Water analysis, *Metals, Instrumentation, Equipment, Sulfates, Phosphates, Chlorides, Mercury, *Waste water treatment.
Identifiers: *Atomic absorption analysis.

Determination of metals in waste water by atomic absorption was reviewed. Direct analysis of about 65 elements is possible whith this method. Sulfate, phosphate, and chloride may be indirectly determined. Standardized techniques for either major or trace levels are available for metals of interest in water quality analysis. Atomic absorption has the advantage of little interference as compared to other techniques. Interferences which do exist are most often chemical, matrix, ionization, and background adsorption. These are relatively easy to control. Solvent extraction is usually used when concentrations below the instrument range occur. This enhances the sensitivity of atomic absorption when the proper organic solvent is used. Flame atomization is most widely used, but has several drawbacks. The sample is inefficiently used, thus reducing the opportunity of sample light adsorption. The graphite furnace method has better sensitivity and detection limits. The hydride generation system is useful in determining very low levels of arsenic, selenium, bismuth, and antimony. Drawbacks of this method include limited applicability to the elements important in water anlaysis; greater sample manipulation is necessary than for the flame method. Its prime advantage is a price of about $500 compared to over $4,000 for the graphite furnace. Various flameless systems have been developed for mercury analysis. (Collins-FIRL)
W77-09909

THE FATE OF POLLUTANTS IN SUBSURFACE ENVIRONMENTS,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5B.
W77-09915

CARBON ISOTOPIC STUDY OF THE FATE OF LANDFILL LEACHATE IN GROUNDWATER,
Indiana Univ., Bloomington. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-09917

SOUTH BEND'S INDUSTRIAL SURVEILLANCE WASTE WATER MONITORING PROGRAM,
South Bend Bureau of Wastewater, Ind.
J. M. Jeter, and R. S. Liggett.
Water and Sewage Works, Vol. 124, No. 5, p 74-80, May, 1977. 6 fig, 2 tab, 10 ref.

Descriptors: *Monitoring, *Industrial wastes, Water pollution sources, Regulation, Legislation, Water quality standards, Personnel, Cities, Treatment facilities, Equipment, Analysis, *Waste water treatment.
Identifiers: South Bend(IN).

The South Bend, Indiana, program for industrial surveillance and waste water monitoring was examined. The program consisted of industrial waste water characterization and treatment facility monitoring. Its objective was to develop a suitable management program. Program personnel and equipment requirements were discussed. A chemist and two technicians were employed full-time, with another chemist and technician available as needed. Automated sampling units, analytical equipment and glassware, as well as a vehicle and traffic equipment were requisitioned as essentials. The quality and quantity of industrial effluents were monitored. Treatment facilities were monitored to determine the impact of the added industrial loads on performance. Evaluation criteria for treatment plants were pH, suspended solids, BOD5, COD, phosphate-phosphorus, fecal and total coliforms, and metals. Water quality parameters for river monitoring were pH, BOD5, COD, DO, phosphate-phosphorus, temperature, fecal coliform, total metals, total cyanides, oil, and greases. The city has expanded its analytical capabilities. Carbon rod atomization and atomic absorption techniques were being refined to increase sensitivity for certain total metal parameters. Phenolics determination and oil finger-printing by gas chromatography were also being developed. Various required reporting procedures were described. (Collins-FIRL)
W77-09919

GROUNDWATER POLLUTION HAZARD NEAR SANITARY LANDFILLS ON THE GLACIATED PLAINS, NORTH DAKOTA - A STUDY OF THE LANGDON, NORTH DAKOTA SANITARY LANDFILL,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 5B.
W77-09925

GEOCHEMICAL CONTROLS ON TRACE ELEMENT CONCENTRATIONS IN NATURAL WATERS OF A PROPOSED COAL ASH LANDFILL SITE,
Kansas State Univ., Manhattan. Dept. of Geology.

For primary bibliographic entry see Field 5B.
W77-09928

TRANSMISSION SPECTROSCOPY EXAMINATIONS OF NATURAL WATERS-C. ULTRAVIOLET SPECTRAL CHARACTERISTICS OF THE TRANSITION FROM TERRESTRIAL HUMUS TO MARINE YELLOW SUBSTANCE,
Copenhagen Univ. (Denmark). Inst. of Physical Oceanography.
M. Brown.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 309-317, May 1977. 5 fig, 1 tab, 24 ref.

Descriptors: *Pollutant identification, *Spectroscopy, *Sea water, *Humus, Laboratory tests, Sampling, Surveys, Salinity, Water types, Chemicals, Chemical properties, Microwaves, Oceanography.
Identifiers: *Transmission spectroscopy, *Baltic Sea.

The author defined a spectral slope value for ultraviolet absorption spectra of natural waters for use in a major study of spectral characteristics of Baltic waters. The results showed a steepening in the spectra as total absorption decreases, going from slightly saline waters of the northern Bothnian Bay to North Sea waters entering the Kattegat. The qualitative change is related to the selective loss of high molecular weight humic components of the yellow substance. The literature relating to spectral differences in molecular weight fractions of natural humus was reviewed. When spectral data are combined with salinity values, a categorization of water types is possible, giving Baltic surface, Baltic deep, and North Sea types. The various processes contributing to the differentiation were discussed, and an associated experiment examined the spectral effects of bacterial activity on marine humus. (Sims-ISWS)
W77-09945

INTERACTIONS BETWEEN ZINC AND SUSPENDED SEDIMENTS IN THE FRASER RIVER ESTUARY, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W77-09949

ESTIMATION OF COMPONENTS OF SOIL CATION EXCHANGE CAPACITY FROM MEASUREMENTS OF SPECIFIC SURFACE AND ORGANIC MATTER,
University Coll., Dublin (Ireland). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-09971

SAMPLING THE UNSATURATED ZONE OF IRRIGATED LANDS FOR RELIABLE ESTIMATES OF NITRATE CONCENTRATIONS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W77-09974

THE COCKFIELD AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09991

ELEMENTS NEEDED IN DESIGN OF A GROUND-WATER-QUALITY MONITORING NETWORK IN THE HAWAIIAN ISLANDS,
Geological Survey, Honolulu, Hawaii. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-09995

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1975--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, Ohio. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10000

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1975--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey Columbus, Ohio. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10001

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1975.
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10002

ANNUAL WATER-RESOURCES REVIEW WHITE SANDS MISSILE RANGE, 1976 - A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10005

WATER QUALITY PROGRAM OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.
R. J. Pickering.
Water and Sewage Works, Vol 124, No 4, p 88-89, April 1977. 2 fig.

Descriptors: *Water quality, *Water resources, *Surface waters, *Groundwater, *Data collections, Reviews, Federal Government, State Governments, *Programs, Projects, Cooperatives, Costs, Water quality control, Water pollution sources, Water analysis, Chemical analysis, United States.

Responsible for assessing the nation's natural resources, the U.S. Geological Survey conducts research on the properties and behavior of water in all segments of the hydrologic cycle. Although it has no regulatory responsibility with respect to the nation's water resources, the Geological Survey gathers more data on their extent, availability and quality than any other U.S. agency. The Geological Survey's water-resources program is conducted by its Water Resources Division which maintains, in addition to its headquarters at the Geological Survey's National Center at Reston, Virginia, 4 regional and 46 district offices throughout the United States and its possessions as well as numerous subdistrict offices, field headquarters, and special project offices. Altogether, the Water Resources Division maintains about 240 field offices. Slightly more than half of the Geological Survey's water-quality work is conducted through its cooperative program with State and local agencies. This program consists of a wide variety of water-resources investigations that are supported by 50 percent federal funds and 50 percent State or local funds. The investigations, which are carried out almost entirely by personnel of the Water Resources Division's field offices, range from studies of the effect of landfills on groundwater quality to sophisticated models of the movement of pollutants in stream and groundwater systems. (Woodard-USGS)
W77-10006

WATER RESOURCES OF THE UMATILLA INDIAN RESERVATION, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-10011

GEOHYDROLOGY OF MUSCATINE ISLAND, MUSCATINE COUNTY, IOWA,
Geological Survey, Iowa City, Iowa. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10012

1976 WATER-QUALITY DATA IN BEAR CREEK BASIN, MEDFORD, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
S. W. McKenzie, and L. A. Wittenberg.
Open-file report 77-90, January 1977. 44 p, 2 fig, 5 tab, 9 ref.

Descriptors: *Water quality, *Surface waters, *Irrigation canals, *Drainage systems, *Streamflow, Flow rates, Data collections, Sampling, Chemical analysis, Sediments, Monitoring, Sites, *Oregon, Water pollution sources, Agricultural runoff, Nutrients, Coliforms, Water temperature, Dissolved solids, Turbidity, Hydrogen ion concentration.
Identifiers: *Bear Creek basin(Southwestern Ore).

The U.S. Geological Survey, in cooperation with the Rogue Valley Council of Governments, is studying surface-water-quality problems and their causes in the Bear Creek basin of southwestern Oregon. Two specific areas of investigation include: measurements of the quality and quantity of water in the irrigation canals and drainage system and the diel (during a 24-hour period) variation of water-quality parameters in the main stem of Bear Creek. The irrigation and drainage study involves 25 sites in canals and natural drainageways. One hundred thirty-three samples were collected for analysis, and discharge was determined at the time of collection. The diel study includes six sites on Bear Creek. (Woodard-USGS)
W77-10015

OIL SPILL IDENTIFICATION SYSTEM.
Coast Guard Research and Development Center, Groton, Conn.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-033 803, Price codes: A02 in paper copy, A01 in microfiche. Interim Report No CG-D-41-75, October 1974. 53 p, 24 fig, 8 tab, 8 append.

Descriptors: *Oil spills, *Pollutant identification, *Water pollution sources, *Oil pollution, Analytical techniques, *Waste identification, Oil wastes.

The U.S. Coast Guard Research and Development Center has developed a system for forensic identification and classification of oil spills. This system is comprised of procedures for sampling, sample transmittal and four independent analytical techniques: infrared and fluorescence spectroscopy, gas chromatography, and thin-layer chromatography. Each analytical technique has been developed to a high degree of reliability and its effectiveness tested under controlled conditions (simulated spills and weathering). The methods were tested in ten simulated spills involving 63 samples. The merits of the identification system have been demonstrated in thirty-eight real world spill cases. In every case, all analytical methods agreed on one source as responsible for the oil spill. In all verifiable cases (approx. 25%) the analytical methods identified the true source. (Sinha-OEIS)
W77-10024

MERCURY DETECTION SIMPLIFIED.
Council for Scientific and Industrial Research, Pretoria (South Africa).
Scientiae, Vol. 16, No. 2, p 18, 1975. 1 fig.

Descriptors: *Pollutant identification, *Mercury, Heavy metals, Sediments, Environment, Industrial water, Water quality, Microwaves, Sampling, Analytical procedures.

Mercury is one of the most dangerous heavy metals in the environment. Because fish and many other organisms have the ability to accumulate this metal, it can cause poisoning even when concentrations detectable in the surrounding environment are extremely low. The monitoring of mercury is essential in any environmental program. A very sensitive method of detection is required, but because of the number and variety of samples to be tested, it should also be simple and practicable. The new method developed by the National Physical Research Laboratory of the Council for Scientific and Industrial Research (CSIR), which uses microwave discharge, has lowered the required concentration of mercury by several orders of magnitude - from 10 to the 9th power to 10 to the 17th power - so that a sample of only 100ml is now sufficient for a test. (So African Water Info Center)
W77-10084

PARAMETERS WHICH INFLUENCE THE ORGANIC CARBON DETERMINATION IN WATER,
National Inst. for Water Research, Pretoria (South Africa).
R. A. Van Steenderen.
Water SA, Vol. 2, No. 4, p 156-159, October 1976. 2 fig, 4 tab, 10 ref.

Descriptors: *Pollutant identification, *Carbon, Sampling, Water analysis, Sample storage, Dissolved solids, Membrane filters, Filtration, Retention, Acidification, Temperature effect, Statistical analysis, Sewage effluents.
Identifiers: *Organic carbon.

An automated Beckman TOC analyser Model 915 was used to study the parameters influencing the organic carbon content of a water sample. Samples must be stored in all glass sealed containers and analysed without delay, or preserved with silver sulphate solution and stored at 4C. DOC samples must be filtered through a 0,45 microgram membrane filter. Acidifying of water samples to remove inorganic carbon is not recommended. (So African Water Info Center)
W77-10092

MICROCYSTIS TOXINS: ISOLATION, IDENTIFICATION, IMPLICATIONS,
National Inst. for Water Research, Pretoria (South Africa).
D. F. Toerien, W. E. Scott, and M. J. Pitout.
Water SA, Vol. 2, No. 4, p 160-162, October 1976. 3 fig, 1 tab, 12 ref.

Descriptors: *Pollutant identification, *Algal toxins, *Bioassay, Chromatography, Electrophoresis, Eutrophication, Peptides.
Identifiers: Hartbeespoort Dam, South Africa, Microcystis aeruginosa.

The nature of Microcystis toxin from Hartbeespoort Dam was reinvestigated. Column and thin layer chromatography and electrophoresis procedures indicated the presence of two toxins, both peptides. The results indicate that the suggestion of Louw (1950) that the toxin of M. toxica is an alkaloid, was erroneous and that the local toxins are similar to the Canadian ones. Since the local toxins can cause the death of a wide variety of animals, produce irreversible liver damage at subacute concentrations, and may not be removed by conventional water treatment processes, these toxins are presently regarded as potential health hazards. Eutrophication problems in South African impoundments are increasing and further research on the nature of the toxins and the conditions under which they are produced are in progress. (So African Water Info Center)
W77-10093

DEHYDRATION OF MARINE ZOOLOGICAL MATERIAL - VOLATILITY OF METABOLISED SELENIUM AT 105-120C,
Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries.
H. O. Fourie, and M. Peisach.
South African Journal of Science, Vol. 72, No. 11, p 349, November 1976. 1 fig, 3 ref.

Descriptors: *Pollutant identification, *Oysters, Cadmium, Lead, Salts, *Dehydration, Marine animals, Trace elements, Heavy metals, *Bioindicators, Temperature effect, Accuracy, Evaluation, Radioisotopes, Volatility.
Identifiers: Crassostrea gigas, South Africa, *Selenium.

The oyster Crassostrea gigas is a known indicator species useful for measuring trace element concentrations in the marine environment. Oyster flesh, with a water content of 90% by mass, is generally oven-fried at low temperatures or freeze-dried, on the assumption that accumulated trace metals retain their inorganic nature and are analysed as inorganic salts, for determining recovery yields. Losses under experimental conditions were considered unlikely. Recent investigations showed that experimental conditions were considered unlikely. Recent investigations showed that losses of ingested radio-active inorganic salts did occur during dehydration, thus implying a change in chemical form during the accumulation process. The reported losses were statistically significant for Se, Cd and Pb. Evidence is reported of the recovery of volatile Se. Similar studies on Cd an Pb will be undertaken. (So African Water Info Center)
W77-10095

5B. Sources Of Pollution

AN ENERGY BALANCE FOR ALGAL POPULATIONS IN LIGHT-LIMITING CONDITIONS,
For primary bibliographic entry see Field 5C.
W77-09609

THE PHYSICO-CHEMICAL LIMNOLOGY OF THE MWENDA RIVER MOUTH, LAKE KARIBA,
Rhodesia Univ., Salisbury. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-09614

THE ROLE OF HUMIC ACIDS IN THE UPTAKE AND RELEASE OF MERCURY BY FRESHWATER SEDIMENTS,
R. W. Miller.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 2082-2086, 1975. 1 fig, 4 tab, 9 ref. EPA R-800427.

Descriptors: *Humic acids, *Mercury, Adsorption, Sedimentation, Organic matter, *Bottom sediments, Dispersion, Movement, Freshwater, *Sediments, Waste water treatment.

Investigations of the removal of mercury from freshwater ecosystems by sedimentary and suspended particulate shows that a cycle of mercury uptake and release involving humic acid occurs in whole sediments under laboratory conditions. Since mercury levels seldom exceed 0.1 ppm in natural waters, almost total mercury removal occurs and only the rate of uptake by the sediments varies. The great difference noted in the mercury uptake rate from water between core tubes and shaken sediments is due to the greater surface area exposed in disturbed sediments, but in most natural systems it may take days or weeks for total removal of mercury from the water. After deposition in the sediments, part of the mercury is associated with humic acid. The amount complexation and reduction processes are controlled by the ratio of humic acid to mercury, as at low humic acid levels the reduction process is limited. As the humic acid concentration increases, the rate of elemental mercury increases, but this is offset by a greater amount of complex formation between humic acid and mercury. When the humic acid is in great excess, all the mercury is strongly bound and is unable to be released. (Auen-Wisconsin)
W77-09615

THE CONSEQUENCES OF IMPOUNDMENT ON AN ARCTIC CHAR LAKE SYSTEM. AN ANALYSIS BY SIMULATION MODELLING,
P. E. Grotnes.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 2529-2537, 1975. 4 fig, 2 tab, 17 ref.

Descriptors: *Model studies, *Impoundments, *Fish, Simulation analysis, Fishing, Fish reproduction, Fish diets, Littoral, Fish food organisms, Fish populations, Biomass, Aquatic environment, Growth stages, Deep water, Lake trout, Subarctic, Salmonids.
Identifiers: Skjomen lake system(Scandinavia).

A digital simulation model of the quasiparallel discrete events sequencing type was developed in order to study the compounded effects of impoundments on fish of the pelagic block and fish of the littoral block. The Skjomen lake system, a char lake system of three subarctic, oligotrophic lakes, was used as a reference. Results indicate that the model was not conclusive as to the most important factor. Food variations gave a response in biomass variation, but the biomass increase was not accompanied by a comparable increase in the catchable portion, and conspicuous increases in catch and sizes of fish caught would not result from a food increase alone. The biomass decreased most severely due to the loss of reproduction for a few years even when the food supply was constant. The catchable biomass was at its largest only when reproduction was reduced. Influence of a 20% annual reduction by fishing of the larger sized individuals seemed to be less important that the reproduction and food level factors. The model predicted that the increases in catches in the first years after the impoundment was a compounded result of a real increase in the fish biomass and increasingly younger pre-impoundment year classes reaching catchable weight. The reduction in catch first occurred when all year classes born before impoundment reached catchable fish sizes. (Luedtke-Wisconsin)
W77-09616

RATES OF TRANSPORT OF TOTAL PHOSPHORUS AND TOTAL NITROGEN IN MACKENZIE AND YUKON RIVER WATERSHEDS, N.W.T. AND Y.T., CANADA,
For primary bibliographic entry see Field 5C.
W77-09617

INTENSIVE LARGE CITY INFLUENCE ON REED-BANKS, (IN GERMAN),
Technische Universitaet, Berlin (West Germany). Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W77-09621

EXPERIMENTS ON THE EFFECTS OF INORGANIC ENRICHMENT OF RIVERS ON PERIPHYTON PRIMARY PRODUCTION.
For primary bibliographic entry see Field 5C.
W77-09625

GROWTH AND PHOTOSYNTHESIS DURING THE FORMATION OF A BENTHIC ALGAL COMMUNITY,
For primary bibliographic entry see Field 5C.
W77-09627

DEGRADATION OF A NONIONIC SURFACTANT IN SOILS AND PEAT,
California Univ., Riverside. Dept. of Soil Physics.
N. Valoras, J. Letey, J. P. Martin, and J. Osborn.
Soil Science Society of America Journal, Vol. 40, No. 1, p 60-63, January-February 1976. 3 fig, 4 tab, 7 ref. OWRT B-141-CAL(13).

Descriptors: *Surfactants, *Soil water movement, Soils, Soil investigations, Soil properties, *Peat, Adsorption, Soil moisture, Organic matter, Water pollution, Water quality.
Identifiers: *Surfactant degradation(Soils).

Nonionic surfactants are used to improve water movement into water-repellent soils. The effective longevity of treatment and potential water pollution are affected by surfactant degradation. Degradation of C-14-labeled Soil Penetrant 3685, a nonionic surfactant, was measured in incubation studies in the laboratory. Three soils and one peat, numerous surfactant concentrations, and two soil-moisture levels were used as experimental variables. Plots of degradation percentage versus time produced 'S' type curves. Increasing the concentration increased the lag period prior to most rapid degradation. The most rapid and highest percentage of degradation were generally associated with soil materials having the lowest adsorptive capacity for the surfactant. From about 75 ot 85 % of the C-14 was evolved as (C-14) 02 in 1 year for the most favorable conditions for degradation. Degradation rate was decreased by decreasing the soil-moisture content. Degradation of soil organic matter was not greatly affected by surfactant applications--< about 10,000 ppm, but progressively decreased with higher surfactant concentrations. (Skogerboe-Colorado State)
W77-09638

EFFECT OF PRETREATMENT ON LOSS OF NITROGEN-15-LABELLED FERTILIZER NITROGEN FROM WATERLOGGED SOIL DURING INCUBATION,
Prairie View A and M Coll., Tex.
For primary bibliographic entry see Field 2G.
W77-09643

PICLORAM DEGRADATION IN SOILS AS INFLUENCED BY SOIL WATER CONTENT AND TEMPERATURE,
Agricultural Research Service, Fort Collins, Colo.
W. D. Guenzi, and W. E. Beard.
Journal of Environmental Quality, Vol. 5, No. 2, p 189-192, April-June 1976. 2 fig, 5 tab, 16 ref.

Descriptors: *Pesticides, *Herbicides, Laboratory tests, Temperature, Soil investigations, Soils, Field capacity, *Pesticide residues, *Microbial degradation, Soil water, Water pollution sources.
Identifiers: *Picloram degradation(Soils).

A laboratory experiment was designed to determine the effect of temperature and alternating incubations at field capacity and during drying periods on the degradation of picloram in five soils. Picloram was added at a rate of 10 ppm, and degradation was measured by (C-14) 02 evolution resulting from the cleavage of the labeled carboxyl carbon. Picloram degraded very little at 5C and increased only slightly up to 25C. Three soils were highest in degradation rates at 30C while two soils were highest at 50C. Picloram degradation rates during 20-day incubation periods at field capacity, interrupted with 16-day drying cycles, varied among soils and decreased after each successive drying cycle at 30 and 50C, except for one soil at 50C. The degradation rate decreased gradually as water content decreased from field capacity (approximately 0.33 bar) to 15 bars tension, and ceased after the soils were air dried. (See also W74-02383) (Skogerboe-Colorado State University).
W77-09644

DISTRIBUTION OF PLUTONIUM IN TRINITY SOILS AFTER 28 YEARS,
Los Alamos Scientific Lab., N. Mex.
J. W. Nyhan, F. R. Miera Jr., and R. E. Neher.
Journal of Environmental Quality, Vol. 5, No. 4, p 431-437, October-December 1976. 6 fig, 4 tab, 22 ref.

Descriptors: Soils, *Soil investigations, Nuclear wastes, Nuclear explosions, Sampling, Soil horizons, Soil profiles, Carbonates, *Distribution, *Path of pollutants, Water pollution sources.
Identifiers: *Trinity soils, *Plutonium.

The soils of four intensive study areas located along the fallout pathway of Trinity, the first nuclear detonation, were sampled to determine soil plutonium concentrations as a function of distance from Ground Zero and soil depth. About half of the 239,240Pu in Trinity soils was found at the 5-20 cm depth in 1973 compared to total plutonium inventories found only in the upper 5 cm of soil about 20 years ago. Soil plutonium concentrations of samples collected at the same depth of each study area generally exhibited coefficients of variation > 1.2. Maximum penetration depths of 239,240Pu into Trinity Site soils were related to the presence of subsoil horizons containing carbonate accumulations and the maximum extent of rainwater penetration into these soil profiles. (Skogerboe-Colorado State)
W77-09647

PREDICTING 2,4,5-T MOVEMENT IN SOIL COLUMNS,
New Mexico Agricultural Experiment Station, University Park.
G. A. O'Connor, M. Th. Van Genuchten, and P. J. Wierenga.
Journal of Environmental Quality, Vol. 5, No. 4, p 375-378, October-December 1976. 8 fig, 1 tab, 9 ref.

Descriptors: *Model studies, Effluents, *Tritium, Soils, Soil investigations, Forecasting, Adsorption, *Pesticides, Herbicides, *2-4-5-T, Soil water movement, *Path of pollutants, Water pollution sources.
Identifiers: Soil columns, Solute transport, Breakthrough curves.

A solute model developed by van Genuchten and Wierenga was used to calculate 2,4,5,-T effluent data from soil columns. The model had been previously shown to adequately predict effluent data given model parameters curve fit to a portion of the effluent curve. The present work shows that 2,4,5,-T effluent curves may be adequately predicted without prior knowledge of the effluent curves for a particular soil column given: (1) model parameters derived from 2,4,5,-T effluent curves for other soil columns, or (2) model parameters obtained from tritium effluent curves for the same columns. The data suggest that once the physical model parameters have been characterized for a soil, reasonable predictions of 2,4,5,-T (and perhaps other solutes) transport can be made given the adsorption coefficient for the solute. (Skogerboe-Colorado State)
W77-09649

SIMULTANEOUS TRANSPORT OF NITRATE AND GASEOUS DENITRIFICATION PRODUCTS IN SOIL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. E. Rolston, and M. A. Marino.
Soil Science Society of America Journal, Vol. 40, No. 6, p 860-865, November-December 1976. 5 fig, 2 tab, 17 ref.

Descriptors: Fertilizer, Fertilization, *Nitrates, *Denitrification, Soil properties, Soil investigations, Soil water, *Soil water movement, Leaching, Path of pollutants, Water pollution sources.

A pulse of NO3(-) fertilizer tagged with N-15 was applied to 100 cm long Yolo loam (Typic Xerorthents) topsoil and subsoil columns maintained uniformly unsaturated at soil-water pressure heads between -20 and -140 cm of water at soil-water fluxes between 1.0 and 0.1 cm day(-1). Nitrate, molecular nitrogen, and nitrous oxide from the applied fertilizer were measured as a function of soil depth and time until the NO3(-) pulse eluted from the column. An analytical solution describing the transport and transformation of NO3(-) was used to determine values for the first-order denitrification rate constants within the columns. A numerical solution of the coupled equations for transport and transformation of NO3(-) and diffusion of the gaseous denitrification products was compared with measured N2 and N2O concentration profiles within columns. The gaseous concentration profiles were very much dependent upon values of the denitrification rate constant and the soil gaseous diffusion coefficient. Values of the soil gaseous diffusion coefficient, more than an order of magnitude smaller than those values measured in the upper part of the column, were required to approximately fit the numerical solution to the measured gas concentration profiles. (Skogerboe-Colorado State)
W77-09653

EFFECTS OF BORON AND NITROGEN ON GRAIN YIELD AND BORON AND NITROGEN CONCENTRATIONS OF BARLEY AND WHEAT,
Department of Agriculture, Charlottetown (Prince Edward Island). Research Station.
For primary bibliographic entry see Field 3F.
W77-09655

INFLUENCE OF IONIC STRENGTH AND INORGANIC COMPLEX FORMATION ON THE SORPTION OF TRACE AMOUNTS OF CD BY MONTMORILLONITE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
J. Garcia-Miragayma, and A. L. Page.
Soil Science Society of America Journal, Vol. 40, No. 5, p 658-663, September-October 1976. 5 fig, 3 tab, 20 ref.

Descriptors: *Cadmium, Sorption, *Montmorillonite, *Clays, Soils, Soil investigations, *Soil chemistry, Heavy metals, *Trace elements, *Ions, Sorption, Soil surfaces.

Cadmium sorption by montmorillonite from solutions in the 15 to 120 ppb range was studied in the presence of increasing concentrations of NaCl04, NaCl, and Na2SO4 solutions. The ionic strengths ranged from 0.01 to 1.00. Increasing ionic strengths decreased the amount of Cd sorbed on the clay surfaces. The percentage sorbed decreased from aount 90% for I=0.01 to about 50% for I=1.00 in the Cl04 systems. The sorption of Cd in the chloride system was in the range between 25 to 50% less than the Cl04 systems for the same ionic strength. This was attributed to the presence of uncharged and negatively charged complexes of Cd and Cl ligands. This fact has some implications, especially in arid zone soils where high Cl concentrations in soil solution are not unusual; there, Cd will behave mainly as a neutral species (CdC12(0)) and as an anion (CaCl3(-) and CdC14(2-)), rather than as a cation (Cd(2+)). The SO4 systems showed a moderate decrease in the amount of Cd sorbed with respect to the Cl04 systems for the same salt concentrations. This observation was interpreted as due to the presence of a fraction of Cd in solution as the CdSO4(0) species. (Skogerboe-Colorado State)
W77-09658

CHEMICAL DISTRIBUTION AND GASEOUS EVOLUTION OF ARSENIC-74 ADDED TO SOILS AS DSMA-(74)AS,
Tennessee Univ., Knoxville. Dept. of Plant and Soil Science; and Tennessee Univ., Knoxville. Agricultural Experiment Station.
M. B. Akins, and R. J. Lewis.
Soil Science Society of America Journal, Vol. 40, No. 5, p 655-658, September-October 1976. 5 tab, 17 ref.

Descriptors: *Arsenic compounds, Organic matter, Soil moistures, Soils, Soil investigations, *Distribution, *Path of pollutants, Soil treatment.
Identifiers: *Arsenic residues(Soils).

Gaseous evolution of (74)As from a soil treated with arsenic-74 labeled disodium methanearsonate at 100 micro g/g was a function of organic matter addition and moisture conditions. Loss of (74)As was greatest from soils that received an exogenous carbon source and were maintained under wet conditions. Arsenic-74 sorbed by soils of pH 4, 6, and 8 was fractionated by a differential dissolution procedure commonly used for phosphorus. Iron arsenate (soluble in 0.1N NaOH) was the most abundant form followed by aluminum arsenate (soluble in 0.5N NH4F). The soils generally contained more aluminum arsenate at pH 4 than at pH 6 or 8. Calcium arsenate fractions (soluble in 0.5N H2SO4) were usually higher at pH 6 and 8 than at pH 4. Water-soluble forms and nonextractable forms were inversely proportional to each other. (Skogerboe-Colorado State)
W77-09659

COMPETITION FOR MERCURY BETWEEN RIVER SEDIMENT AND BACTERIA,
Ottawa Univ. (Ontario). Dept. of Biology.
S. Ramamoorthy, S. Springthorpe, and D. J. Kushner.
Bulletin of Environmental Contamination and Toxicology, vol 17, no 5, p. 505-511, 1977 1 tab, 2 fig, 14 ref.

Descriptors: *Mercury, Metals, *Sediments, Water quality, Water pollution effects, *Path of pollutants, Laboratory tests, *Bacteria, *Microorganisms, *Sediment-water interface, Clay minerals, *Canada.
Identifiers: *Clay sediments, Pseudomonas, *Mercury ions, *Mercury exchange, *Ottawa River.

Laboratory experiments show that bacteria compete very effectively with sediment in accumulating mercuric ions from river water. (Katz).
W77-09661

MERCURY ACCUMULATION BY LARGEMOUTH BASS (MICROPTERUS SALMOIDES) IN RECENTLY IMPOUNDED RESERVOIRS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5C.
W77-09667

HISTOPATHOLOGIC ALTERATIONS IN SHELL GLAND ACCOMPANYING DDT-INDUCED THINNING OF EGGSHELL,
Army Veterinary Corps, Aberdeen Proving Grounds, Md. Veterinary Pathology Biomedical Labs.
For primary bibliographic entry see Field 5C.
W77-09673

NITROGEN FIXATION IN ARCTIC MARINE SEDIMENTS: EFFECT OF OIL AND HYDROCARBON FRACTIONS,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Microbiology.
R. Knowles, and C. Wishart.
Environmental Pollution, vol. 13, p 133-149, 1977. 7 fig., 9 tab., 30 ref.

Descriptors: *Oil, Water pollution effects, *Sediments, *Nitrogen fixation, *Arctic, *Bacteria, *Anaerobic bacteria, *Inhibitors, Nitrogen cycle, Bottom sediments, Bottom sampling, Laboratory tests, Carbon cycle, Clostridium, Carbohydrates, Organic compounds.
Identifiers: *Arctic marine sediments.

Nitrogen fixation (acetylene reduction was measured in grab and core samples of sediments from the Beaufort Sea and Eskimo Lakes, Northwest Territories, Canada. Very low rates (about mg N/square meter/year) were detected in untreated sediments. Activity was stimulated by the addition of glucose, sucrose, lactose, mannitol, and malate but much less so by acetate; negligible activity was supported by N-acetylglucosamine. There was no consistent effect of the presence or absence of oxygen. Nitrogen fixation potentials in glucose-supplemented sediment samples showed large variation between stations, between samples from the same station and between depths within single cores down to 18 cm. Weathered Norman Wells crude oil, hexance, decane, dodecane, and hexadecane had no effect on nitrogen fixation or carbon dioxide evolution. There was no evidence of the utilization of any of the hydrocarbons tested during periods of over 30 days under experimental conditions. (Katz)
W77-09676

THE EFFECT OF WIND ON THE DISTRIBUTION OF CHLOROPHYLL A AND CRUSTACEAN PLANKTON IN A SHALLOW EUTROPHIC RESERVOIR,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
D. G. George, and R. W. Edwards.
The Journal of Applied Ecology, vol. 13, no. 3, p 667-704, December 1976. 2 tab, 20 fig, 28 ref.

Descriptors: *Zooplankton, *Algae, *Cyanophyta, *Chlorophyll, *Distribution patterns, *Spatial distribution, *Winds, *Air circulation, Shallow water, Reservoirs, Crustaceans, Lake breezes, Eutrophication, Water pollution effects, *Path of pollutants.
Identifiers: Eglwys, Ngnydd, *Wales(South).

The horizontal and vertical distribution patterns of chlorophyll a. and crustacean zooplankton in a shallow reservoir were studied in relation to wind-induced water movements. Plankton distribution patterns could be explained in terms of an interaction between the vertical movement of the organisms and mechanical transport. When green algae or diatoms were dominant, chlorophyll remained homogeneously distributed both vertically and horizontally. Bouyant blue-green algae and positively phototactic crustacea both tended to accumulate downwind. Local concentrations of blue-green algae appeared at wind speeds below 400 cm/s. Zooplankton patches were capable of forming even under high winds. Using the ratio of mean crowding to mean density as an index of vertical and horizontal heterogeneity, the formation of horizontal aggregations in both blue-green algae and the zooplankton could be predicted from a knowledge of their vertical distribution. The appearance of systematic concentration gradients in the blue-green algae provided a basis for a crude model of algae accumulation. A series of empirical relationships was derived, and used to forecast conditions under which undesirable downwind accumulations of blue-green algae could occur. (Katz)
W77-09679

SEASONAL VARIATION IN TEMPERATURE, SALINITY, AND DENSITY OVER THE CONTINENTAL SHELF OFF OREGON,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2L.
W77-09703

THE EFFECT OF EXCHANGE REACTIONS BETWEEN FRASER RIVER SEDIMENT AND SEAWATER ON DISSOLVED CU AND ZN CONCENTRATIONS IN THE STRAIT OF GEORGIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-09707

FLUSHING CHARACTERISTICS OF A MISSISSIPPI DEAD-END CANAL SYSTEM,
University of Southern Mississippi, Hattiesburg. Dept. of Geology.
O. L. Paulson, Jr., G. F. Pessoney, H. Battalora, R. Williams, and J. Eastman.
Water Resources Bulletin, Vol. 13, No. 2, p 341-348, April 1977. 5 fig, 13 ref.

Descriptors: *Canals, *Water circulation, *Water pollution sources, *Mississippi, Tides, Tidal waters, Dye releases, Dye concentration, On-site investigations, Water temperature, Salinity, Conductivity, Coliforms, Hydrogen ion concentration, Turbidity, Biochemical oxygen demand, Dissolved oxygen, Bathymetry, Coasts, Path of pollutants.
Identifiers: *Canal flushing, Dead-end canals, Man-made canals, Residential canals.

A study of residential canal system on the Mississippi Gulf Coast and adjacent natural water bodies was conducted to determine the relationship in flushing characteristics between man-made and natural systems. The comparison was based on measurements of temperature, salinity, conductivity, coliform, pH, transparency, biological oxidation demand, dissolved oxygen, bathymetry, tides, water velocity, and Rhodamine dye concentrations. The results indicate that coliform bacteria increase with increasing distance of stations from St. Louis Bay and dissolved oxygen decreases in a similar manner. Biological oxidation demand was low at all stations; showing no differences between natural and man-made systems. The canal system studied was shallower than adjacent water bodies, and water velocities in the canal system are a function of tidal amplitude. Velocities in the river are affected by both tides and runoff. The other parameters measured show little or no difference between natural and man-made systems, but reflect overall seasonal changes. Flushing rates between the residential canal systems and an adjacent natural system are equivalent on the basis of decline in dye concentrations measured over a five-day period. (Sims-ISWS)
W77-09721

DOMESTIC AND AGRICULTURAL CONTRIBUTIONS TO THE INPUTS OF PHOSPHORUS AND NITROGEN TO LOUGH NEAGH,
Northern Ireland Dept. of Agriculture, Antrim. Freshwater Biological Investigation Unit.
R. V. Smith.
Water Research, Vol. 11, No. 5, p 453-459, May 1977. 4 fig, 10 tab, 15 ref.

Descriptors: *Water pollution sources, *Lakes, Pollutants, *Nutrients, *Nitrogen, *Nitrates, *Phosphorus, Animal populations, Domestic animals, Agriculture, Agricultural runoff, Cities, Urban runoff, Urbanization, Rivers, Foreign countries, Foreign research, Drainage, Runoff, Water pollution, *Path of pollutants.
Identifiers: *Lough Neagh(Northern Ireland), *Northern Ireland.

Loadings of nitrogen and phosphorus from the major river catchments that contribute to Lough Neagh were measured for the years 1971-1974. Analysis of the data indicated that there was a very significant correlation between soluble ortho-P loadings and the human, but not the animal, population densities of the catchments. The land drainage and agricultural contribution of soluble ortho-P to Lough Neagh was 0.14 kg P/ha/yr,

which was about 25% of the measured soluble ortho-P loading to the Lough. It was estimated that the introduction of phosphorus removal treatment at sewage works connected to populations greater than 2000 could curtail 50% of the phosphorus available to support algal growth in the Lough. There was a good correlation between nitrogen fertilizers usage in Northern Ireland and the nitrate concentration in the major rivers. (Sims-ISWS)
W77-09722

LOGGING ROADS AND PROTECTION OF WATER QUALITY.
Arnold, Arnold and Associates, Seattle, Wash.; and Dames and Moore, Seattle, Wash.
For primary bibliographic entry see Field 5G.
W77-09725

LOADING FUNCTIONS FOR ASSESSMENT OF WATER POLLUTION FROM NONPOINT SOURCES,
Midwest Research Inst., Kansas City, Mo.
A. D. McElroy, S. Y. Chiu, J. W. Nebgen, A. Aleti, and F. W. Bennett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 325, Price codes: A20 in paper copy, A01 in microfiche. Environmental Protection Agency Technology Series, Report EPA-600/2-76-151, May, 1976. 465 p, 50 fig, 89 ref, 75 tab.

Descriptors: *Water pollution sources, Water pollution, Runoff, Salinity, Nitrogen, Phosphorus, Pesticides, Urban runoff, Mine wastes, Farm wastes, Agricultural runoff, Construction, Surface runoff, Nutrients, Model studies, Hydrology, Heavy metals, Pollutants, Forests, Watersheds(Basins), *Waste assimilative capacity.
Identifiers: *Nonpoint pollution sources, *Waste loading functions.

Methods for evaluating the quantity of water pollutants generated from nonpoint sources, including agriculture, silviculture, construction, mining, runoff from urban areas and rural roads, and land disposal sites, are developed and compiled for use in water quality planning. The loading functions, plus in some instances emission values, permit calculation of nonpoint source pollutants from available data and information. Natural background was considered to be a source and loading functions are presented to estimate natural or background loads of pollutants. Loading functions/values are presented for average conditions, i.e., annual average loads expressed as metric tons/hectare/year (tons/acre.year). Procedures for estimating seasonal or 30-day maximum and minimum loads are also presented. In addition, a wide variety of required data inputs to loading functions, and delineation of sources of additional information are included in the report. An evaluation of limitations and constraints of various methodologies which will enable the user to employ the functions realistically is also presented. (Witt-IPC)
W77-09726

USING O(XYGEN) D(EMAND) I(NDEX), COD, AND BOD TESTS TO CHARACTERIZE KRAFT MILL EFFLUENT,
Saint Mary's Univ., Halifax (Nova Scotia). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-09729

CHARACTERIZATION OF SPENT BLEACHING LIQUORS. PART 1, SPENT LIQUORS FROM THE CHLORINE AND ALKALI EXTRACTION STAGES IN THE PREBLEACHING OF PINE KRAFT PULP,
Swedish Forest Products Research Lab., Stockholm.
For primary bibliographic entry see Field 5A.
W77-09731

DILUTION CHARACTERISTICS OF EFFLUENTS IN DEEP WATER RESERVOIRS DETERMINED WITH A RADIOACTIVE INDICATOR (ON THE EXAMPLE OF LAKE BAIKAL), (IN RUSSIAN),
V. A. Vetrov, and S. A. Dekii.
In: Materialy Vsesoyuznogo Nauchnogo Simpoziuma Sovremennym Problemam Samoochishcheniya Regulirovaniya Kachestva Vody, 5th, Vol. 1, p 22-27, 1975. 4 fig, 3 ref.

Descriptors: *Deep water, *Waste dilution, *Tracers, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Gold radioisotopes, Pollutants, Foreign countries, Chlorides, Ions, Radioactivity, Water quality, Pulp and paper industry.
Identifiers: *Lake Baikal(USSR), *USSR.

The dilution of pollutants in deep natural waters can be determined using a radioactive isotope as indicator. The indicator is added at the point of effluent discharge, and the radioactivity in various zones of the water reservoir is measured by means of a probe lowered from a vessel. From data thus collected, the dilution coefficients can be calculated, and from such coefficients in a large area a dilution field can be obtained and used to predict concentrations of pollutants. This method was used to determine the distribution of effluent from the Baikal pulp and paper mill in Lake Baikal. The indicator was Au-198 (in the form of chloroauric acid) which has a half-life of 2.7 days. The experiments were conducted over a period of 3 years, during various seasons. From the data obtained, a model of dilution was drawn to a depth of 50 m. This model was compared with the concentrations of chloride ions at the same measurement points, and the coefficients of chloride ion dilution were calculated. There was a good correlation between the two sets of measurements. (Stapinski-IPC)
W77-09735

NITRATE AND PHOSPHATE CONTENT OF GROUND AND SURFACE WATERS OF THE WHITE RIVER DRAINAGE, NORTHWEST NEBRASKA,
Union Coll., Middlesboro, Ky. Environmental Education Center.
C. E. Baker.
Trans Nebr Acad Sci. Vol 2, p 144-151, 1973.

Descriptors: *Phosphates, *Nitrates, Water pollution sources, Water pollution effects, Drainage, Nebraska.
Identifiers: Cyanosis, Infants, White River(Neb), Methemoglobinemia.

Selected stream and ground water sites in the White River Drainage Basin were sampled for phosphate and nitrate content. The sampling procedure was designed to elucidate the impact of each tributary drainage area on water quality of the White River. Concentration of nitrates found in surface waters was 5.7 plus or minus 1.75 ppm (X plus or minus SD), while that of phosphates was 0.67 plus or minus 0.33 ppm. Ground water contained higher concentrations of both contaminants, 8.81 plus or minus 0.66 ppm for nitrates and 0.82 plus or minus 0.20 ppm for phosphates. The White River increased in nitrate content at each downstream sampling site. Values ranged from 4.4 ppm near the headwaters to 7.7 ppm at the farthest point sampled downstream. The highest nitrate concentration found in any stream sampled was 9.9 ppm, and the highest in ground water was 25.7 ppm. These concentrations, especially the latter, are high enough to induce cyanosis due to methemoglobinemia if consumed by infants.--Copyright 1975, Biological Abstracts, Inc.
W77-09743

WATER TRANSPORT OF WOOD (IN CANADA): THE CURRENT SITUATION,
Environmental Protection Service, Regina (Saskatchewan). Water Pollution Control Branch.
For primary bibliographic entry see Field 5C.
W77-09755

FOREST HARVEST, RESIDUE TREATMENT, REFORESTATION, AND PROTECTION OF WATER QUALITY.
Montgomery (James M.), Inc., Boise, Idaho.
For primary bibliographic entry see Field 5G.
W77-09756

AQUATIC FIELD SURVEYS AT RADFORD, HOLSTON, VOLUNTEER, AND MILAN ARMY AMMUNITION PLANTS - VOLUME I - RADFORD,
WAPORA, Inc., Washington, D.C.
For primary bibliographic entry see Field 5C.
W77-09761

AQUATIC FIELD SURVEYS AT RADFORD, HOLSTON, VOLUNTEER, AND MILAN ARMY AMMUNITION PLANTS, VOL. II - HOLSTON - FINAL REPORT,
WAPORA, Inc., Washington, D.C.
For primary bibliographic entry see Field 5C.
W77-09762

AQUATIC FIELD SURVEYS AT RADFORD, HOLSTON, VOLUNTEER, AND MILAN ARMY AMMUNITION PLANTS, VOLUME IV - MILAN, FINAL REPORT,
WAPORA, Inc., Washington, D.C.
For primary bibliographic entry see Field 5C.
W77-09763

CATALYTIC DEOXYGENATION OF AQUEOUS SOLUTIONS BY HYDRAZINE,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
P. A. Lurker.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 794, Price codes: A02 in paper copy, A01 in microfiche. Report AMRL-TR-76-23, May 1976. 19 p, 6 tab, 8 ref.

Descriptors: Oxygen, *Dissolved oxygen, Aqueous solutions, *Catalysts, *Iron, *Zinc, *Cobalt, *Nickel, Metals, Ions.
Identifiers: *Catalytic kinetics, *Reaction rates, *Hydrazine, 1,1-dimethyl-hydrazine, Unsymmetrical dimethyl hydrazine, *Catalytic deoxygenation, Reactions, *Propellants.

The catalytic effects of metallic ions at their reported maximum environmental water concentrations were studied in the deoxygenation by hydrazine in aqueous solutions. Fe(III), Fe(II), Zn(II), Co(II), and Ni(II) ions did not significantly enhance the deoxygenation of aqueous solutions. The thermal effects of the kinetic deoxygenation rate for hydrazine, MMH, and UDMH by the catalytic reactions with copper were studied. Previous work at this lab established a predictive model for the deoxygenation kinetic rate constant as a function of propellant and copper concentration. This was expanded to include a thermal ratio parameter. (Katz)
W77-09766

GEOCHEMICAL INTERACTIONS OF HEAVY METALS IN SOUTHEASTERN SALT MARSH ENVIRONMENTS,
Skidway Inst. of Oceanography, Savannah, Ga.
H. L. Windom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 250, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 600/3-76-023, March 1976. 35 p, 7 tab, 8 fig, 20 ref.

Descriptors: *Metals, *Mercury, *Cadmium, *Salt marshes, *Path of pollutants, Estuaries, *Geochemistry, Flocculation, Sediments, Water pollution, *Heavy metals, *Iron, *Manganese, *Salinity, Carbon, Southeast U.S.
Identifiers: *Metal complexes, Salt water sediments, *Heavy metal geochemistry, *Heavy metal transport, *Estuarine geochemistry, Coastal littoral waters, Salt marsh estuaries.

Results are summarized of a three year study of the transport, fate and geochemical interactions of mercury, cadmium, and other inorganic pollutants in the southeastern coastal littoral-salt marsh environment. The general objectives of the study were to determine: (1) the rate of input of these materials to salt marsh estuaries, (2) the geochemical interaction they experience there and, (3) their ultimate fate in coastal littoral waters. The results provide a base for future evaluation of the rates of inputs of the metals studied and their existing concentrations in the water and sediment column of salt marsh estuaries. The interactions of metals with organic matter in rivers and estuaries and their effect on transport and fate are discussed. The effects of processes such as flocculation, precipitation, adsorption, and desorption from particles in estuaries are evaluated. The distribution and rate of accumulation of Hg, Cd and other metals in salt marsh sediments are compared to their inputs to determine the amount of these metals that ultimately reach coastal littoral waters. And finally, the residence time of Hg and Cd in coastal littoral waters is estimated from their input rates and concentrations. (Katz)
W77-09767

VARIATIONS IN THE ABUNDANCE OF CHANNEL CATFISH YEAR CLASSES IN THE UPPER MISSISSIPPI RIVER AND CAUSATIVE FACTORS,
Iowa State Conservation Commission, Des Moines. Fisheries Section.
For primary bibliographic entry see Field 5C.
W77-09768

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: KETONIC SOLVENTS,
Syracuse Research Corp., N.Y. Center for Chemical Hazard Assessment.
S. A. Lande, P. R. Durkin, D. H. Christopher, P. H. Howard, and J. Saxena.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 970, Price codes: A10 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Toxic Substances, Report EPA-560/2-76-003, May, 1976. 330 p., 104 tab., 42 fig., 471 ref.

Descriptors: *Public health, *Solvents, Environment, Environmental effects, Chemical properties, Physical properties, Path of pollutants, *Freshwater fish, Aquatic environment, Pollution abatement, *Reviews, Water pollution, Bibliographies.
Identifiers: *Environmental hazards, *Ketonic solvents, *Cyclohexane, *Methyl ethyl ketone, *Methyl isobutyl ketone, *Isophorone, *Mesityl oxide, Environmental contamination, Bioconcentration, Bioaccumulation.

A review is presented of the potential environmental hazard from the commercial use of ketonic solvents, with the exception of acetone. Three ketones - cyclohexanone, methyl ethyl ketone, and methyl isobutyl ketone - dominate the market. Other commercial ketonic solvents include diacetone alcohol, isophorone, mesityl oxide, and acetophenone. Information on physical and chemical properties, production methods and quantities, commercial uses and factors affecting environmental contamination, as well as information related to health and biological effects, are reviewed. (Katz)
W77-09770

PETROLEUM HYDROCARBONS: DEGRADATION AND GROWTH POTENTIAL OF DEEP-SEA SEDIMENT BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-09772

WATER QUALITY: WESTERN FISH TOXICOLOGY STATION AND WESTERN OREGON RIVERS,
Corvallis Environmental Research Lab., Oreg. Western Fish Toxicology Station.
For primary bibliographic entry see Field 5A.
W77-09777

NATIONWIDE EVALUATION OF COMBINED SEWER OVERFLOWS AND URBAN STORMWATER DISCHARGES. VOLUME II: COST ASSESSMENT AND IMPACTS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W77-09874

STUDY OF THE DECOMPOSITION OF ORGANIC MATTER BY THE RESPIROMETRIC DILUTION METHOD (UNTERSUCHUNGEN UEBER DAS ABBAUVERHALTEN ORGANISCHER STOFFE MIT HILFE DER RESPIROMETRISCHEN VERDUENNUNGSMETHODE),
For primary bibliographic entry see Field 5D.
W77-09888

ADVANCE SEWER PLANNING FOR RIO DE JANEIRO COASTLINE,
ENCIBRA South America, Rio de Janeiro (Brazil).
For primary bibliographic entry see Field 5D.
W77-09890

CHANGES IN INORGANIC NITROGENOUS COMPOUNDS FROM SEPTIC TANK EFFLUENT IN A SOIL WITH A FLUCTUATING WATER TABLE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
R. B. Reneau Jr.
Journal of Environmental Quality, Vol. 6, No. 2, p 173-178, April-June, 1977. 6 fig, 4 tab, 26 ref.

Descriptors: *Nitrogen compounds, *Septic tanks, *Water table, *Nitrification, *Denitrification, Oxidation-reduction potential, *Soil disposal fields, Water table aquifer, Perched water, Chemical properties, Chemical reactions, Adsorption, Aerobic conditions, Anaerobic conditions, Soils, Monitoring, *Waste water disposal.

The fate of septic tank effluent inorganic nitrogenous fractions in soil was investigated. A Virginia test site had been used for nearly 15 years. The soil was a Varina sandy loam that was very slowly permeable to water and air. This resulted in a fluctuating water table. The septic tank system discharged about 700 gpd of effluent. The compounds monitored were NO3(-), NO2(-), and NH4(+), above and in the plinthic material. Redox potentials, pH, dissolved oxygen, and temperature were determined for field sub-samples. Inorganic N was found in septic tank effluent largely in the form of NH4(+). These concentrations significantly decreased with distance from the the drainfield. A reduction from 23 to 4.1 micrograms/milliliter was found 12 meters from the drainfield. Nitrate and nitrite concentrations, above the plinthic materials, remained at substantially the same levels for all distances. Decreased NH4(+) concentrations, as a function of distance from the drainfield, were due to the anaerobic decomposition of organic matter and to denitrification. At the 1.27-meter distance, NO2(-) accumulations probably indicated nitrification inhibition by high NH4(+) concentrations or heterotrophic conversion of NH4((+) to NO2(-). Nitrification and denitrification above the plinthic layer at this distance were possibly enhanced by the fluctuating water table. Data indicated that anaerobic conditions were sufficient to cause denitrification to a distance of 6.1 meters. Redox potentials near +200 mV (adjusted to 25C and pH7) were suggested in denitrification areas. Nitrite and NO3(-) in the plinthic horizon were not subjected to denitrification. Conditions for biological denitrification were not favored in this horizon. (Collins-FIRL)
W77-09907

A MATHEMATICAL MODEL FOR WATER QUALITY IN A COASTAL REGION IN TERMS OF SEA BOTTOM WASTE DEPOSITS (KAITEI OSENBUSSHITSU NADO NO EIKYO O KORYO SHITA KAIIKI NO SUISHITSU NO YOSOKU-MODERU NO KAIHATSU NI KANSURU KENKYU),
Public Works Research Inst., Tokyo (Japan).
H. Hashimoto, and T. Uda.
Kankocho Kogai Semnon Shiryo, Vol. 12, No. 1, p 66-81, 1977. 7 ref.

Descriptors: *Water quality, *Model studies, *Estuaries, Water quality control, *Mathematical models, Analysis, Chemical oxygen demand, Sedimentation, Adsorption, Organic matter, Waste disposal, Tidal effects, Dissolved oxygen, Suspended solids, Coasts.

A mathematical model was developed to evaluate the effect of waste water treatment levels, the establishment of sewage systems, and the control of land use for estuarine water quality control. Physical, chemical, and biological processes were investigated. Field data were analyzed in the Seto Inland Sea. Three-fourths of the total influent COD was removed by sedimentation, absorption, or decay. The remainder was dispersed to the Pacific Ocean. Seasonal variations of COD in summer and in winter were clear. Organic matter reproduction was active in summer and had an effect on water quality. Thermodine developed in water at depths of 5-10 meters. Convection and dispersion by tidal currents and the decay and reproduction of organic matter should be included in the model. Analyses of density effects were carried out by two layer tidal computation. Inclusion of tidal flow dispersion in the diffusion equation is advantageous, although it is difficult to calculate the diffusion coefficient. Consumption of dissolved oxygen, organic matter suspension due to tidal flow, and dissolution of bed nutrients determine the effect of waste deposits on water quality. The importance of waste deposits is not clearly understood due to the lack of data. A mechanical turbulence generator was developed to analyze mechanisms involved in waste deposit suspension. (Collins-FIRL)
W77-09911

THE IDENTIFICATION AND ADAPTIVE PREDICTION OF URBAN SEWER FLOWS,
Cambridge Univ. (England). Dept. of Engineering.
M. B. Beck.
International Journal of Control, Vol. 25, No. 3, p 425-440, March, 1977. 7 fig, 21 ref.

Descriptors: *Model studies, *Flow, *Sewers, *Treatment facilities, Hydrologic data, Overflows, Urban areas, Rainfall, Theoretical analysis, *Waste water treatment.

Studies were conducted to develop models for the identification and prediction of urban sewer input flows to treatment plants. Plant operations would be enhanced by a more precise knowledge of input material, which varies with time. Such knowledge would also minimize storm water overflows from sewers. Results were presented for identification of a stochastic input-output, time-series model

using the maximum likelihood method. Two steps were involved in the prediction problem: black-box model predictions estimated recursively with a least squares technique, and plant inflow prediction by a newly updated model and parameter estimates. The identification problem involved the determination of a dynamic model which related given rainfall measurements to the flow component. Adaptive prediction should identify the process equation by maximum likelihood methods; compute optimal, minimum variance, predictor; and compare the adaptive predictor for the unknown process with the optimal predictor for the known process. The major limitation of adaptive prediction was the poor quality of the data. (Collins-FIRL)
W77-09914

THE FATE OF POLLUTANTS IN SUBSURFACE ENVIRONMENTS,
Weston (Roy F.), Inc., West Chester, Pa.
A. A. Metry.
Journal of Environmental Sciences, Vol. 20, No. 2, p 27-31, March/April, 1977. 8 fig.

Descriptors: *Water pollution sources, *Pollutant identification, *Groundwater, *Model studies, Aquifers, Waste disposal, Seepage, Deep wells, Solid wastes, Leachates, Analysis, Water quality.

Groundwater will continue to be a growing source of water supply and aquifers may become alternatives for direct and indirect disposal of liquid and solid wastes. Groundwater pollution can develop from several sources: waste water disposal on land, seepage from waste water holding basins, deep well injection, and leachates from solid waste disposal. Two models were developed to predict leachate/pollutant migration and fate in subsurface environments. The first was a one-dimensional model for pollutant attenuation prediction in subsaturated media (soils), and the second was a two-dimensional model for pollutant migration and fate prediction in saturated media (aquifers). The models include the mass-transport mechanisms of molecular diffusion, convective dispersion, and chemical reaction. These models are flexible and practical, accurate, and have a sound mathematical basis. (Collins-FIRL)
W77-09915

CARBON ISOTOPIC STUDY OF THE FATE OF LANDFILL LEACHATE IN GROUNDWATER,
Indiana Univ., Bloomington. Dept. of Chemistry.
L. M. Games, and J. M. Hayes.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 668-677, April, 1977. 7 fig, 6 tab, 22 ref.

Descriptors: *Isotope studies, *Carbon, *Leachate, *Groundwater, *Landfills, Analytical techniques, Water pollution, Water pollution effects, Waste disposal, Chemical properties, Waste water treatment.

An isotopic study was conducted to gain information on carbon movement in groundwater and on the effects of a landfill on the presence of different carbon molecular forms. Oversimplification was avoided by the simultaneous study of four carbon fractions - inorganic carbon, volatile organic carbon, non-volatile organic carbon, and CO and CH4. It was concluded that soil microorganisms quickly modified the bulk of mobile carbon entering the groundwater system from the landfill. Non-volatile organic carbon was effectively immobilized. Though the landfill did not significantly alter the bulk carbon budget, it is possible that trace amounts of unusually mobile materials could have entered the aquifer. These might be highly toxic with a negative effect on water quality, even in small quantities. Large variations of amounts and isotope ratios with time suggested the need for a longer study period. The isotopic method made available direct bulk carbon information for organic chemical aspects. It was also a good data source for the effects of soil microorganisms on groundwater carbon. (Collins-FIRL)
W77-09917

GROUNDWATER POLLUTION HAZARD NEAR SANITARY LANDFILLS ON THE GLACIATED PLAINS, NORTH DAKOTA - A STUDY OF THE LANGDON, NORTH DAKOTA SANITARY LANDFILL,
Geological Survey, Grand Forks, N. Dak.
B. M. Arndt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 466, Price codes: A05 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report No. WI-221-039-76, May 1977. 38 p, 3 tab, 35 fig, 3 plates, 23 ref, 4 append. North Dakota Geological Survey Open File Report OF-1. OWRT A-038-NDAK(1), 14-31-0001-5034.

Descriptors: *Hydrogeology, Groundwater, *Landfills, *Water analysis, Sampling, Glacial sediments, *North Dakota, *Path of pollutants, Pollutant identification, Water pollution sources, *Dissolved solids.
Identifiers: Langdon(N Dak).

The objectives of the study of the Langdon landfill were threefold: (1) to define the geologic and hydrologic setting of the landfill site; (2) to gather information pertaining to quantity, types, and migration of dissolved solids from the landfill into the groundwater flow system; and (3) to evaluate the criteria used in the study of this landfill and their applicability to landfill sites in similar geologic settings in North Dakota. Eleven water-sampling wells placed in the landfill site were periodically sampled over an 18-month period for water-quality analyses. These analyses included Ca, Na, K, NH3, HCO3, PO4, SO4, Cl, COD, BOD, pH, electrical conductivity, and total hardness. The analyses indicate no significant alteration of groundwater quality as a result of the presence of refuse. Some contamination of groundwater by ammonia, phosphate, and nitrate occurs in those wells near the perimeter of the landfill. The landfill site is surrounded on three sides by cropland, and those wells closest to this land indicate alteration as a result of crop fertilization. However, in no case are Public Health Standards for drinking water exceeded. The findings suggest that groundwater contamination by proper solid waste disposal methods is not a serious threat in most of North Dakota, a conclusion that seems valid for at least the glaciated parts of the state. The Langdon landfill is atypical of many landfill sites in the state because it is located in a gravel pit. Many landfills are located in glacial sediment that has substantially lower hydraulic conductivities, thereby decreasing even more the rate at which groundwater can move through a site.
W77-09925

BUOYANT SURFACE JETS DISCHARGED INTO A STRONG CROSSFLOW,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
C.-Y. Lin, E. R. Holley, W. Hall, and C. Maxwell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 455, Price codes: A11 in paper copy, A01 in microfiche. Illinois Water Resource Center, Urbana, Research Report No. 124, April 1977. 216 p, 61 fig, 3 tab, 88 ref, append. OWRT B-088-Ill(1).

Descriptors: Fluid mechanics, *Heated water, *Mixing, Interfaces, Rivers, *Thermal pollution, *Thermal stratification, *Water temperature, *Jets, Model studies, Dispersion, Waste dilution, *Distribution patterns, Path of pollutants, Buoyancy.
Identifiers: Crossflow, *Temperature distribution.

Analytical and experimental investigations were carried out for three-dimensional buoyant surface jets with strong ambient flow but without boundary attachment. A numerical model in curvilinear coordinates was developed from an integral jet analysis modified for buoyancy effects and included a symmetry of the jet. Detailed temperature distributions were measured in the laboratory with demsimetric Froude numbers (Fo) of 5, 10 and 15 and velocity ratios (R) from 2 to 13. Experimental results showed that ambient crossflows can cause significant distortion of the jet, even for R = 13. Near the exit, the lower portion of the jet is swept toward the lee side of the jet. The resulting L-shaped cross section and the associated density instability may enhance spreading on the lee side and may contribute to the subsequent formation of bimodal temperature distributions. The jet bending increases as R decreases and as Fo increases. Dilution increases with increasing Fo and decreasing R. The model was calibrated against the entire set of measured temperatures for each run and is capable of predicting temperature distributions to an accuracy of 0.63C. The agreement could probably be improved by using similarity profiles better suited to the actual jet cross sectional shape which was not known at the beginning of the research.
W77-09926

GEOCHEMICAL CONTROLS ON TRACE ELEMENT CONCENTRATIONS IN NATURAL WATERS OF A PROPOSED COAL ASH LANDFILL SITE,
Kansas State Univ., Manhattan. Dept. of Geology.
D. O. Whittemore, and J. Switek.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 429, Price codes: A05 in paper copy, A01 in microfiche. Kansas Water Resources Research Institute, Manhattan, KWRRI Contribution No. 188, April 1977. 76 p, 7 fig, 40 tab, 33 ref, append. OWRT A-070-KAN(1), 14-31-0001-6017.

Descriptors: *Trace elements, Water quality, Soil chemistry, *Kansas, *Sediments, Iron, Manganese, Copper, Lead, Zinc, Cadmium, Chromium, Selenium, Arsenic, *Landfill, *Path of pollutants, Distribution, Industrial wastes, *Metals, Groundwater, Watersheds(Basins), Drainage basin.
Identifiers: Coal ash landfill, Sediment pore water chemistry.

The distributions of Fe, Mn, Cr, Cu, Pb, Zn, Cd, As, and Se were studied in rocks, soils, stream sediments, and natural waters of a small upland drainage basin near a coal-fueled power plant being built in northeastern Kansas. Analyses of the total and dilute acid soluble fractions of rocks, soils, and stream sediments indicated that most trace metals are either concentrated in hydrous Mn and Fe oxides or left in clays after the weathering of the limestone and calcareous shale bedrock. Average exchangeable and chelateable concentrations of minor and trace metals ranged from < 0.01% (for Cr) to 26% (for Mn) of the total amounts in soils and sediments. The dissolved trace metal concentrations in natural waters were well below recommended standards for drinking waters. The slightly acidic nature of rain and snow allowed higher dissolved metal concentrations than in the ground and surface waters. The pH's of the spring and stream waters were 7.1 + or - 0.1 and 8.2 + or - 0.2, respectively, and were well buffered by dissolved carbonate species. Thus, precipitation as oxides, hydroxides, and carbonates, and adsorption on solid surfaces kept dissolved trace metals concentrations very low. Values ranged from < 0.01 to 6 micrograms/l for all metals except Fe, Mn, and Zn, which were occasionally > 6 micrograms/l. When the power plant is operative, most trace metals released to the environment should either accumulate in soils and sediments after precipitation as oxides, hydroxides, and carbonates or adsorption on clays and hydrous Mn and Fe oxides, or be carried out of the watershed in suspended matter in streams.
W77-09928

TRANSMISSION SPECTROSCOPY EXAMINATIONS OF NATURAL WATERS-C. ULTRAVIOLET SPECTRAL CHARACTERISTICS OF THE TRANSITION FROM TERRESTRIAL HUMUS TO MARINE YELLOW SUBSTANCE,
Copenhagen Univ. (Denmark). Inst. of Physical Oceanography.
For primary bibliographic entry see Field 5A.
W77-09945

INTERACTIONS BETWEEN ZINC AND SUSPENDED SEDIMENTS IN THE FRASER RIVER ESTUARY, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
D. Grieve, and K. Fletcher.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 415-419, May 1977. 2 fig, 1 tab, 16 ref.

Descriptors: *Zinc, *Heavy metals, *Rivers, *Canada, Sediments, Suspended solids, Estuaries, Chemicals, Iron, Manganese, On-site investigations, Sampling, Water temperature, Conductivity, Adsorption, Pollutants, *Path of pollutants, Water pollution, Pollutant identification.
Identifiers: *Fraser River, *British Columbia.

Behavior of Zn was studied in the Fraser River estuary. Increases in dissolved and suspended Zn in the mixing zone between fresh and brackish waters demonstrate the importance of both adsorption and desorption phenomena in estuarine waters. Together with estuarine circulation, adsorption and desorption provide a mechanism for retention of heavy metals in coastal zone sediments and waters. (Sims-ISWS)
W77-09949

AMMONIA VOLATILIZATION FROM SURFACE APPLICATIONS OF AMMONIUM COMPOUNDS ON CALCAREOUS SOILS: V. SOIL WATER CONTENT AND METHOD OF NITROGEN APPLICATION,
Texas A and M Univ., El Paso. Agricultural Research Station.
For primary bibliographic entry see Field 2G.
W77-09960

THE INFLUENCE OF CATION EXCHANGE CAPACITY AND DEPTH OF INCORPORATION ON AMMONIA VOLATILIZATION FROM AMMONIUM COMPOUNDS APPLIED TO CALCAREOUS SOILS,
Texas A and M Univ., El Paso. Agricultural Research Station.
For primary bibliographic entry see Field 2G.
W77-09961

MICROBIAL INORGANIC POLYPHOSPHATES: FACTORS INFLUENCING THEIR ACCUMULATION,
Ohio Agricultural Research and Development Center, Wooster.
For primary bibliographic entry see Field 2G.
W77-09965

AMMONIUM DIFFUSION AS A FACTOR IN NITROGEN LOSS FROM FLOODED SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
K. R. Reddy, W. H. Patrick, Jr., and R. E. Phillips.
Soil Science Society of America Journal, Vol 40, No 4, p 528-533, July-August 1976. 6 fig, 2 tab, 36 ref.

Descriptors: *Nitrogen, *Leaching, *Nitrification, *Denitrification, Soil investigations, Ammonium compounds, Anaerobic conditions, Aerobic conditions, *Path of pollutants, Water pollution sources.
Identifiers: Ammonium diffusion, Flooded soils.

The role of NH4(+)-N diffusion in a flooded soil on nitrogen (N) loss through the nitrification-dentrification process was investigated under laboratory conditions. The distribution of applied NH4(+)-N in both the aerobic and anaerobic soil layers of a flooded soil was experimentally determined and compared with the values obtained from theoretical equations. The total loss of NH4(+)-N from the flooded soil system (15 cm depth) by nitrification-denitrification was equivalent to 12.43 g N/sq m for a 120-day incubation period when the initial concentration of NH4(+)-N was 44.84 g N/sq m. Diffusion of NH4(+)-N from the anaerobic soil layer to the aerobic soil layer accounted for more than 50% (7.16 g N/sq m) of the total NH4(+)-N loss with the remainder being lost from NH4(+)-N originally present in the aerobic layer. The NH4(+)-N that diffused upward into the aerobic soil layer was nitrified to NO3(-)-N, which readily diffused back down into the anaerobic soil layer and was subsequently denitrified. (Skogerboe-Colorado State)
W77-09966

COMPUTER SIMULATION OF PHOSPHORUS MOVEMENT THROUGH SOILS,
New Hampshire Univ., Durham. Inst of Natural and Environmental Resources.
R. D. Harter, and B. B. Foster.
Soil Science Society of America Journal, Vol 40, No 2, p 239-242, March-April 1976. 4 fig, 1 tab, 9 ref.

Descriptors: *Computer models, Model studies, *Phosphorus, Soil investigations, *Mathematical models, Waste water, Nutrients, Fertilization, *Path of pollutants, *Simulation analysis, Water pollution sources.

Although the movement of P through soil can be described by mathematical models, this approach has certain limitations in practical application, particularly when soil is used for waste water renovation. To circumvent the limitations of mathematical modeling, empirical adsorption equations can be obtained and utilized in computer simulation of phosphorus movement. In this way, the renovation lifetime of a soil can be estimated. This approach is not limited to P, and can be used for any potential ground-water contaminate, whether inorganic or organic. (Skogerboe-Colorado State)
W77-09970

RELATION BETWEEN THE KINETICS OF NITROGEN TRANSFORMATION AND BIOMASS DISTRIBUTION IN A SOIL COLUMN DURING CONTINUOUS LEACHING,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 2G.
W77-09973

SAMPLING THE UNSATURATED ZONE OF IRRIGATED LANDS FOR RELIABLE ESTIMATES OF NITRATE CONCENTRATIONS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W77-09974

CHANGES IN THE PHYSICAL PROPERTIES OF SOIL CLAYS DUE TO PRECIPITATED ALUMINUM AND IRON HYDROXIDES: II. COLLOIDAL INTERACTIONS IN THE ABSENCE OF DRYING,
Hawaii Univ., Honolulu. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-09975

MOVEMENT OF CARBARYL THROUGH CONGAREE SOIL INTO GROUND WATER,
Clemson Univ., S.C. Dept. of Agronomy and Soils.
K. S. LaFleur.
Journal of Environmental Quality, Vol. 5, No. 1, p 91-92, January-March 1976. 1 fig, 3 tab, 6 ref.

Descriptors: *Soil profiles, *Groundwater, Pollutants, Soil investigations, *Path of pollutants, *Water pollution sources.
Identifiers: *Carbaryl.

Carbaryl was applied to a Congaree sandy loam fieldplot containing a shallow (about -1.1 m) water table. Movement and loss in the soil profile, and accumulation in underlying ground water were monitored for 16 months. Rainfall during this time was 182 cm (3.5 pore volumes based on the upper 1 m of soil). The upper 1 m contained about 6% of the applied carbaryl after 16 months. No carbaryl was found in the 0-20 cm layer after the 4th month. Loss of carbaryl with time in the upper 1 m was concentration-dependent. Time to half-concentration within the upper 1 m was < 1 month. Carbaryl appeared in the underlying ground water within 2 months after soil application and persisted through the 8th month. Maximum ground water concentration, about 0.3 micromol/liter, occurred at the end of the second month. (Skogerboe-Colorado State)
W77-09976

UPTAKE OF CADMIUM BY SOYBEANS AS INFLUENCED BY SOIL CATION EXCHANGE CAPACITY, PH AND AVAILABLE PHOSPHORUS,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 2G.
W77-09977

LONG-TERM EVALUATION OF SLOW-RELEASE NITROGEN SOURCES OF TURFGRASS,
Community Coll. of the Finger Lakes, Canandaigua, New York.
For primary bibliographic entry see Field 3C.
W77-09978

SENSITIVITY ANALYSIS OF THE WATER QUALITY FOR RIVER-RESERVOIR SYSTEMS MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
K. W. Thornton, and A. S. Lessem.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 382, Price codes: A04 in paper copy, A01 in microfiche. Miscellaneous Paper Y-76-4, September 1976. 49 p, 30 fig, 3 tab, 4 ref.

Descriptors: *Mathematical models, *Water quality, *Data collections, *Ecosystems, Model studies, Computer programs.
Identifiers: *Sensitivity analysis.

Most total ecosystem models require extensive data sets for initializing and calibrating the model to the prototype system. Data collection programs, however, are expensive and time-consuming. To obviate these constraints, the data collection program should be guided by a knowledge of the model sensitivity to various initial conditions and coefficients. A software program was developed for the Honeywell 600 computer system that permitted an evaluation of sensitivity of coefficients. The program permitted the display of 21 water quality variables on the same plot and a comparison of the responses produced by changing one coefficient by 10 percent. In general, the model results were more sensitive to 10-percent changes in coefficients at high nutrient concentrations than at low nutrient concentrations. The model results were quite sensitive to a 10-percent change in the evaporation and dispersion (effective diffusion) rate coefficients, biota growth, respiration, and temperature rate coefficients. Sensitivity analyses perform a useful function in modeling programs by providing insight into the interrelation of various compartments and

the overall function of the system, making possible the design of a more effective and inclusive data-collecting program. (WES)
W77-09981

WATER-RESOURCES APPRAISAL OF THE CARSON RIVER BASIN, WESTERN NEVADA,
Geological Survey, Carson City, Nev. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-09992

MODELING CHLORIDE MOVEMENT IN THE ALLUVIAL AQUIFER AT THE ROCKY MOUNTAIN ARSENAL, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
L. F. Konikow.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price 75 cents. Water Supply Paper 2044, 1977. 43 p, 19 fig, 3 tab, 28 ref.

Descriptors: *Path of pollutants, *Groundwater movement, *Industrial wastes, Chlorides, *Model studies, Estimating, Analytical techniques, Waste disposal, Ponds, Seepage, Hydrogeology, Aquifer characteristics, Evaluation, *Colorado.
Identifiers: *Rocky Mountain Arsenal(Colo).

A solute-transport model that can be used to predict the movement of dissolved chemicals in flowing ground water was applied to a problem of ground-water contamination at the Rocky Mountain Arsenal, near Denver, Colo. The model couples a finite-difference solution to the ground-water flow equation with the method-of-characteristics solution to the solute-transport equation. From 1943 to 1956 liquid industrial wastes containing high chloride concentrations were disposed into unlined ponds at the Arsenal. Wastes seeped out of the unlined disposal ponds and spread for many square miles in the underlying shallow alluvial aquifer. Since 1956 disposal has been into an asphalt-lined simulation model quantitatively integrated the effects of the major factors that controlled changes in chloride concentrations and accurately reproduced the 30-year history of chloride ground-water contamination. (Woodard-USGS)
W77-09994

ELEMENTS NEEDED IN DESIGN OF A GROUND-WATER-QUALITY MONITORING NETWORK IN THE HAWAIIAN ISLANDS,
Geological Survey, Honolulu, Hawaii. Water Resources Div.
K. J. Takasaki.
Available from Supt. of Documents, GPO, Washington, DC 20402, price $6.35. Water-Supply Paper 2041, 1977. 23 p, 10 fig, 5 plates, 11 ref.

Descriptors: *Groundwater resources, *Hawaii, *Path of pollutants, *Network design, *Water pollution sources, Data collections, Monitoring, Water quality, Groundwater movement, Hydrologic data, Hydrogeology, Water wells, Water supply, Water users, Pollutant identification.

The elements needed in the design of a ground-water-quality monitoring network in the Hawaiian Islands are described and summarized. The elements are given by geohydrologic units which represent areas where there are similarities in the occurrence of ground water or in the geology pertinent to the occurrence of ground water. The goal is to establish a network of observation points to inventory and maintain surveillance of existing and potential sources of pollution of ground water. Of principal concern to Hawaii's environment is pollution of the potable ground-water supplies and of the near-shore recreational waters, the latter by the discharge of polluted ground water. Existing monitoring efforts, although intensive in many areas, are not adequate because they are geared more toward (1) the detection and surveillance of pollutants in the conveyances of ground water instead of in the sources of ground water and (2) the monitoring of extensive nonpoint sources of pollution instead of from discrete point sources. (Woodard-USGS)
W77-09995

GROUND-WATER RESOURCES OF THE LEXINGTON, KENTUCKY, AREA,
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09996

WATER QUALITY PROGRAM OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-10006

1976 WATER-QUALITY DATA IN BEAR CREEK BASIN, MEDFORD, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-10015

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE, SPECIAL REPORT III: A METHODOLOGY FOR INVESTIGATING FRESH WATER INFLOW REQUIREMENTS OF A TEXAS ESTUARY, VOL I,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 2L.
W77-10022

OIL SPILL IDENTIFICATION SYSTEM.
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5A.
W77-10024

WATER COLOR AND CIRCULATION SOUTHERN CHESAPEAKE BAY. PART I. SOUTHERN CHESAPEAKE BAY WATER COLOR AND CIRCULATION ANALYSIS, PART II. SKYLAB MSS VS. PHOTOGRAPHY FOR ESTUARINE WATER COLOR CLASSIFICATION,
Virginia Inst. of Marine Science, Gloucester Point. Applied Marine Science and Ocean Engineering
For primary bibliographic entry see Field 2L.
W77-10026

THREE-LAYER CIRCULATIONS IN ESTUARIES AND HARBORS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Materials Science; and Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 2L.
W77-10030

OIL AND GAS SEEPS IN ALASKA. ALASKA PENINSULA, WESTERN GULF OF ALASKA,
Bureau of Mines, Anchorage, Alaska. Alaska Field Operation Center.
D. P. Blasko.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 013, Price codes: A05 in paper copy, A01 in microfiche. Report of Investigations 8122, 1976. 83 p, 8 fig, 31 tab, 5 ref.

Descriptors: *Alaska, *Oil pollution, *Seepage, *Water pollution sources, *Baseline studies, Gases.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Bitumen, Resources management.

The Bureau of Mines investigated two areas of the Alaska Peninsula (Iniskin Peninsula and Becharof Lake) where oil and gas seeps were known to occur in an attempt to determine (1) whether the seeps are still active and (2) the amount of bitumen contained in the drainage leaving the seeps. The oil, water, oil-water, and gas were sampled and analyzed. Five oil samples were taken at four separate oil seeps. The API gravity of the oil ranged from 8.9 to 21.4 degrees and the sulfur content was from 0.12 percent to 0.59 percent. Four of the seven gas samples obtained revealed fairly high caloric values, ranging from 746 to 924 Btu/cu ft, and averaging 844 Btu/cu ft. A total of 44 water samples were obtained. Bitumen content of the water was a high as 9,733 mg/l at one seep, but averaged less than 1 mg/l where the seep-drainage water entered the Gulf of Alaska. (Sinha-OEIS)
W77-10033

SIMULATION FACTORS INVOLVED IN OCEAN THERMAL POWER PLANTS,
Naval Academy, Annapolis, Md. Dept. of Naval Systems Engineering.
B. J. Wegner, and M. E. Nelson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-017 390, Price codes: A02 in paper copy, A01 in microfiche. August 1975. 21 p, 2 tab, 4 ref.

Descriptors: *Diffusion, *Nuclear powerplants, *Thermal powerplants, *Thermal pollution, Heat transfer, Dimensional analysis, Oceans.
Identifiers: *Ocean thermal powerplants, Thermal plumes, Energy balance.

The parameters which control the diffusion of heat from an ocean sited nuclear power plant are investigated. The relative severity of the thermal plume resulting from the utilization of sea water as a cooling medium for power plants, both fossil and nuclear fueled, has been somewhat of a controversial problem considered by various segments of society, ranging from engineers to fishermen and conservationists. In this study dimensional analysis is applied to identify dimensionless groups which are involved in the diffusion of heat from an ocean sited plant. The techniques of dimensional analysis and its usefulness are discussed. The energy balance for the system is introduced from which the parameters and factors which are most significant are correlated into dimensionless heat transfer groups. (Sinha-OEIS)
W77-10034

A DYNAMIC WATER QUALITY MODEL FOR THE NEUSE ESTUARY, N.C.,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
M. Amein, and S. G. Wardak.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 345, Price codes: A04 in paper copy, A01 in microfiche. Sea Grant Publication No UNC-SG-75-28, December 1975. 68 p, 8 fig, 3 tab, 21 ref. Sea Grant 04-3-158-40.

Descriptors: *Estuaries, *Water quality, *North Carolina, Mathematical models, Computer programs.
Identifiers: *Neuse estuary(NC).

The numerical model consists of two parts. The first part employs an implicit method for the solution of the shallow water hydrodynamic equations. The objective of this part of the work is to obtain the values of discharge, velocity and depth in the estuary under the action of freshwater inflow, surface runoff, winds and tides. The second part of the model uses an explicit method for the solution

of the unsteady mass-balance equation (equation of mass transport). The objective of this part of the work is to obtain values for concentration of materials in the estuary. The process can be steady or unsteady, the material can be conservative or non-conservative. Applications of the model to the Neuse Estuary are given and the model is tested with field data for ammonia, nitrates and dissolved oxygen. (Sinha-OEIS)
W77-10037

BAY SPRINGS LAKE WATER-QUALITY STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
S. C. Wilhelms.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 023, Price codes: A07 in paper copy, A01 in microfiche. Technical Report H-76-7, May 1976. 135 p, 22 fig, 64 plates, 12 ref, 2 append.

Descriptors: *Artificial watercourses, *Hydraulic models, *Simulation analysis, *Dissolved oxygen, *Water quality, *Mathematical models, *Inland waterways, Synthetic hydrology, Locks, Navigation, Stratified flow, Water temperature, Tennessee, Reservoirs, Mississippi, Alabama, Tennessee.
Identifiers: *Tennessee-Tombigbee Waterway(Ala-Miss-Tenn), *Bay Springs Lake(Miss), Tombigbee Waterway(Miss).

A laboratory investigation was made to predict expected temperature and dissolved oxygen content of water within and released from Bay Springs Lake, Mississippi, part of the projected extension of the Tennessee-Tombigbee Waterway from the existing Black Warrior-Tombigbee Waterway to the Tennessee Valley system. The location of proposed lock intakes was evaluated with respect to their ability to meet water quality requirements established by state environmental and wildlife agencies. Three models were used to investigate the mechanics of density-stratified flow within the lake as affected by inflow from the local drainage areas and the divide-cut canal and to predict the temperature and dissolved oxygen regime of the lake immediately upstream of the dam and in releases through the lock. An undistorted physical model was used to define steady-state withdrawal characteristics at the lock intakes and local topography. A highly-distorted-scale physical model was used to simulate the lake, the divide-cut canal and a local embayment, and to determine the response of the proposed lake to dynamic density-stratified flow. A mathematical model--WESTEX--was used to simulate daily variations in temperature and dissolved oxygen. The various simulations indicate that the proposed project will satisfy water quality considerations. (Harris-Wisconsin)
W77-10055

CALCIUM CARBONATE PRECIPITATION KINETICS, PART I, PURE SYSTEM KINETICS,
Cape Town Univ. (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W77-10087

5C. Effects Of Pollution

A GUIDE TO AERATION/CIRCULATION TECHNIQUES FOR LAKE MANAGEMENT,
Tetra Tech., Inc., Lafayette, Calif.
For primary bibliographic entry see Field 5G.
W77-09603

NUTRIENT DIVERSION: RESULTING LAKE TROPHIC STATE AND PHOSPHORUS DYNAMICS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-09604

STUDIES ON THE RECLAMATION OF STONE LAKE, MICHIGAN,
Notre Dame Univ., Ind.
For primary bibliographic entry see Field 5G.
W77-09605

WASTEWATER TREATMENT BY NATURAL AND ARTIFICIAL MARSHES,
Wisconsin Univ., Oshkosh.
For primary bibliographic entry see Field 5D.
W77-09606

TEMPERATURE EFFECTS ON THE DENITRIFICATION PRODUCTS BY TWO AQUATIC PSEUDOMONAS SPECIES,
Y. K. Chan, and N. E. R. Campbell.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 2674-2681, 1975. 7 fig, 12 ref.

Descriptors: *Denitrification, *Water temperature, *Bacteria, *Mode of action, *Canada, Pseudomonas, Nitrogen compounds, Lakes.
Identifiers: *Nitrous oxide, *Experimental Lakes Area(Canada).

Laboratory experiments dealt with two aspects of aquatic denitrification: (1) a comparison of the quantitative distribution of denitrification products over the growth temperature ranges between psychotrophic bacteria (able to grow at 5C or less regardless of its optimum temperature range), and mesophilic (able to grow at a medium temperature) isolates of Pseudomonas from bottom sediments of a lake in the Experimental Lakes Area, Northwestern Ontario; and (2) an assessment of the contribution to denitrification by each species at various temperatures. Low temperature tends to retard the formation of intermediates and denitrification products, with rates dropping more slowly with decreasing temperature in the psychotroph and more rapidly in the mesophile. Accumulation of nitrate became most significant at low incubation temperatures for both species. The mesophile formed more nitrous oxide at 10 and 15C than at the other temperatures used (5-30C). The implication is that at temperatures of 10-15C, which prevail in the lower portion of the thermocline during summer stratification in lakes where oxygen is limiting and nitrate is available, both Pseudomonas species contribute to denitrification in the water column, but only the mesophile is responsible for the nitrous oxide formation. Both the psychotroph and mesophile released dissolved molecular nitrogen as the end product. (Auen-Wisconsin)
W77-09607

METHANE OXIDATION IN A EUTROPHIC CANADIAN SHIELD LAKE,
J. W. M. Rudd, and R. D. Hamilton.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 2669-2673, 1975. 2 fig, 4 ref.

Descriptors: *Methane, *Oxidation, Biodegradation, Anaerobic conditions, Carbon, Carbon dioxide, Thermocline, Eutrophication, Bacteria, *Canada, Lakes.
Identifiers: *Experimental Lakes Area(Canada), *Methane oxidation.

The controlling factors of microbial methane oxidation, as a source of carbon and carbon dioxide, was investigated in a dimictic, eutrophic lake of the Experimental Lakes Area, northwestern Ontario, where large quantities of methane accumulate in the anaerobic bottom waters during summer and winter. The maximum oxidation rate closely follows the level of zero oxygen concentration from spring until early winter. However, as winter progresses the level of zero oxygen and maximum methane oxidation rate diverges with the level of maximum oxidation preceding the level of zero oxygen up the water column. It is concluded that the microorganisms responsible for the methane oxidation were microaerophilic and that they demonstrate optimal activity at oxygen concentrations in the range between 0.1 and 1.0 mf/l. The field observations were confirmed by adding oxygen to exceed 1.0 mg/l which reduced the methane oxidation rate by about 40%; thus oxygen inhibition is the main controlling factor of methane oxidation. The methane oxidizing microorganism population is well adapted to its controlled niche and can efficiently scavenge methane down to less than 0.05 microrole; they are active at low temperatures (0.1C) and operate optimally at oxygen concentrations of 0.1-1.0 mg/l. (Auen-Wisconsin)
W77-09608

AN ENERGY BALANCE FOR ALGAL POPULATIONS IN LIGHT-LIMITING CONDITIONS,
H. J. Gons, and L. R. Mur.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 2729-2733, 1975. 2 fig, 5 ref.

Descriptors: *Trophic level, *Primary productivity, *Measurement, *Energy budget, Algae, Light intensity, Limiting factors, Growth rates, Biomass, Foreign research, Estimating.
Identifiers: Netherlands.

A mathematical method of measuring the relationship between production and algal absorption of light energy is proposed for a light-limited system, where production is dependent on the quantity of absorbed light energy, the conversion efficiency of light energy to energy used in cells, and the energy requirement for maintenance of cells. The method is based on chemostat cultures of Scenedesmus protuberans, maintained at 20C, one illuminated by 30,000 J and the other by 13,000 J, with a diurnal light-dark cycle of 16 and 8 hours. All incidental light energy was absorbed when the cultures were in steady state. Production was measured from daily culture outputs, as biovolume (dry weight) and as heat of combustion, resulting in an energy balance which considered the light energy to be used for growth and maintenance of the alga. Maintenance energy was extrapolated from production data at various growth rates, resulting in a maintenance rate constant of 0.20/day. This concept of gross production allows comparisons of energy flows of different ecosystems, and is a useful parameter to describe the trophic condition of a system. Gross production is generally considered as the sum of net production and respiration, where in most cases net production and respiration are measured as gaseous exchange in order to fix a carbon balance (Auen-Wisconsin)
W77-09609

MACROPHYTE-SEDIMENT RELATIONSHIPS IN CHAUTAUGUA LAKE,
S. A. Nicholson, R. A. Levey, and P. R. Clute.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 2758-2764, 1975. 1 fig, 5 tab, 18 ref.

Descriptors: *Aquatic plants, *Spatial distribution, *Bottom sediments, *Particle size, Lakes, Clays, Silts, Sands, Shallow water, Turbulence, *New York, *Lake sediments.
Identifiers: *Chautaugua Lake(NY), Najas flexilis, Anacharis canadensis, Ceratophyllum demersum, Myriophyllum, Potamogeton crispus, Potamogeton richarsonii, Vallisneria americana, Heteranthera dubia, Macrophytes-sediment relationship.

How distribution of rooted macrophytes is influenced by sediment particle size was investigated in Chautaugua Lake, New York, by comparing communities of Najas flexilis, Anacharis canadensis, Ceratophyllum demersum, Myriophyllum, Potamogeton species, Vallisneria americana and Heteranthera dubia with sediments from several sites at similar depths. Partly because of water turbulence, macrophyte-sediment relationships were stronger at 1.5 m than at 2 m. The close relationship of weakly-rooted macrophytes

with substrate texture at 1.5 m also suggests that water activity influences macrophyte species distribution. The rather-indiscriminate distribution of strongly-rooted macrophytes with substrate points to the existence of other regulatory mechanisms. It is postulated that mechanisms which favor weakly-rooted macrophytes on fine textured (protected) sites may include differing tolerances to silting, varying uptake and release efficiencies, and the role of vitamins or allelopathic substances in poorly circulated waters. The experimental data clearly show that weakly-rooted macrophytes (N. flexilis, A. canadensis, C. demersum) were closely related to sediment character, particularly grain size, whereas other macrophytes were not. (Auen-Wisconsin)
W77-09612

THE PHYSICO-CHEMICAL LIMNOLOGY OF THE MWENDA RIVER MOUTH, LAKE KARIBA,
Rhodesia Univ., Salisbury. Dept. of Zoology.
A. P. Bowmaker.
Archiv fur Hydrobiologie, Vol 77, No 1, p 66-108, 1976. 12 fig, 4 tab, 48 ref.

Descriptors: *Limnology, *Lakes, *Africa, *Reservoirs, Tributaries, Rivers, Physicochemical properties, Water pollution sources, Water pollution effects.
Identifiers: *Lake Kariba(Africa), Zambia, Rhodesia.

Effects of a fluvial estuary of the Mwenda River, typical of tributaries to Lake Kariba, on the Zambian-Rhodesian border, are described. The river mouth was partially covered by a floating Salvinia molesta mat which reduced oxygen during summer periods of minimal river discharge, deep within and below the mat. The Mwenda River enters man-made Lake Kariba as unde-, inter-, and overflows, depending on discharge volume. A local, shallow, periodically titled thermocline persisted throughout the year, above the overall lake summer thermocline. Oxyclines only developed in association with the overall thermocline. Nitrate-nitrogen concentrations were approximately ten times greater in the estuary than elsewhere in the lake. They are attributed to the possibility of the river receiving runoff nitrates from geological deposits in its catchment and to the high riverine concentrations of albuminoid nitrogen being deposited on the lake bottom, mineralizing to ammonia during the dry season, and oxidized to nitrate by the scouring action and high oxygen content of flood underflow. Described are the limnological development and characteristics of Lake Kariba, and its temperature and water quality (as well as that of the Mwenda River estuary and bay), seasonal changes in temperature and dissolved oxygen, its stratification, the chemical characteristics of its waters, and the water quality of different pools in the lake. (Auen-Wisconsin)
W77-09614

THE CONSEQUENCES OF IMPOUNDMENT ON AN ARCTIC CHAR LAKE SYSTEM. AN ANALYSIS BY SIMULATION MODELLING,
For primary bibliographic entry see Field 5B.
W77-09616

RATES OF TRANSPORT OF TOTAL PHOSPHORUS AND TOTAL NITROGEN IN MACKENZIE AND YUKON RIVER WATERSHEDS, N.W.T. AND Y.T., CANADA,
G. J. Brunskill, P. Campbell, S. Elliott, B. W. Graham, and G. W. Morden.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 3199-3203, 1975. 3 tab, 17 ref.

Descriptors: *Phosphorus, *Nitrogen, Rivers, Streams, Sampling, Velocity, *Watersheds(Basins), River flow, Erosion, Runoff, Precipitation(Atmospheric), Nitrogen fixation, Nutrients, *Canada.
Identifiers: *Transport rates, *Mackenzie River watershed(Canada), *Yukon River watershed(Canada), Non-point nutrient sources.

Transport rates were calculated from samples for particulate phosphorus (PP), particulate nitrogen (PN), total dissolved phosphorus (TDP), and total dissolved nitrogen (TDN) taken in 1971-74 on 11 streams and rivers in the Mackenzie River watershed, and a tributary to the Porcupine River in the Yukon River watershed. These transport rates calculations allowed comparison between large and small rivers and represent the flux of total nitrogen and total phosphorus from the watershed resulting from precipitation, mechanical and chemical erosion, and biological fixation and transport. The group of large rivers transported relatively large amounts of total nitrogen and total phosphorus per unit watershed area, and on the average there was a 1:1 ratio of TDN to PN, and about five times more PP than TDP. The group of small rivers transported relatively small amounts of total nitrogen and phosphorus with an average ratio of TDN to PN of 7 and TDP to PP of 1.8. These results indicate that: (1) higher concentrations of PP and PN, and greater runoff contribute to higher rates of transport of these elements in large rivers, (2) greater runoff contributes to higher rates of transport of TDP in these rivers, and (3) factors other than discharge or runoff contribute to TDN transport rates in the Mackenzie Valley. This data was found to cover the range of high and low values found in Temperate Zone watersheds. (Luedtke-Wisconsin)
W77-09617

AN INVESTIGATION OF THE ROLE OF ORGANIC MATERIALS IN FRESHWATER SYSTEMS,
J. E. Schindler, and J. J. Alberts.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 2201-2206, 1975. 2 fig, 1 tab, 14 ref.

Descriptors: *Trace elements, *Humus, *Organic matter, *Lake sediments, *Chemistry of precipitation, Chemical reactions, Cation exchange, Oxidation-reduction potential, *South Carolina, Nuclear powerplants, Humic acids.
Identifiers: Par Pond(SC), Electron transport.

The type of distribution of humic materials in sediments and the extent of concentrations of trace elements associated with humus were studied in sediment cores from Par Pond, a cooling pond for nuclear reactors at the Savannah River Plant near Aiken, South Carolina. The total molar concentration of the cations in the alkali extracted fraction seemed related to the amount of organic material (as organic carbon) in the sediments. Early sediments showed relatively high redox potentials, which indicate a lack of reducing activity. However, the low redox potential and the increase in the amount of Fe and Mn in the acid extracts suggests that increased inorganic deposition had occurred, resulting in increased sulfide generation. Indications were that humic compounds are also capable of accepting as well as donating electrons; thus humics behave similarly to flavo-proteins in the electron transport processes with metals, serving as temporary electron acceptors in the sediments. Results indicated that sedimentary humic materials are relatively unimportant in the burial of cations but they may function as an intermediate electron transport system within anoxic sediments that may reduce metals such as iron and mercury. (Auen-Wisconsin)
W77-09618

MELOSIRA GRANULATA (EHR.) RALFS: MORPHOLOGY AND ECOLOGY OF A COSMOPOLITAN FRESHWATER DIATOM,
S. S. Kilham, and P. Kilham.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 2716-2721, 1975. 2 fig, 1 tab, 16 ref. NSF GB-8328, NSF GB-41315.

Descriptors: *Diatoms, *Plant morphology, *Systematics, *Phylogeny, Plant ecology, *Africa, Lakes.
Identifiers: *Melosira granulata, Melosira granulata jonensis, Melosira granulata angustissima, *Lake Mulehe(Uganda).

Melosira granulata (Ehr.) Ralfs is shown to be simply a larger form of M. granulata jonensis (Grun.) and M. granulata angustissima (O. Muller). The ecological conditions that contribute to its abundance and distribution were investigated in East and Central African lakes. M. granulata was isolated from Lake Mulehe, Uganda, and germinated in a mud sample that had been stored for one year, then maintained in unialgal culture. The clone had the characteristics of M. granulata angustissima. Auxospores produced in the cultures were isolated and the resulting auxospore clones produced diatoms with the characteristics of M. granulata. During size reduction these auxospore clones passed through the varietal sequence of M. granulata to M. granulata jonensis to M. granulata angustissima, indicating that these varieties are simply different morphological forms in the M. granulata life cycle. Its distribution and proliferation usually occurs in mesotrophic waters with alkalinities of less than 8 meq/l, pH less than 9.0 conductivities less than 600 micromhos/cm, silicon dioxide greater than 5-10 mg/l, and that are shallow and well-mixed. (Auen-Wisconsin)
W77-09619

INTENSIVE LARGE CITY INFLUENCE ON REED-BANKS, (IN GERMAN),
Technische Universitaet, Berlin (West Germany). Inst. of Ecology.
H. Sukopp, B. Markstein, and L. Trepl.
Beitr Naturkd Forsch Suedwestdtsch 34, p 371-385, 1975.

Descriptors: *Aquatic algae, Vegetation, Lakes, *Sewage disposal, Eutrophication, Cities, Urbanization, Water level fluctuations, Water pollution sources, Water pollution effects.
Identifiers: *West Germany, Phragmites, Scolochloa-festucacea, Urtica-kioviensis, *Tegler Lake(Germany), *Reed-banks(Lakes), *Havel Lake(Germany).

The bank vegetation of Havel and Tegler Lakes (West Germany) was mapped in 1962, 1967 and 1972. The present natural characteristics of this area are described in detail. The reed-banks of the Berlin Havel area are distinguished in the north by Scolochloa festucacea and in the south by Urtica kioviensis. The Havel Lakes receive the effluent from the Berlin sewage disposal system. The lakes are released for general use as waters of the 1st order. Changes in the reed-banks, especially with reference to longitudinal and surface extensions over 1962-1972, are described. Some of the causes responsible for these changes are changes in water level, boat traffic, shoreline construction, bathing, alluvial material, eutrophication and its effects on Phragmites and algae.
W77-09621

EXPERIMENTS ON THE EFFECTS OF INORGANIC ENRICHMENT OF RIVERS ON PERIPHYTON PRIMARY PRODUCTION,
K. Wuhrmann, and E. Eichenberger.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p. 2028-2034, 1975. 1 fig., 6 tab., 8 ref.

Descriptors: *Primary productivity, *Rivers, *Eutrophication, *Inorganic compounds, *Periphyton, Phosphates, Nitrites, Nitrates, Sessile algae, *Trace elements, *Metals.

Laboratory channels were used to simulate lotic environments to determine whether under ecologically-equal chemical and physical conditions eutrophication can occur in rivers, i.e., enhancement of primary production by increases of inor-

ganic nitrogen, phosphorus concentrations, and other factors. Enrichment with in organic nitrogen, and phosphates (500-700 microgram/l and about 8 microgram/l, respectively) produced no significant effect, as the natural concentrations of about 650 microgram nitrate/l and about 15 microgram phosphate/l already permitted unlimited growth. Nor did the enrichment have any significant influence on the periphyton species composition. Additions of presedimented sewage in 1/2000 and 1/4000 vol/vol increased biomass about 100% and 300%, but it is unlikely that the accelerated production was due to increased dissolved N and P, since the additions represented about 5 and 25 microgram N/l and 1.5 to 7 P/l. The community composition was unaffected by these additions despite the enhanced productivity. Increases of about 10 to 20% of trace elements remarkably accelerated biomass buildup and changes in community structure, but higher additions inhibited growth. No conclusions as to the effects of trace metals on primary productivity and community structure of the sessile algae in rivers are proposed on the basis of these experiments. (Auen-Wisconsin).
W77-09625

GROWTH AND PHOTOSYNTHESIS DURING THE FORMATION OF A BENTHIC ALGAL COMMUNITY,
E. Eichenberger, and K. Wuhrmann.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p. 2035-2042, 1975. 5 fig., 1 tab., 1 ref.

Descriptors: *Rivers, *Benthic flora, *Succession, *Photosynthesis, Laboratory tests, Model studies, Analytical techniques, Measurement, Primary productivity.

Colonization and succession of benthic algae in artificial rivers is detailed and the harvest method is compared with the oxygen balance determination. Photosynthetic activity throughout four months of observation followed fluctuations in standing crop. However, the structure of the biocenosis affected the intensity of oxygen exchange in several ways: A dense growth depressed activity per unit weight. This effect of biomass is clearly depicted when the daily photosynthesis is plotted against illumination. When the biomass is larger, the light intensity required for photosynthesis saturation is less, suggesting that photosynthesis is limited by the exchange between organisms and the surrounding medium. The mechanism involved may affect photosynthesis directly or, alternatively, by a growth reduction which as a consequence may lead to an accumulation of substrate within cells and thus inhibit carbon fixation. In the channel biocenosis the ratio of extinctions of the pigment extract at 420 and 663 nm reflected the sociological composition. The data suggest a greater activity per unit biomass in an ecology with a lower extinction ratio, being presumably richer in green algae. It was evident that even when the biomass is decreasing at a fast rate, a high photosynthetic activity is maintained. This observation is of considerable importance in the selection of methods to determine productivity in running waters. (Auen-Wisconsin).
W77-09627

DIATOMS IN POND PLANKTON: RELATIONSHIPS TO EPIPHYTIC AND EPIPELIC POPULATIONS,
W. J. Clark, and W. C. Runnels.
Verhanlungen Internationale Vereinigung Limnologie, Vol 19, p. 2722-2728, 1975. 2 fig., 2 tab., 10 ref.

Descriptors: *Diatoms, *Plant populations, *community development, *Ponds, *Distribution, *Texas, Niches, Periphyton, Varieties, Benthos, Sessile algae, Plant morphology, Systematics, Artificial lakes, Lakes.
Identifiers: *Fish Lake(Texas), *Parsons Lake(Texas), *Fields Lake(Texas).

Studies of diatom populations in three small artificial ponds in Brazos County, Texas, confirm evidence that the classical bimodal phytoplankton cycle is not operative in small lakes and provide additional evidence of the complexity of the interactions between planktonic, epiphytic and epipelic habitats. The results reinforce other evidence that there are no taxonomically-defined diatom phytoplankton in minor lakes with the presently constituted taxa. The same species exist in separate epiphytic and planktonic populations which react independently of each other. Despite the limnological similarity of the ponds, the relative importance of the three habitats for a given species varied considerably. Some species such as Synedra ulta, S. rumpens, Navicula pennata, N. gregaria, Cymbella ventricosa, were common in all three ponds. Others, such as Pinnularia braunii, P. major and Synefra acus were absent from one or two ponds. In no case did the epiphytic maxima coincide with the major mid-winter plankton pulse. The only consistence was that very large pulses, when they occurred, came in mid-winter. Unanswered are the questions: why similar ponds in the same area take such significantly different paths in their population structures and dynamics, and the nature of the phytoplankton and their relationship to the epiphytic and benthic or epipelic habitats. Several theories are discussed. (Auen-Wisconsin).
W77-09628

ANALYSIS OF THE POPULATION DYNAMICS OF OSCILLATORIA REDEKEI VAN GOOR IN LAKE EDEBERG,
M-E. Meffert.
Verhanlungen Internationale Vereinigung Limnologie, Vol 19, p. 2682-2688, 1975. 2 fig, 1 tab, 17 ref.

Descriptors: *Algae, *Carbon dioxide, Nuisance algae, Growth rates, Europe, Population, Carbon cycle, Plankton, Inhibition, On-site investigations, Plant physiology, Cytological studies, Lakes, Systematics, Lakes.
Identifiers: *Oscillatoria redekei, *Lake Edeberg(Germany), Cell lysis.

The population dynamics of Oscillatoria redekei were investigated both in laboratory experiments and in-situ at beta-mesosaprobic Lake Edeberg, Germany, to determine the specific conditions that cause a biomass decrease in this species. Results indicated that carbon dioxide deficiency induces trichome fragmentation and cell lysis in this alga and that the carbon dioxide concentration causing lysis varies with light intensity. In the lake, the growth pattern was defined as follows: Up to pH 9, with a regular carbon dioxide supply, the algae grow rapidly without fragmentation or lysis. When a carbon dioxide deficiency occurs above pH 9, the cell numbers per trichome decrease. During the fragmentation phase the concentration of free carbon dioxide was always below 10 micromol/l and frequently below 5 micromol/l. The origin, duration, and extent of fragmentation and lysis depend on the extent of carbon dioxide deficiency and the duration of good weather conditions. The decrease in the number of carbon-fixing organisms causes an increase in carbon dioxide concentration, which, in turn, induces renewed growth. A carbon dioxide deficiency causes a decrease in biomass but not a total destruction of the Oscillatoria population. (Auen-Wisconsin).
W77-09629

A FOOD WEB MODEL FOR LAKE MICHIGAN: PART I-JUSTIFICATION AND DEVELOPMENT OF THE MODEL,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
A. H. Vogel, and R. P. Canale.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-75-11185, Price codes: A03 in paper copy, A01 in microfiche. MICHU-SG-74-203 (Sea Grant Technical Report 40), March 1974. 61 p. 5 fig., 59 ref. SG 04-3-158-23.

Descriptors: *Lake Michigan, *Model studies, *Fish management, *Water quality control, *Food webs, Methodology, Trophic level, Eutrophication, Phytoplankton, Zooplankton, Computer models, Nutrients.
Identifiers: Alewife.

Biological, chemical and physical aspects are presented for a lower trophic level model being developed to provide guidance for the effective management of water quality and fisheries production in Lake Michigan. Justification of why such a model is necessary, the methods of approach, the nature of the model, the availability of data, and its uses and limitations are discussed. It is concluded that it is feasible to develop an effective modelling methodology and that it is: (1) required as a first step toward defining optimal resource management, (2) will facilitate the testing of hypotheses concerning biological mechanisms in Lake Michigan, and (3) will be useful to pinpoint specific areas where research is necessary to the understanding of the limnological processes. A highly complex model is required because eutrophication effects on the fisheries are plankton-taxon specific and also to predict the effects of the introduction of new fish species such as the alewife invasion. Present model equations account for separate phytoplankton and zooplankton taxa, major nutrient chemical species, detrital components, the alewife, and age groupings within the alewife and zooplankton populations. It is recommended that a single computer system be used for the storage and retrieval of all Lake Michigan limnological data and that a comprehensive plan be established to define needs of data gathering programs. (Luedtke-Wisconsin).
W77-09631

CLASSIFYING AND MONITORING WATER QUALITY BY USE OF SATELLITE IMAGERY,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W77-09634

EFFECT OF ORGANIC EXCRETION BY BENTHIC ANNELIDA ON THE PRODUCTIVITY OF PHYTOPLANKTON,
Institut Oceanographique, Paris (France). Laboratoire de Physiologie des Etres Marins.
J. C. Lacaze, and O. V. de Naide.
Internationale Revue der gesamten Physiologie vol 62, no 1, p. 153-155, 1977 1 fig., 5 ref.

Descriptors: *Phytoplankton, *Marine benthos, Growth rates, *Marine algae, Marine biology, Bethos, *Primary productivity, Bioassay, Laboratory tests, Estuarine environment, Herbicides, Animal physiology, Benthic fauna, *Annelids, Pollutant identification.
Identifiers: *EDTA, *Growth ingibition, *Polychaetes, Excretory products, Paronis, *Rance estuary(France).

The incorporation of an organic chelating agent (EDTA) in water containing the benthic polychaete Sabella paronia for 16 hours causes an increase of 25% in primary production. This observation supports the hypothesis that the waste products of these organisms inhibit phytoplankton productivity. (Katz)
W77-09660

COMPETITION FOR MERCURY BETWEEN RIVER SEDIMENT AND BACTERIA,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W77-09661

RENAL EXCRETION IN CHANNEL CATFISH FOLLOWING INJECTION OF QUINALDINE SULPHATE OR 3-TRI-FLUOROMETHYL-4-NITROPHENOL,
Fish and Wildlife Service, La Crosse, Wis. Fish Control Lab.
J. L. Allen, and J. B. Hunn.
Journal of Fish Biology, vol 10, no 5, 1977, p. 473-479 4 tab., 18 ref.

Descriptors: Channel catfish, *Fish physiology, *Animal pathology, *Sodium, *Potassium, *Calcium, *Magnesium, *Chlorides, Laboratory tests, Water pollution effects, *Pesticides, Methodology, Pollutant identification.
Identifiers: Ictalurus, *Quinaldine sulphates, *3-trifluoromethyl-4-nitrophenol, *Kidney function, *Renal excretion, Urine collection techniques, *TFM.

Channel catfish, Ictalurus puctatus Rafinesque, injected intraperitoneally with 2-methyl-quinoline sulphate (QdSO4) or 3-trifuoro-methyl-4-nitrophenol (TFM) eliminate most of the dose of these compounds by extra-renal routes. Patterns of renal excretion of Na+, K+, Ca2+, Mg2+, and C1- (uEq kg-1) appeared to be associated with the 'stress' of the urine collection technique rather than with the elimination of either compound. Concentrations of Na+, K+, Ca2+, Mg2+, and C1- (mEq/1) were determined in urine, plasma and gall bladder bile. (Katz).
W77-09662

THE TOXICITY OF SODIUM PENTACHLOROPHENOLATE FOR THREE SPECIES OF DECAPOD CRUSTACEANS AND THEIR LARVAE,
Amsterdam Univ. (Netherlands). Pharmacological Lab.
J. J. van Dijk, C. van der Meer, and M. Wijnanms.
Bulletin of Environmental Contamination and Toxicology, vol 17, no 5, p. 622-630, 1977 5 tab, 18 ref.

Descriptors: *Toxicity, Bioassay, Methodology, Laboratory tests, *Crustaceans, *Shrimp, Growth stages, Juvenile growth stage, Water pollution effects, Statistical methods, Water temperature, Salinity, *Herbicides.
Identifiers: Biocide, *Decapod crustaceans, *Crangon, *Palaemon, *Palaemonetes, First instar larvae, Dose-mortality data, *Sodium pentachlorophenolate, Moulting.

The toxicity of sodium pentachlorophenolate for two marine decapods, Crangon crangon and Palaemon elegans and a brackish water decapod, Palaemonetes varians has been compared using adults as well as first instar larvae. Among the adults, Crangon was the most sensitive; among the first instar Crangon and Palemon were equally sensitive and Palaemonetes was most tolerant. (Katz).
W77-09663

PLANKTON ECOLOGY IN LONG POND, ST. JOHNS, NEWFOUNDLAND: A POLLUTED POND CHARACTERIZED BY A HIGH FLUSHING RATE,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
M. F. O'Connell, and C. W. Andrews.
Internationale Revue der Gesamten Hydrobiologie, vol. 62, no 1, p. 133-152, 1977 6 tab., 12 fig., 35 ref.

Descriptors: *Phytoplankton, *Zooplankton, *Ponds, *Domestic wastes, Dominant organisms, Agricultural runoff, Agricultural watersheds, *Primary productivity, *Nannoplankton, *Eutrophication, Ecosystems, On-site-investigations, Nutrients, Daphnia, Phosphates, Nitrates, *Canada.
Identifiers: *Long Pond(St. Johns, Newfoundland), High flushing rate, Seasonal distribution, Oscillatoria, Diatomia, Tabellaria, Synura, Ulothrix, Spirogyra, Trachelomonas, Cryptomonas, Chlamydomonas, Ciliates, Bosmina, Epischura, Diaptomus, Sub-dominant zooplanktons.

Plankton was studied seasonally and quantitatively in Long Pond, St. John's, Newfoundland. This pond receives both rural and urban runoff and is characterized by a high flushing rate. A comparison is made with Clarkes Pond, Hogans Pond and Bauline Long Pond. Long Pond phytoplankton was characterized by nannoplankton (particularly flagellated forms). The most important zooplanters were Bosmina coregoni and Daphnia catawba. Aspects of plankton ecology are discussed in relation to eutrophication and water renewal. (Katz)
W77-09664

THE EFFECT OF TRICAIN METHANESULPHONATE (MS-222) ON THE MICROHAEMATOCRIT OF FISH BLOOD,
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Dept. of Zoology.
J. Hattingh.
Journal of Fish Biology, vol. 10, p 453-455, 1977 1 fig, 10 ref.

Descriptors: *Fish behavior, *Fish diseases, Animal pathology, Freshwater fish, Bioassay, Laboratory tests, Water pollution effects, Methodology, Carp, Fish toxins, Fish physiology, *Pollutant identification.
Identifiers: *Tricaine methanesulphonate, *Fish blood, *Microhaematocrit, Fish anaesthetics, Haemolysis, Labeo, Barbus.

The effects of the anaesthetic, MS-222, on the haematocrit value of freshwater fish have been examined. Blood containing MS-222 showed a higher haematocrit value than blood without the anaesthetic and haemolysis occurred in the former after a variable time depending on the concentration. The results are discussed in relation to previous findings. (Katz)
W77-09665

THE EFFECT OF PARASITISM ON THE TOXICITY OF CADMIUM TO THE THREE-SPINED STICKLEBACK, GASTEROSTEUS ACULEATUS L.,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
D. Pascoe, and P. Cram.
Journal of Fish Biology, vol. 10, no. 5, p 467-472 1977. 2 tab, 2 fig, 21 ref.

Descriptors: *Cadmium, *Toxicity, Bioassay, Laboratory tests, *Parasitism, *Sticklebacks, Fish physiology, *Animal pathology, Water quality, Water pollution effects, Methodology, Pollutant identification.
Identifiers: *Toxic mechanism, *Parasitic infection, *Tapeworm, Cestode, Schistocephalus, Staic toxicity, Test, *Continuous flow, Toxicity test, Median period of survival, Mean parasitic index.

The toxicity of cadmium to sticklebacks was determined over a wide range of concentrations. The 96 h LC50 was 6.5 mg Cd 1-1. The shape of the time-concentration curve suggests that cadmium may have two toxic mechanisms. The median period of survival for fish infected with the plerocercoids of the cestode, Schistocephalus solidus, was considerably shorter than for non-parasitized fish. This observation is considered in the light of the known effects of S. solidus on its host. (Katz)
W77-09666

MERCURY ACCUMULATION BY LARGEMOUTH BASS (MICROPTERUS SALMOIDES) IN RECENTLY IMPOUNDED RESERVOIRS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
A. R. Abernathy, and P. M. Cumbie.
Bulletin of Environmental Contamination and Toxicology, vol. 17, no. 5, p 599-601, 1977 6 tab, 20 ref.

Descriptors: *Mercury, *Bass, Freshwater fish, Path of pollutants, Water pollution effects, On-site-investigations, *South Carolina, Hydroelectric power, *Impoundments, *Impounded waters, *Metals, *Oligotrophic, Sediments, Water quality, Eutrophication.
Identifiers: *Lake Hartwell(SC), *Lake Keowee(SC), *Lake Jocassee(SC), Multipurpose hydroelectric impoundment, Micropterus, *Tissue mercury concentrations, Axial muscle.

Mercury levels of largemouth bass from three reservoirs in the southeastern United States were highest in bass from the younger, relatively oligotrophic reservoirs and were significantly lower in bass from an older, more eutrophic reservoir in the same drainage system. The reservoir with the highest mercury levels in bass is the reservoir farthest upstream, and is not subject to inputs of municipal or industrial wastes. The source of mercury in these reservoirs appears to be the soil which formed their original sediments. Preliminary data indicate that mercury levels in largemouth bass in these systems decline as the reservoirs age. Elevated mercury levels in fish appear to be a transitory phenomenon in newly impounded, relatively oligotrophic reservoirs. (Katz)
W77-09667

TOXICITY OF HYDROGEN SULFIDE TO VARIOUS LIFE HISTORY STAGES OF BLUEGILL (LEPOMIS MACROCHIRUS),
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
L. L. Smith Jr., D. M. Oseid, G. L. Kimball, and S. M. El-Kandelgy.
Transactions of the American Fisheries Society, vol. 105, no. 3, p 442-449, May 1976. 8 tab, 10 ref.

Descriptors: *Toxicity, *Lethal limit, *Fish reproduction, Water pollution effects, *Hydrogen sulfide, Environmental effects, *Bioassay, Feeding rates, *Growth rates, *Growth stages, Longevity, Mortality, Fish eggs, Sulfides, *Life history studies, Laboratory tests, *Sunfishes, Fry, Juveniles, Pollutant identification.
Identifiers: *Sublethal effects.

Bluegill (Lepomis macrochirus) eggs, fry, juveniles, and adults were exposed to hydrogen sulfide concentrations to determine acute toxicity. For eggs, 72-h LC50 was 0.0190 mg/liter; 96-h LC50 for 35-day-old fry was 0.0131 mg/liter, for juveniles 0.0478 mg/liter and for adults 0.0448 mg/liter. Exposure to lower levels of hydrogen sulfide resulted in some acclimation. No egg deposition occurred after long-term exposure to 0.0022 mg/liter hydrogen sulfide and reduced deposition was observed after 97 days at 0.0010 mg/liter. Growth was adversely affected at levels from 0.0031 to 0.0107 mg/liter hydrogen sulfide depending on the life history stage at which chronic exposure was started. When exposure was started with eggs, the lower level retarded growth. Time to anesthesia with MS:222 was reduced at levels from 0.0014 to 0.0031 mg/liter hydrogen sulfide. The most sensitive stage to acute toxicity was the feeding fry and to chronic toxicity was the spawning adults. (Katz)
W77-09668

IMMEDIATE BEHAVIORAL REACTIONS OF BLACKNOSE DACE, RHINICHTHYS ATRATULUS, TO DOMESTIC SEWAGE AND ITS TOXIC CONSTITUENTS,
Maryland Univ., College Park. Inland Environmental Lab.
J. A. Fava, and C. F. Tsai.
Transactions of the American Fisheries Society, vol. 105, no. 3, p 430-441, May 1976. 5 tab, 3 fig, 24 ref.

Descriptors: *Domestic wastes, *Chlorine, *Fish behavior, Environmental effects, *Nitrogen compounds, *Sewage, *Toxins, Laboratory tests, Ammonia, Ammonium salts, Freshwater fish, Water pollution effects, Methodology, Stress.
Identifiers: *Avoidance reactions(Fish), *Chloramine, *Rhinichthys, *Dace.

Using a channelled avoidance trough, immediate behavioral reactions of Blacknose dace to a domestic sewage effluent and its toxic constituents, chloramines, free chlorine, and ammonia, were investigated. Two avoidance indexes were computed from time spent and number of entries by fish into a test solution channel and a clean water channel. On the basis of the time avoidance index, the more sensitive of the two, the fish did not avoid unchlorinated sewage effluent and ammonium chloride solution in concentrations as high as 270 mg/liter as ammonia-nitrogen. The fish did avoid chlorinated sewage effluent, chloramines, and free chlorine. The degree of fish avoidance increased as total chlorine content increased. The threshold avoidance concentration under test conditions was 0.13 mg/liter as total chlorine for chlorinated sewage effluent, 0.18 mg/liter for chloramines, and 0.61 mg/liter for free chlorine. The degree of fish avoidance and the pattern of behavioral responses to chlorinated sewage effluent were almost identical with those to chloramines but different from those to free chlorine. These results suggest that chloramines are the major factor causing avoidance reaction of blacknose dace to chlorinated sewage effluent. (Katz)
W77-09669

THE TOXICITY OF MALATHION AND ITS HYDROLYSIS PRODUCTS TO THE EASTERN MUDMINNOW, UMBRA PYGMAEA (DEKAY),
Rutgers - The State Univ., New Brunswick, N. J.
M. E. Bender, and J. R. Westman.
Chesapeake Science, Vol. 17, No. 2, p 126-128, July 1976. 4 tab., 15 ref.

Descriptors: *Toxicity, *Pesticides, *Lethal limit, *Organophosphorous pesticides, *Insecticides, Persistence, Hydrolysis, *Mortality, Water pollution effects, Freshwater fish, *Bioassay, Laboratory tests, Water quality, Chemical degradation, Pollutant identification.
Identifiers: *Malathion, *Mudminnows, Umbra pygmaea.

The toxicity of malathion and its major hydrolysis products to the eastern mudminnow, Umbra pygmaea, was determined by utilizing 4-day static toxicity tests and 14-day continuous flow tests. Four-day LC50 values in mg/l were as follows: malathion .24; dimethylphosphorodithioic acid 17; diethyl fumarate 8.5; 2-mercaptodiethylsuccinate 47 and dimethylphosphorothionic acid 26. The basic hydrolysis products were more toxic than the acid hydrolysis products; 14-day continuous flow tests were conducted only on malathion and the basic hydrolysis products. Calculations of field application rates for the pesticide reviewed in light of the toxicity results suggest that only the parent compound, malathion, poses an environmental hazard to the mudminnow. (Katz)
W77-09670

ATP CONTENT AND MORTALITY IN MYTILUS EDULIS FROM DIFFERENT HABITATS IN RELATION TO ANAEROBIOSIS,
Utrecht Rijksuniversiteit (Netherlands), Lab. of Chemical Animal Physiology.
T. C. M. Wijsman.
Netherlands Journal of Sea Research, Vol. 10(1), p. 140-148, 1976. 3 fig, 22 ref.

Descriptors: *Mussels, Biochemistry, *Anaerobic conditions, Environmental effects, Habitats, *Aerobic conditions, Aquiculture, *Mortality, *Metabolism, Animal physiology, Laboratory tests, Respiration, Shellfish farming, Crustaceans, Energy, Energy budget, Oxygen, Water pollution effects.
Identifiers: *ATP, *Mytilus edulis.

Mortality and ATP content during experimental exposure to air were determined in two groups of Mytilus edulis, a wild group which is dry during low tide and a cultured group which is continuously covered by sea water. When kept in sea water, ATP levels were 2.02 plus or minus 0.14 mM in cultured and 2.08 plus or minus 0.09 mM in wild mussels. In mussels exposed to air for 7 days, a maximum decrease in ATP content to 1.18 MM (cultured) and 0.94 mM (wild) was determined after 3 days. Mortality in wild mussels reached 9% and stopped after reimmersion in sea water, whereas mortality in cultured animals was 24% at the end of exposure and continued under aeroic conditions, being 50% after 4 days of aerobiosis. Normal ATP levels were restored after 2 to 3 days of aerobiosis in both groups. When mussels were exposed to air and immersed in sea water alternately for periods of 24h, ATP levels were maintained at about 1.4 mM for cultured and 1.2 mM for wild animals. Mortality did not exceed control levels. (Katz)
W77-09671

TOXIC ACTION OF SEVERAL LETHAL CONCENTRATIONS OF AN ANIONIC DETERGENT ON THE GILLS OF THE BROWN TROUT (SALMO TRUTTA L.),
Aston Univ., Birmingham (England). Dept. of Biological Sciences.
P. D. Abel.
Journal of Fish Biology, Vol. 9, p. 441-446, 1976. 4 fig., 1 tab., 24 ref.

Descriptors: Water pollution effects, *Detergents, *Mortality, *Fish diseases, *Brown trout, Animal pathology, *Cytological studies, *Toxicity, Toxins, Anions, Microscopy, Laboratory tests, Salmonids, Fish physiology, Respiration, Phosphates, *Pollutant identification, *Electron microscopy.
Identifiers: *Cell lysis, *Sodium lauryl sulphate, *Gill damage, *Histology, Anionic detergent.

The pathological effects of ten lethal concentrations of the anionic detergent, sodium lauryl sulphate, on the gills of Salmo trutta have been studied by light and electron microscopy. At concentrations to 120 mg/l (medium survival times greater than 1 hour), epithelial cell death is associated with lysosome formation. Acute inflammation of the gill tissue, extensive detachment of the epithelium and, except at the lowest concentrations, collapse of the pillar cell system occur. At concentrations above 120 mg/l (medium survival times less than 1 hour) very rapid lysis of cells results in the complete disruption of cellular and tissue structure. Review of the biomedical literature suggests the observed effects of sodium lauryl sulphate on gill cells correspond to the two mechanisms by which detergents cause death in isolated cells. These are lysis by the action of the cell's own enzymes, induced by an initial lesion in the cell membrane whose precise nature is not known; and rapid lysis by the direct action of the detergent on the cell constituents. (Katz)
W77-09672

HISTOPATHOLOGIC ALTERATIONS IN SHELL GLAND ACCOMPANYING DDT-INDUCED THINNING OF EGGSHELL,
Army Veterinary Corps, Aberdeen Proving Grounds, Md. Veterinary Pathology Biomedical Labs.
G. T. Kolaja, and D. E. Hinton.
Environmental Pollution, Vol. 10, p 225-231, 1976. 5 fig., 1 tab., 13 ref.

Descriptors: *DDT, *Path of pollutants, *Mallard ducks, *Reproduction, *Water bird, *Animal pathology, *Waterfowl, *Bird eggs, Pesticides, Chlorinated, Hydrocarbon pesticides, Cytological studies, Laboratory tests, Microscopy, Calcium.
Identifiers: *Eggshells, *Histology.

Eggshell gland morphology was studied in control and DDT-treated (75ppm) mallard ducks. Histopathologic alterations in DDT-treated ducks included edema of villous projections, pyknosis of glandular epithelium, and cytoplasmic vacuolation of lining epithelium. These alterations accompanied DDT-induced thinning of eggshells. Eggshells of DDT-treated ducks were 13.8% thinner than those from controls. Edema in the shell gland may cause decreased calcium transport, a possible cause of eggshell thinning.
W77-09673

ECOLOGICAL RESPONSES OF PHYTOPLANKTON ON CHRONIC OIL POLLUTION,
Democritus Nuclear Research Center, Athens (Greece). Dept. of Biology.
L. Ignatiades, and N. Mimicos.
Environmental Pollution, Vol. 13, p 109-118, 1977. 2 fig., 5 tab., 38 ref.

Descriptors: *Biological communities, Water pollution effects, *Phytoplankton, *Marine microorganisms, *Diatoms, *Dinoflagellates, *Cyanophyta, *Oil wastes, Oil pollution, *Toxicity, On-site investigations, Seasonal, Annual succession, Productivity, Aquatic microorganisms, Bays.
Identifiers: *Sublethal effects, *Elefsis Bay(Aegean Sea).

The composition of phytoplankton in an inshore environment constantly polluted by petroleum hydrocarbons was followed over an annual cycle. The diatoms, dinoflagellates, micro-flagellates, coccolithophores, silico-flagellates, blue-greens, and others seemed to resist the toxicity of oil at recorded concentrations (14.90-21.85 mg/liter near surface and 11.90-27.00 mg/liter near bottom, total hydrocarbons). Special attention was paid to the species composition, dominance, diversity, and succession of diatoms and dinoflagellates. The results are compared with data obtained from other nonpolluted environments and the relationships discussed. It is recommended that such factors as grazing, biodegradation, temperature, and nutrients be taken into consideration when laboratory data are used to interpret corresponding phenomena in nature. (Katz)
W77-09674

THE EFFECT OF MIREX ON THE BURROWING ACTIVITY OF THE LUGWORM (ARENICOLA CRISTATA),
Environmental Research Lab., Gulf Breeze, Fla.
W. P. Schoor, and S. M. Newman.
Transactions of the American Fisheries Society, vol. 105, no. 6, p 700-703, 1976. 2 fig., 2 tab., 7 ref.

Descriptors: Path of pollutants, *Pesticides, *Chlorinated hydrocarbon pesticides, *Adsorption, *Benthic fauna, Animal behavior, Water pollution effects, Benthos, Invertebrates, Laboratory tests, Analytical techniques, Gas chromatography, Feeding rates, Bottom sediments, Worms, *Bioassay, Pollutant identification.
Identifiers: *Arenicola, *Lugworm, *Mirex, Arenicola.

An inexpensive bioassay system was developed to estimate pollutant effects on a benthic animal. Mirex, a fire ant toxicant, was taken into the substrate by the burrowing and feeding activity of the lugworm, Arenicola cristata, and significantly affected this activity. Mirex was present in the adult worm as well as in its juvenile stage. (Katz)
W77-09675

ORGANCHLORINE PESTICIDES AND PCBS DISTRIBUTION IN TISSUES OF PURPLE

HERON AND SPOON DUCK FROM THE BIOLOGICAL RESERVE OF DONANA (SPAIN),
Consejo Superior de Investigaciones Cientificas, Madrid (Spain). Instituto de Quimica Organica General.
For primary bibliographic entry see Field 5A.
W77-09677

ACCOMODATION OF DAPHNIA PULEX TO ALTERED PH CONDITIONS AS MEASURED BY FEEDING RATE,
Kansas Dept. of Health and Environment, Topeka.
R. L. Kring, and W. J. O'Brien.
Limnology and Oceanography, Vol. 21, No. 2, p 313-315, 1976. 1 fig., 13 ref.

Descriptors: Environmental effects, *Feeding rates, *Daphnia, *Hydrogen ion concentration, *Water temperature, Animal behavior, Laboratory tests, *Crustaceans, Water quality, Temperature, Zooplankton, Water pollution effects.

The maximal feeding rate of cladoceran populations occurs at or near the temperature and pH at which the animals were raised, suggesting that cladocerans may be able to alter their maximal feeding rates upon prolonged exposure to different conditions. Feeding rates of a population of Daphnia pulex collected from water of pH 7.7 to 7.9 and cultured in water of the same pH and pH 6.5 to 6.6 were measured over a wide range of pH conditions. Within 6 weeks to 2 months of exposure to the lowered pH, the population was able to feed maximally at the new pH. (Katz)
W77-09678

THE EFFECT OF WIND ON THE DISTRIBUTION OF CHLOROPHYLL A AND CRUSTACEAN PLANKTON IN A SHALLOW EUTROPHIC RESERVOIR,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5B.
W77-09679

TEMPERATURE AS A PROXIMATE FACTOR IN ORIENTATION BEHAVIOR,
Pennsylvania State Univ., Wilkes-Barrs. Dept. of Biology.
W. W. Reynolds.
Journal of the Fisheries Board of Canada, Vol 34, p 734-739, 1977. 40 ref.

Descriptors: Fish, *Fish physiology, *Fish behavior, *Thermal pollution, *Water pollution effects, Thermal power, *Thermal stress, Thermal waters, Temperature, Trout, Salmon, Ecological distribution, Habitats, Fish reproduction, Reviews, On-site-investigations, Laboratory tests.
Identifiers: *Thermoregulation(Fish), Orientation, Preferendum, Habitat selection, Avoidance, Fish responses, *Preference, *Behavioral mechanisms, Proximate and ultimate factors.

Temperature serves as a proximate factor (cue, guidepost, sign stimulus, or directive factor) affecting locomotor responses of fishes. Although temperature can also serve as an ultimate ecological factor, as in behavioral thermoregulation, nonthermal factors may in some cases provide the ultimate adaptive or ecological value of a temperature response; some examples are habitat selection, intraspecific size segregation, interspecific niche differentiation, isolating mechanisms, predator avoidance, prey location, escape reactions, and migrations (thermoperiodic, diel, seasonal, spawning). Conversely, nonthermal variables such as light intensity or water depth may act as accessory proximate factors in thermoregulation. In spawning migrations, thermal requirements of eggs and larvae may take precedence over the (often different) preferenda or optima of adults. Although thermal responses of fishes are largely innate and species specific, ontogenetic and other changes can occur. Since temperature can serve as an unconditioned reinforcer in operant conditioning, thermal responses are not limited to simple kineses or taxes. Nonthermal factors such as photoperiod, circadian rhythms, currents, social and biotic interactions, stresses, infections, or chemicals can affect thermal responses, and may account for some lack of conformity between laboratory preferenda and field distributions and behaviors. (Katz)
W77-09680

CONTINUOUS-FLOW APPARATUS FOR USE IN PETROLEUM BIOASSAY,
Battelle Pacific Northwest Labs., Sequim, Wash. Marine Research Labs.
For primary bibliographic entry see Field 5A.
W77-09681

NOTE ON THE EFFECTS OF LEAD ON OXYGEN PRODUCTION OF SEVERAL LITTORAL SEAWEEDS OF THE ADRIATIC SEA,
Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research.
N. Zavodnik.
Botanica Marina, Vol 20, No 3, p 167-170, 1977. 2 tab, 6 ref.

Descriptors: *Toxicity, *Photosynthesis, *Lead, *Marine algae, *Primary productivity, Water pollution effects, Phaeophyta, Rhodophyta, Chlorophyta, Laboratory tests, Diurnal, Sea water.
Identifiers: *Fucus, *Adriatic Sea.

Under constant conditions of salinity (37 degrees/oo) and temperature (15C) the influence of lead on oxygen production of Fucus virsoides, Padina pavonia, Ulva rigida, and Laurencia obtusa was studied. The lead concentrations in media ranged between 100-1000 ppb. In short-term tests lasting up to six days, the tidal species F. virsoides and U. rigida exhibited similar variations of net oxygen production under the slight inhibitory influence of lead. P. pavonia and L. obtusa could not adapt to experimental conditions and decayed within three days of the beginning of the experiment. Lead ion concentrations used in this experiment were below levels detectably toxic to the algal species used. (Katz)
W77-09682

INDUCTION OF HEPATIC ARYL HYDROCARBON HYDROXYLASE IN SALMON EXPOSED TO PETROLEUM DISSOLVED IN SEAWATER AND TO PETROLEUM AND POLYCHLORINATED BIPHENYLS, SEPARATE AND TOGETHER, IN FOOD,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
E. H. Gruger, Jr., M. M. Wekell, P. T. Numoto, and D. R. Craddock.
Bulletin of Environmental Contamination and Toxicology, Vol 17(5), p 512-520, 1977. 2 tab, 28 ref.

Descriptors: Fish physiology, *Chlorinated hydrocarbon pesticides, *Fish behavior, Bioassay, *Toxicity, Salmon, Juvenile fish, Laboratory tests, Animal pathology, Biochemistry, Oil, *Oil pollution, Water pollution effects, *Polychlorinated biphenyls, Enzymes, Sea water, Oil wastes, Water pollution effects.
Identifiers: *Hepatic aryl hydrocarbon hydroxylase, *Coho salmon, Soluble hydrocarbons, *Prudhoe Bay Crude Oil, Sea water soluble fractions.

Hepatic Aryl Hydrocarbon Hydroxylase (AHH) is induced in coho salmon exposed to 1 ppm PCB's in the diet; however, comparable experiments with 1 ppm of Prudhoe Bay crude oil did not significantly alter the AHH activities. These findings suggest that in aquatic food-chains containing both petroleum hydrocarbons and PCB's, the latter compounds may exert a predominant influence on the induction of the hepatic AHH enzyme system. Despite the lack of induction of hepatic AHH with 1 ppm Prudhoe Bay crude oil in the diet, young coho salmon exposed to 150 ppb (0.15 ppm) of a seawater-soluble fraction for 6 days exhibited a significant induction of this enzyme system. Thus, crude oil components of relatively high water solubility (e.g., methylated naphthalenes and polyakylated benzenes) may be more effective than high molecular weight insoluble components in inducing AHH. (Katz)
W77-09683

THE EFFECTS OF SALINITY, TEMPERATURE, AND MERCURY ON MORTALITY OF THE TROCOPHORE LARVAE OF SERPULA VERMICULARIS L. (ANNELIDA: POLYCHAETA),
Washington Univ., Friday Harbor. Friday Harbor Labs.
J. S. Gray.
Journal of Experimental Marine Biology and Ecology, Vol 23, p 127-134, 1976. 2 fig, 4 tab, 12 ref.

Descriptors: *Salinity, *Water temperature, *Mortality, *Mercury, *Worms, Environmental effects, *Larval growth stage, Analytical techniques, Toxicity, *Methodology, Metals, Statistical methods, Water pollution effects.
Identifiers: *Serpula, Mercuric ions, Annelids, Polychaeta's response-surface contours.

Using response surface methods 4-day old larvae of Serpula vermicularis L. were shown to be more euryplastic with respect to salinity and temperature than were gastrulae and 1-day old larvae. Significant interaction was found between the effects of temperature and reduced salinity on mortality of the larvae at each age tested. Four-day old trocophore larvae were more resistant to reduced salinity at low temperatures than were gastrulae and 1-day old larvae. The change in tolerance with age was in resistance rather than capacity adaptation and, since the larvae were acclimated at 16C, this change was genetic. Mercuric ions did not show synergistic effects with reduced salinity but merely acted additionally. The concentrations of mercury found to be toxic were much higher than those that are likely to be found in coastal waters where S. vermicularis occurs. (Katz)
W77-09684

SHORT TERM VARIABILITY IN VERTICAL CHLOROPHYLL STRUCTURE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 2L.
W77-09702

DOMESTIC AND AGRICULTURAL CONTRIBUTIONS TO THE INPUTS OF PHOSPHORUS AND NITROGEN TO LOUGH NEAGH,
Northern Ireland Dept. of Agriculture, Antrim. Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5B.
W77-09722

THERMAL TOLERANCE OF TWO SPECIES OF GAMMARUS,
National Water Quality Lab., Duluth, Minn.
W. E. Smith.
Trans Am Fish Soc. Vol. 102, No. 2, p 431-433, 1973.

Descriptors: *Amphipoda, Aquatic animals, Invertebrates, Crustaceans, Reproduction, Temperature, Thermal pollution, Water pollution effects.
Identifiers: Acclimation, Gammarus-lacustris, Gammarus-pseudolimnaeus.

Gammarus pseudolimnaeus Bousfield acclimated at 18C, had a 96-hr TL50 (tolerance limit) of 26C and a 30-day TL50 of 22-24C depending upon the test method. G. lacustris Sars, acclimated at 18C, had 96-hr TL50 of 26C and a 30-day TL50 of 25C. Both species reproduced most successfully at 18C; the numbers of young produced were reduced at temperatures above 18C. Simulated winter chill was not required to stimulate reproduction in either species.--Copyright 1973, Biological Abstracts, Inc.
W77-09730

EFFLUENTS OF KRAFT MILLS AND THEIR TOXICITY FOR HYDROBIONTS (STOCHNYE VODY SUL'FAT-TSELLYULOZNYKH ZAVODOV I IKH TOKSICHNOST' DLYA GIDROBIONTOV)),
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).
Gidrobiologicheskie Zhurnal, Vol. 11, No. 5, p 118-125, 1975. 53 ref, 5 tab.

Descriptors: *Pulp wastes, *Toxicity, Aquatic life, *Water pollution effects, *Reviews, Effluents, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Water pollution, Phenols, Fish, Daphnia, Aquatic animals, Sulfur compounds, Effluents, Lethal limit, Evaporation, Burning, Incineration.
Identifiers: Kraft mills, *Hydrobionts.

The presence in kraft mill effluents (both crude and biologically purified) of various toxic compounds and the effect of these compounds on aquatic organisms are discussed on the basis of available literature data. Tables are presented showing the effects of various concentrations of phenols on several species of fish and on Daphnia; the lethal concentrations of several phenolic compounds on Daphnia; the toxic and lethal concentrations of sulfur compounds contained in the effluents for various fish species; the toxic and lethal concentrations for fish of other effluent components (rosin and fatty acid salts, formaldehyde, phenylmercury acetate, phytosterol, and rosin acids); and the toxic, lethal, and fish-tainting concentrations (imparting unpleasant odor and taste) of several phenolic compounds in water. It is pointed out that the only effective means to eliminate the harmful effects of kraft mill effluents is their evaporation and burning. The combustion of foul-smelling organic compounds has been recommended at the International Meeting on Industrial Effluents held in Stockholm in 1970. (Stapinski-IPC)
W77-09739

NITRATE AND PHOSPHATE CONTENT OF GROUND AND SURFACE WATERS OF THE WHITE RIVER DRAINAGE, NORTHWEST NEBRASKA,
Union Coll., Middlesboro, Ky. Environmental Education Center.
For primary bibliographic entry see Field 5B.
W77-09743

WATER TRANSPORT OF WOOD (IN CANADA): THE CURRENT SITUATION,
Environmental Protection Service, Regina (Saskatchewan). Water Pollution Control Branch.
J. Karau.
Environmental Protection Service, Economic and Technical Review Report EPS 3-WP-75-3, October, 1975. 90 p, 11 fig, 77 ref, 9 tab.

Descriptors: *Water pollution, *Lumbering, Pulp and paper industry, Leachate, Bark, Costs, Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Lumber, Transportation, Water quality, Wood wastes.
Identifiers: *Log rafting.

This study reviews the techniques of transporting wood (logs) by water, pointing out the pros and cons of each method; discusses the impact of water transport on the environment (including water bodies involved, effect of leachates and bark, and modifications to river banks, channels, and stream flows to facilitate wood floatage); considers alternative means of transportation and their costs; and recommends procedures to help reduce the effects of water transport on the environment. (Witt-IPC)
W77-09755

EFFECTS OF LOG HANDLING AND STORAGE ON WATER QUALITY,
Corvallis Environmental Research Lab., Oreg.
G. S. Schuytema, and R. D. Shankland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 267, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency Technology Series, Report EPA-600/2-76-262, September, 1976. 84 p, 9 fig, 28 ref, 22 tab.

Descriptors: *Water pollution sources, *Lumbering, *Wood wastes, *Water quality, Lumber, Runoff, Ponding, Biological oxygen demand, Chemical oxygen demand, Color, Aesthetics, Water pollution, Wastes, Industrial wastes, Bark, Streamflow.
Identifiers: Log storage, Log ponds, Log decks, Log rafting.

The biological and chemical effects of three types of log storage on water quality were investigated. Three flow-through log ponds, two wet deck operations, and five log rafting areas were studied. Both biological and chemical aspects of stream quality can be adversely affected by flow-through log ponds and runoff from wet decks. The severity of degradation varies widely with each situation. Runoff from wet decks had pollution characteristics equal to or greater than that of the waters from the flow-through log ponds studied. Esthetically, a stream can be affected by the dark color of the water coming from a log pond or wet deck. Floating bark from a log raft or a log pond is also aesthetically displeasing. The most significant problem associated with log rafting is the loss of bark which commonly occurs when the logs are dumped into the water. (Witt-IPC)
W77-09760

AQUATIC FIELD SURVEYS AT RADFORD, HOLSTON, VOLUNTEER, AND MILAN ARMY AMMUNITION PLANTS - VOLUME I - RADFORD,
WAPORA, Inc., Washington, D.C.
B. L. Huff, W. Duckert, P. Barding, J. Wheeler, and R. B. Bogardus.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 191, Price codes: A08 in paper copy, A01 in microfiche. Report to Army Medical Research and Development Command, Washington, D.C., December, 1975. 145 p, 16 tab, 14 fig, 75 ref, append.

Descriptors: On-site investigations, *Virginia, *Bacteria, *Protozoa, *Phytoplankton, *Periphyton, *Zooplankton, Benthos, Freshwater fish, Water quality, *Water pollution effects, *Water pollution sources, Laboratory studies, Waste water(Pollution), Water temperature, Sulfates, *Nitrates, Nitrites, *Ammonium compounds, Aquatic populations, Aquatic animals.
Identifiers: *Munitions, *New River(Va), *Radford Army Ammunition Plant, *Macroinvertebrates, Species diversity.

Laboratory and field studies were conducted on September 16-20, 1974, at the Radford Army Ammunition Plant (RAAP) to determine possible effects of munition manufacturing wastes on the aquatic life in the New River, Virginia. Macroinvertebrate diversity was reduced below the C-line Acid Neutralization Facility and Nitroglycerin Area No. discharges and remained at a low level on the right bank (or major effluent side of the New River), downstream, beyond the 48-inch general purpose sewer line, the A/B line discharge, and Stroubles Creek discharges. Recovery was apparent at the lower stations where the New River flows away from the RAAP boundary. Decreased macroinvertebrate community diversity was found at the stations on Stroubles Creek below the major solvent and thermal discharges as compared with an upstream reference station. Fewer species of fishes were collected at stations below the 48-inch general purpose outfall and Stroubles Creek outfall than at either upstream or downstream sampling locations. The following parameters determined from laboratory analyses of water samples were apparently affected by RAAP operations: alkalinity, color, total dissolved solids, total organic carbon, sulfates, nitrates, nitrites, and total kjeldahl nitrogen. (See also W77-09762 and W77-09763) (Katz)
W77-09761

AQUATIC FIELD SURVEYS AT RADFORD, HOLSTON, VOLUNTEER, AND MILAN ARMY AMMUNITION PLANTS, VOL. II - HOLSTON - FINAL REPORT,
WAPORA, Inc., Washington, D.C.
B. L. Huff, W. Duckert, P. Barding, J. Wheeler, and R. B. Bogardus.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 192, Price codes: A07 in paper copy, A01 in microfiche. Report to Army Medical Research and Development Command, Washington, D.C., December, 1975. 127 p, 14 tab., 19 fig., 72 ref.

Descriptors: On-site investigations, *Tennessee, *Bacteria, *Protozoa, *Phytoplankton, *Periphyton, *Zooplankton, *Benthos, Freshwater fish, Water quality, Water pollution effects, Water pollution sources, Laboratory studies, Waste water(Pollution), Water temperature, Sulfates, Nitrates, Nitrites, *Ammonium compounds, Aquatic populations, Aquatic animals, Sediments.
Identifiers: Holston Army Ammunition Plant, *Holston River(Tenn), Munitions plants, *Macroinvertebrates, Species diversity.

Laboratory and field studies were conducted from September 23-28, and October 16, 1974 at the Holston Army Ammunition Plant (HAAP) to determine the effects of munition manufacturing wastes on the aquatic life in the Holston River, Tennessee. In addition to laboratory and field determinations of selected chemical and physical parameters the following aquatic groups were investigated: bacteria, protozoa, phytoplankton, periphyton, zooplankton, benthic macroinvertebrates and fish. Analytical data generated in this study are based on the results obtained from single grab samples and should be considered within that limitation. Of the physical/chemical in situ parameters, only pH and temperature appeared to be influenced by the plant. Water and sediment survey stations Je, Jf, K2, and M were located where discharges from HAAP Area B could conceivably affect their chemistry. Only a few parameters however, reflected the possible influence of plant activities in their concentration patterns, namely: color, dissolved sulfates, total solids (water) dissolved nitrates (water), TOC (water), and total volatile solids (sediments). (See also W77-09761) (Katz)
W77-09762

AQUATIC FIELD SURVEYS AT RADFORD, HOLSTON, VOLUNTEER, AND MILAN ARMY AMMUNITION PLANTS, VOLUME IV - MILAN, FINAL REPORT,
WAPORA, Inc., Washington, D.C.
B. L. Huff, W. Duckert, P. Barding, J. Wheeler, and R. B. Bogardus.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 194, Price codes: A06 in paper copy, A01 in microfiche. Report to Army Medical Research and

Development Command, Washington, D.C. 20314, December 1975. 107 p, 16 tab, 15 fig, 63 ref, append.

Descriptors: On-site investigations, *Aquatic animals, *Aquatic environment, Freshwater fish, *Aquatic productivity, Zooplankton, *Water quality, *Sediments, Conductivity, Water pollution effects, *Phosphates, *Oil, *Cadmium, *Lead, *Chromium, Chemical oxygen demand, Tennessee.
Identifiers: *Monitoring, *Macroinvertebrates, Species diversity, *Milan Army Ammunition Plant, *Total dissolved solids, Total volatile solids, Orthophosphates, *Oil and grease, Obion River(Tenn).

Studies were undertaken at Milan Army Ammunition Plant (MAAP) to determine the effects of munitions wastes on aquatic life in the receiving system. The following aquatic groups were investigated: bacteria, phytoplankton, periphyton, zooplankton, protozoa, macroinvertebrates and fish. Of the physical/chemical in situ parameters, only conductivity appeared to be influenced by plant activity. Those water and sediment (laboratory) parameters which appeared to be affected as result of plant activities were: total solids (water), total dissolved solids, total volatile solids, TKN, orthophosphates, COD (water), TOC, oil and grease (water), cadmium (water), COD (sediments), lead (sediments) and chromium (sediments). Other parameters demonstrated concentration patterns not based on proximity to plant discharges. The operation of MAAP has not had an apparent significant impact on the aquatic flora and fauna of the Rutherford Fork of the Obion River. The low abundance of aquatic organisms in Rutherford Fork is primarily due to the channelized nature of the stream with its fluctuating flows, high suspended sediments load and lack of suitable habitats. These prevailing conditions make the observation of significant effluent effects and drawing of firm conclusions about the impact of MAAP impossible within the limitations of this initial survey. (See also W77-09761) (Katz)
W77-09763

TOXICITY OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM), 2',5-DICHLORO-4'-NITROSALICYLANILIDE (BAYER 73), AND A 98:2 MIXTURE TO FINGERLINGS OF SEVEN FISH SPECIES AND TO EGGS AND FRY OF COHO SALMON,
Fish and Wildlife Service, La Crosse, Wis. Fish Control Lab.
T. D. Bills, and L. L. Marking.
Investigations in Fish Control No. 69, 1976. 9 p, 3 tab, 18 ref.

Descriptors: *Toxicity, *Bioassay, *Mortality, *Salmon, Fish eggs, Juvenile fish, *Pesticides, Brown trout, Rainbow trout, Lake trout, Brook trout, Channel catfish, Perches, *Hydrogen ion concentration, Laboratory tests, Sunfishes, Yellow perch, Lampreys.
Identifiers: *TFM, *3-trifluoromethyl-4-nitrophenols, 2'-5-dichloro-4'-nitroso-salicylanilide(Bayer 73), *Coho salmon, *Lampricides, Safety margin, Fish control laboratory.

Toxicity was determined of the lampricides 3-trifluoromethyl-4-nitrophenol (TFM) and 2',5-dichloro-4'-nitrosalicylanilide (Bayer 73) and a 98:2 mixture of these compounds against fingerlings of seven species of fish - brown trout (Salmo trutta), rainbow trout (Salmo gairdneri), lake trout (Salvelinus namaycush), brook trout (Salvelinus fontinalis), channel catfish (Ictalurus punctatus), bluegill (Lepomis macrochirus), and yellow perch (Perca flavescens) - and to eggs and fry of coho salmon (Oncorhynchus kisutch). Channel catfish were the most sensitive to TFM and brown trout to Bayer 73. Bluegills were the most resistant to both TFM and Bayer 73. The toxicity of TFM and Bakyer 73 individually was influenced far more by pH than was the mixture in standard laboratory tests with rainbow trout. Toxicity of the mixture was additive or less than additive to all species and life stages tested. The mixture was slightly more toxic to larval lampreys (Petromyzon marinus) than to other fish in comparable laboratory toxicity tests. The margin of safety was narrow, however, when the 24-h toxicity for brown trout or rainbow trout was compared with the 24-h LC99 for sea lamprey larvae. (Katz)
W77-09764

THE FRESHWATER MUSSEL (ANODONTA SP.) AS AN INDICATOR OF ENVIRONMENTAL LEVELS OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. W. Maki, and H. E. Johnson.
Fish and Wildlife Service, Investigations in Fish Control No. 70, 1976. 5 p, 3 tab, 9 ref.

Descriptors: *Toxicity, Bioassay, *Mortality, Laboratory tests, *Mussels, Mollusks, Biochemistry, Water pollution effects, *Physiology, *Methodology, Behavior, Monitoring.
Identifiers: *Freshwater mussels, *Anodonta, *Lampricides, 3-trifluoromethyl-4-nitrophenol(TFM), *TFM, Model stream, Uptake, Elimination rates, Radio-assay, Tissue concentrations.

After freshwater mussels (Anodonta sp.) were exposed to 8.68-mg/l solutions of 3-trifluoromethyl-4-nitrophenol (TFM; 14C-TFM and analytical grade TFM) in a model stream for 24 h, uptake and elimination rates of TFM residues for three body components were determined by radioassay. The average residue concentrations (micrograms TFM/g wet wt) after the 24-h exposure were 44.4 in the foot, 37.7 in the gill, and 38.5 in the viscera. The average calculated half-time for residue elimination from the three components was 20.2 h. The rate of uptake and ultimate residue concentration was widely variable, presumably because the feeding and locomotor activity of individual mussels varied greatly during the exposure period. (Katz)
W77-09765

GEOCHEMICAL INTERACTIONS OF HEAVY METALS IN SOUTHEASTERN SALT MARSH ENVIRONMENTS,
Skidway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W77-09767

VARIATIONS IN THE ABUNDANCE OF CHANNEL CATFISH YEAR CLASSES IN THE UPPER MISSISSIPPI RIVER AND CAUSATIVE FACTORS,
Iowa State Conservation Commission, Des Moines. Fisheries Section.
D. R. Helms.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 071, Price codes: A03 in paper copy, A01 in microfiche. Iowa Fisheries Research, Technical Series No. 75-1, December 1975. 31 p., 18 tab., 2 fig., 13 ref.

Descriptors: *Channel catfish, Freshwater fish, *Iowa, *Mississippi River, On-site investigations, Growth, *Fish populations, Fish management, Environmental effects, *Fish reproduction, Fish diseases, Parasitism, *Methodology, Water pollution effects.
Identifiers: Year classes(Catfish), Fish spawning, Mid-water trawling.

Vital statistics for channel catfish were described for Pools 9, 11, 13 and 18 in the Mississippi River to determine differences in year class abundance and causative factors. The 1970 year class was the most abundant. Very poor year classes occurred in 1971 and 1972. The 1973 year class was slightly better than 1974. Year class abundance of channel catfish was established in the first year of life during spawning or hatching. No cause and effect relationships could be correlated with pesticides in eggs, ovarian parasites, fecundity or water level fluctuations. Spawning time and intensity was correlary to water temperature, but had no direct association to establishment of year class strength. Turbidity also influenced spawning, but was not adequately measured to determine its total effect. Factors that were suspected to be involved but not evaluated in this study, were adult population density, abundance of predator and competitor species, food availability, and the quality of spawning habitat. More than a single factor obviously affects year class abundance. Trawling in the main channel of the stream during August was determined to be the most satisfactory method of surveying year class strength of O-age channel catfish. (Katz)
W77-09768

EVALUATION OF A LABORATORY MICROCOSM FOR STUDY OF TOXIC SUBSTANCES IN THE ENVIRONMENT: FINAL TECHNICAL REPORT, JULY 1, 1973-DECEMBER 31, 1975,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 5A.
W77-09769

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: KETONIC SOLVENTS,
Syracuse Research Corp., N.Y. Center for Chemical Hazard Assessment.
For primary bibliographic entry see Field 5B.
W77-09770

PETROLEUM HYDROCARBONS: DEGRADATION AND GROWTH POTENTIAL OF DEEP-SEA SEDIMENT BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, P. A. Seesman, T. L. Herbert, and R. R. Colwell.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 884, Price codes: A02 in paper copy, A01 in microfiche. Environmental Pollution, Vol. 10, 1976. 89-99 p., 6 tab., 7 fig., 6 ref.

Descriptors: *Oil, *Oil spills, *Bacteria, Carbon compounds, *Sediments, Marine microorganisms, Marine bacteria, Phosphates, Nitrates, Nitrites, Ammonium compounds, *Decomposing organic matter, Organic compounds, Microbial degradation.
Identifiers: *Petroleum hydrocarbons, *Mixed hydrocarbon substrate, Marine sediments, *Marine sediment bacteria, Bacterial growth.

Marine sediment bacteria were found to be capable of utilizing a mixture of 19 petroleum hydrocarbons, referred to as mixed hydrocarbon substrate (MHS). Autoclaving and the addition of sediment inoculum were found to change the concentration of inorganic nutrients (PO4, NO3, NO2, and NH4) in sea water. The concentration of inorganic nutrients affected growth of sediment bacteria and their utilization of MHS. (Katz)
W77-09772

TEMPERATURE EFFECTS ON YOUNG YELLOW PERCH, PERCA FLAVESCENS (MITCHILL),
Environmental Research Lab., Duluth, Minn.
J. H. McCormick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 169, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-76-057, May, 1976. 19 p, 1 tab, 2 fig, 31 ref.

Descriptors: Perch, *Yellow perch, Freshwater fish, *Water temperature, *Fish diseases, Environmental effects, *Thermal stress, *Thermal water, Seasonal, Methodology, Water pollution effects, *Thermal pollution.
Identifiers: Thermal variation, Seasonal variation, *Deformities(Fish).

The effect of temperature on growth of young-of-the-year yellow perch was determined over an 8-week period at constant temperatures from 8 to 34C. Absolute growth rates peaked at 28C, but were not significantly less ($P > 0.05$) over the range from 26 to 30C. Deformities occurred at 32C but at no lower temperatures, and all fish died within 7 days at 34C. A suggested seasonal temperature cycle for yellow perch habitats is presented, based on the data from this experiment for the summer period of rapid growth and on data from previous studies for other life stages. (Katz)
W77-09773

ANALYSIS OF DATA FROM BIOLOGICAL SURVEYS OF STREAMS: DIVERSITY AND SAMPLE SIZE,
Kansas Univ., Lawrence. Dept. of Geology; and Kansas Univ., Lawrence. Museum of Invertebrate Paleontology.
For primary bibliographic entry see Field 5A.
W77-09778

LEAD AND FRESHWATER FISHES: PART 2--IONIC LEAD ACCUMULATION,
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
M. Merlini, and G. Pozzi.
Environmental Pollution, Vol 13, p 119-126, 1977. 3 fig, 4 tab, 9 ref.

Descriptors: *Lead, *Absorption, Path of pollutants, *Ions, *Toxicity, *Bioassay, *Tracers, Laboratory tests, Radioisotopes, Metals, Heavy metals, *Pollutant identification.
Identifiers: *Lake Maggiore(Italy), *Bioaccumulation, *Carassius, *Italy.

When lead was added to Lake Maggiore (North Italy) water as nitrate only 8% of a 0.5 ppm lead concentration remained in the ionic state. There was good agreement between the concentration factors for radiolead and stable lead when the quantity of ionic lead was used in the calculations instead of total lead. These results and those of a previous experiment indicate that fish accumulate lead in the ionic state and that only a small amount of total lead remains in that form in freshwater with the qualities of that of Lake Maggiore. (See also W77-06435) (Katz)
W77-09779

MESENCHYMAL TUMORS OF SOME ESTUARINE FISHES IN THE NORTHERN GULF OF MEXICO. II. SUBCUTANEOUS FIBROMAS IN THE SOUTHERN FLOUNDER, PARALICHTHYS LETHOSTIGMA, AND THE SEA CATFISH, ARIUS FELIS,
Gulf Coast Research Lab., Ocean Springs, Miss.
R. M. Overstreet, and R. H. Edwards.
Bulletin of Marine Science, Vol 26, No 1, p 41-48, 1976. 16 fig., 20 ref.

Descriptors: *Trematodes, *Fish parasites, *Nematodes, *Fish physiology, *Pathology, *Gulf of Mexico, *Environmental effects, Microscopy, Mississippi.
Identifiers: Tumors, *Southern flounder, *Sea catfish, Arius, *Tissue analysis, Paralichthys, *Histology, Arius.

Benign subcutaneous mesenchymal fibromas in the southern flounder and in the sea catfish collected in esturine and marine water in Mississippi are described. Under the gular membrane of the flounder occured two pseudoencapsulated tumors, whereas only a single deeply-embedded non-encapsulated one occupied an area at the base of the catfish's anal fin. Because the latter tumor had a chondromatous component, it is considered to be a chonddromatous component, it is considered to be a condrofibroma. Tumors from both fish displayed morphological similarities, including tumor cell characteristics. They contained abundant collagen, and both incorporated bony and catilaginous spicules. The etiology of those from the flounder could be related to a philometrid nematode or a didymozoid trematode. This is the first description of tumors from Paralichthys Lethostigma and Arius felis. (Katz)
W77-09780

HEAVY METAL TOLERANCE OF MARINE PHYTOPLANKTON. II. COPPER TOLERANCE OF THREE SPECIES IN DIALYSIS AND BATCH CULTURES,
Norwegian Inst. of Seaweed Research, Trondheim.
A. Jensen, B. Rystad, and S. Melson.
Journal of Experimental Marine Biology and Ecology, Vol 22, p. 249-256, 1976. 1 fig, 3 tab, 15 ref.

Descriptors: *Diatoms, *Copper, Metals, *Heavy metals, Resistance, *Growth rates, *Absorption, *Algae, *Dialysis, Phytoplankton, Laboratory tests, Chlorophyll, Photosynthesis, Primary productivity, Aquatic microorganisms, Methodology.
Identifiers: *Skeletonema, *Thalassiosira, *Phaeodactylum, Dialysis cultures, Bater cultures.

The tolerance to copper ions of the three diatoms, Skeletonema costatum, Thalassiosira pseudonana, and Phaeodactylum tricornutum, grown in dialysis and batch cultures in the local fjord water was established. Reduction of growth rates was observed by the addition of 10, 25, and 400 micrograms/l of copper ions, respectively, for the three species. At higher levels of copper addition (400 and 700 micrograms/l) cells of P. tricornutum in dialysis culture increased their copper content to more than 200 times over those of the controls, the ratio of copper to chlorophyll in the cells increasing 150 times. All three species showed marked increases in copper content when a copper salt was added to batch cultures of the algae. The two clones of S. costatum tested showed nearly identical sensitivity to copper ions, but they differed in their zinc tolerance. (See also W74-11329) (Katz)
W77-09781

EFFECTS OF AROCLOR (R) 1254 ON BROOK TROUT, SALVELINUS FONTINALIS,
Environmental Research Lab., Duluth, Minn.
V. M. Snarski, and F. A. Puglisi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-191 215, Price codes: A07 in paper copy, A01 in microfiche. EPA Ecological Research Series, Report EPA 600/3-76-112, December 1976. 33 p, 5 tab, 1 fig, 30 ref, append.

Descriptors: *Bioassay, Methodology, *Brook trout, Freshwater fish, *Aroclors, *Growth rates, Fish reproduction, *Polychlorinated biphenyls, *Laboratory tests, Juvenile fish, Animal pathology, Water pollution effects.
Identifiers: *Aroclor 1254, PCB Residues, *Bioaccumulation.

No adverse effects were observed on survival, growth and reproduction of book trout exposed for 71 weeks to 0.94 ug/1. and lower concentrations of the polychlorinated biphenyl Aroclor (R) 1254 ($P=0.05$). Survival and growth to 90 days of alevin-juveniles from exposed parents were also unaffected ($P=0.05$). Polychlorinated biphenyl concentrations in the brook trout were directly proportional to the water exposure concentrations ($P=0.05$). The PCB tissue concentrations appeared to have reached a steady state by the first sampling after 14 weeks of exposure. The PCB residues (wet-tissue basis) in chronically exposed fish were approximately 2 ug/g in the fillet and 9 ug/g in the 'whole body' (entire fish minus one fillet and the gonads) at the highest water concentration, 0.94 ug/1. The higher residue in the whole body compared to the corresponding fillet was due to the higher fat content of the former. (Katz)
W77-09783

EFFECTS OF EXPOSURE TO HEAVY METALS ON SELECTED FRESH WATER FISH. TOXICITY OF COPPER, CADMIUM, CHROMIUM AND LEAD TO EGGS AND FRY OF SEVEN FISH SPECIES,
EG and G Bionomics, Wareham, Mass. Aquatic Toxicology Lab.
S. Sauter, K. S. Buxton, K. J. Macek, and S. R. Petrocelli.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 612, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-76-105, October 1976. 75 p, 40 tab, 49 ref.

Descriptors: *Lead, *Chromium, *Cadmium, *Copper, Brook trout, Rainbow trout, Lake trout, *Channel catfish, Suckers, Pikes, *Bioassay, *Toxicity, *Freshwater fish, Water pollution effects, *Juvenile fish, Walleye, Methodology, *Sunfishes, *Heavy metals.
Identifiers: White sucker, Northern pike.

Embryo and larvae of rainbow trout, lake trout, channel catfish, bluegill, white sucke, northern pike, and walleye were exposed for 60 days after hatch to lead and chromium in sofr water. Brook trout, channel catfish, and walleyes were also exposed for 60 days after hatch to copper and cadmium in soft and hard water. The effects on survival and growth indicated that copper and cadmium were toxic at much lower concentrations than lead and chromium. Water hardness did not appear to have a significant effect on the observed toxicity in most cases. (Katz)
W77-09784

GROWTH RESPONSES OF CHICKS FED MICROBIAL PROTEIN PRODUCED FROM ORGANIC WASTES,
Tennessee State Univ., Nashville.
O. L. Adams, and E. J. Thornton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 968, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, EPA, 600/3-76-074, August 1976. 16 p., 4 tab., 1 fig., 5 ref.

Descriptors: *Organic wastes, *Organic matter, *Organoleptic properties, *Microbial degradation, *Protein, Microbiology, Foods, *Food processing industry, Fungi, Feeds, Feeding rates, *Growth rates, Growth stages.
Identifiers: Growth responses, Chicken growth response, Microbial protein, *Aspergillus, *Bacterial proteins, Growth curves, Palatability, Fungal protein, *Potato wastes.

The objective was to investigate the use of microbial protein produced from organic wastes as a source of protein in chick starting rations. Microbial protein recovered from the mold mycelia was produced when potato waste materials were homogenized and added to a mineral salt containing a culture medium suitable for the action of a strain of Asperqillus niger. The new product containing approximately 29.0 percent protein was added to chick starting rations, replacing the soybean protein, Sixty-two percent (62%) of the protein in the ration was supplied by soybean meal. The length of the feeding trial was four weeks. Results of the feeding trials showed that fungal protein was effective in supporting body maintenance but was ineffective in stimulating growth. Palatability of rations and poor feed con

sumption were factors contributing to slow growth. However, feed utilization was less of a problem as shown by nitrogen retention trials. (Katz)
W77-09785

ACUTE TOXIC EFFECTS OF PETROLEUM REFINERY WASTEWATERS ON REDEAR SUNFISH,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
J. E. Matthews, and L. H. Myers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 913, Price codes: A04 in paper copy, A01 in microfiche. EPA Environmental Protection Technology Series, Report EPA 600/2-76-241, October 1976. 55 p., 4 tab., 1 fig., 14 ref., 3 append.

Descriptors: *Bioassay, *Toxicity, Freshwater fish, *Oil wastes, *Oil pollution, *Ammonia, Waste treatment, Wastewater treatment, *Phenols, *Sulfides, *Sunfishes, Industrial plants, Industrial wastes, Chemical analysis, Fish behavior.
Identifiers: Petroleum refining waste waters, *Petroleum refiners, *Redear sunfish, Lepomis, *Behavioral symptoms, Biodegradable toxicants.

Static bioassays of 24 hours' duration were performed on samples of wastewaters provided by 22 domestic petroleum refiners. These wastewaters represent three types of water discharges prevalent to this industry. Bioassays were performed using redear sunfish (Lepomis microlophus) as test organisms. Twenty-four hour 50 percent tolerance limits (TL50) of the various wastewaters are compared with results of chemical analyses performed during the same study. Tosicity varied considerably both between refineries and for waste streams from within a single refinery. Results of these analyses and observed behavioral symptoms of distresses fish revealed that ammonia, sulfides, and phenolics, alone or in combination, were major contributors to toxicity exerted in most samples. Three refineries had samples which were more toxic than anticipated based on results of chemical analysis, indicating the presence of other toxic compounds in unknown quantities; e.g., various hydrocarbons. (Katz)
W77-09786

THE EFFECT OF HIGH CONCENTRATIONS OF DISSOLVED OXYGEN ON SEVERAL SPECIES OF POND FISHES,
Bureau of Fisheries Lab., Fariport, Iowa.
A. H. Wiebe.
Ohio Journal of Science vol. 33, no. 2, p. 110-126, 1933. 8 tab., 7 ref.

Descriptors: Oxygen, *Supersaturation, *Bioassay, Laboratory tests, *Freshwater fish, *Fish physiology, *Fish behavior, Fish diseases, Bass, Sunfishes, Minnows, Brook trout, Rainbow trout, *Dissolved oxygen.
Identifiers: Black crappie, White crappie.

Laboratory experiments show that some species of freshwater fish tolerate large and sudden changes in the concentration of O2 in either direction, i.e. from 5.67 ppm to 40,33 ppm and from 41.2 ppm to 7.3 ppm. Several species of fish can stand a pressure of pure oxygen of 10 to 13 abs for a period of 24 hrs and pressures from 15 to 9 lbs for shorter periods. No instances of exopthalmus, opaqueness of the lens and the formation of gas bubbles were observed. No fish were observed to lose their equilibrium except in a few instances in the pressure experiment where depression occurred too rapidly. Exposure to high concentrations of dissolved oxygen with a superstratum of pure oxygen at atmospheric pressures and under small pressures is not harmful. (Katz)
W77-09789

INFLUENCE OF CERTAIN WATER CONDITIONS, ESPECIALLY DISSOLVED GASSES, ON TROUT,
Bureau of Commercial Fisheries, Beaufort, N.C.
J. S. Gutsell.
Ecology, Vol 10, No 1, p 77-96, 1929. 7 tab, 1 fig, 53 ref.

Descriptors: *Aquiculture, Fish hatcheries, *Dissolved oxygen, Laboratory tests, Bioassay, Mortality, Water quality, Brook trout, Brown trout, Rainbow trout, *Carbon dioxide, Water supply, Hydrogen ion concentration, Fish disease, *Fish physiology, Water quality, *Trout.
Identifiers: *Asphyxiation, *Oxygen tension, Transfer experiment, Seasonal changes, Trout streams.

Change in the water chemistry with the change in seasons was investigated in the Aquicultural Laboratory of Cornell University. As the water became warmer the O2 decreased to 1 ppm which was unsatisfactory for trout. Trout gradually accustomed to reduced O2 survived O2 content considerably below those fatal to trout from well oxygenated water. Asphyxiation of some trout in transfer experiments was observed in water of 2.5 ppm. At 1.3 ppm or less all asphyxiated. Recovery was observed in trout at 2.17 ppm O2. Carbon dioxide up to 28 ppm was not harmful. CO2 contents up to 39 ppm did not increase the ill effects of reduced O2. (Katz)
W77-09790

HOW A HEAT PUMP IMPROVED WATER CONDITIONS AT A FISH HATCHERY,
Cornell Univ., Ithaca, N.Y. Dept. of Thermal Engineering.
F. S. Erdman.
ASHRAE Journal, Vol 3, No 2, p 62-64 and p 136, Feb 1961. 4 fig.

Descriptors: Fish disease, *Fish hatcheries, *Supersaturation, *Water supply, *Fish physiology, Environmental engineering, Atlantic Salmon, Mortalities, Dissolved oxygen, Water quality, *Water temperature, Heat transfer, *Heated water, New York, *Pumps.
Identifiers: *Heat pump, Trout hatchery, *Cooling water, *Heating water, Water coolers.

For the hatchery at Cornell University, cold water which had been saturated with atmospheric gases became super saturated when warmed. An increase of 5F in water temperature with an electric immersion heater resulted in severe gas edema in young fish. High mortality of fry occurred with popeye and some mortality of younger fish. An engineering solution to this problem utilizing a heat pump was developed. (Katz)
W77-09791

ANNOTATED EXTRACTS OF SOME PAPERS DEALING WITH THE MEASUREMENT AND SOLUBILITY OF DISSOLVED ATMOSPHERIC GASES, WITH NITROGEN GAS SUPERSATURATION, AND WITH GAS BUBBLE DISEASE IN FISH,
British Columbia Water Resources Service, Victoria.
M. J. R. Clark.
Water Resources Service, Pollution Control Branch, Revised April 1974. 212 p, 375 ref.

Descriptors: Bibliographies, *Atmospheric gases, *Dissolved oxygen, Nitrogen, *Supersaturation, Fish diseases, Fish physiology, *Fish behavior, Freshwater fish, Bioassays, Mortalities, Fishkills, Water quality, Laboratory analysis, Methodology, Gas chromatography, Solubility, Analytical techniques, On-site-investigations, Reviews.
Identifiers: *Gas bubble diseases, Pop-eye, *Exophthalmia, *Nitrogen supersaturation, Annotated bibliography, Literature search.

A compilation of information and an annotated bibliography of papers regarding atmospheric gases dissolved in water and in blood are presented. These papers deal with dissolved gas supersaturation and with gas bubble disease in fish; gas supersaturation or related fish kills in Canadian waters; bio-assay investigations of gas bubble disease in fish or related gas embolism in animals; dissolved gas measurement techniques or gas solubilities and related subjects. (Katz)
W77-09792

SUPERSATURATION OF ATMOSPHERIC GASES IN THE COASTAL WATERS OF THE GULF OF MAINE,
National Marine Fisheries Service, West Boothbay Harbor, Maine. Biological Lab.
A. P. Stickney.
Fish Bulletin, Vol 67, (1), p 117-123, 1968. 1 tab, 1 fig, 13 ref.

Descriptors: Atlantic Ocean, Maine, Oceans, Water quality, *Supersaturation, *Dissolved oxygen, *Nitrogen, *Photosynthesis, Water temperature, Continental margin, Continental shelf, On-site-investigations, Seasonal, Water chemistry, Fish diseases, Environmental effects, *Sea water, Seasonal.
Identifiers: *Gulf of Mexico, Year-round observations, *Oxygen supersaturation, Seasonal variations, Coastal waters, Nitrogen measurements, Causative factors, *Gas bubble disease.

Year-round observations of dissolved oxygen in 1964-67 regularly revealed supersaturation of 120 to 150 percent during the spring and summer. Seasonal variations took the form of a sinusoidal cycle that showed definite phase relations to temperature. Comparisons with data for offshore oxygen showed that in general the coastal waters were more highly supersaturated. Nitrogen measurements made in conjunction with those of oxygen led to the conclusion that oxygen supersaturation was usually due to photosynthesis, but occasionally supersaturation of both gases indicated some physical cause. (Katz)
W77-09793

A REPORT ON STUDIES OF THE EFFECTS OF DREDGING AND DISPOSAL IN THE GREAT LAKES WITH EMPHASIS ON CANADIAN WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
P. G. Sly.
Scientific Series No 77, 1977. 38 p, 6 fig, 9 tab, 54 ref.

Descriptors: *Great Lakes, *Dredging, *Lake sediments, Wastes, *Waste treatment, *Waste disposal, Chemical wastes, Heavy metals, Water temperature, Water sampling, Pore water, Sedimentation rates, Water quality, Mud, Clays, *Canada.
Identifiers: *Open lake disposal, Confined disposal, Great Lakes Water Quality Agreement(Canada-US).

Following establishment of the Great Lakes Water Quality Agreement in 1972, open-lake disposal activities have been much reduced. Since 1972, a number of unpublished studies have been undertaken to assess the influence of dredging practices on water quality and this report refers principally to studies in the Canadian portion of the Great Lakes which, in most cases, have been undertaken in conjunction with regular dredging operations. At Port Stanley (Lake Erie) and Bronte Harbour (Lake Ontario), in studies before, during and after maintenance dredging, it was shown that total and reactive phosphorus levels increased rapidly in the receiving waters both at the removal site and at the open-lake dumping site; similar increases in other nutrient elements and heavy metals were also observed. As a result of particle settling and dilution, elevated concentra-

tions decreased rapidly and background conditions in the overlying waters were generally re-established within a few hours. Because of the influence of wave activity in Lake Erie the dumped materials were rapidly redistributed and no evidence was obtained to indicate a long term influence on water chemistry. At Thunder Bay (Lake Superior) recent evidence suggests that some harbour materials disposed of in deep water, below wave base, may continue to influence overlying waters for extended periods. At Mitchell Bay (Lake St. Clair), containment of dredged materials in an artificial island was examined, particularly to assess the significance of sediment water exchange processes. Tests were made both upon pumped slurry and on dumped materials after settlement. Despite seasonal variations in surface materials pore water concentrations below about 1.5 m remained sensibly constant; concentrations of Al, Cd, Cu, Pb and Zn were similar and concentration profiles of Fe, Mn and P showed strong dependence upon pH and redox potential; Hg in pore water remained independent of sediment values. (WATDOC)
W77-09794

IMPACT ON MARINE BENTHOS OF WASTE WATER DISCHARGE,
California Univ., Davis. Dept. of Civil Engineering.
G. T. Orlob, and D. A. O'Leary.
Journal of the Environmental Engineering Division-ASCE, Vol. 103, No. EE2, p 307-320, April, 1977. 8 fig, 1 tab, 8 ref.

Descriptors: *Outfalls, *Pollution abatement, *Benthos, Water pollution sources, Biochemical oxygen demand, Monitoring, Sediments, Treatment facilities, Aquatic animals, Performance, Evaluation, Mollusks, Crustaceans.
Identifiers: San Diego Bay(CA), Enchinoderms, Polycheates.

Results were presented from recent investigations on the effects of waste water discharge from Point Loma into San Diego Bay. This plant began operation in 1963 and has been successful in restoring the Bay as a community asset. This review emphasized the response of marine benthos, including benthic animal populations, to changes occurring during the life of the outfall. At the time of this study, 1974, mean daily discharge was slightly less than 40% above hydraulic design capacity. Wastes treated were primarily domestic, with contributing industrial and commercial wastes. Most discharge regulations, except suspended solids removal, are being met even with this low efficiency operation. High BOD content in sediments on the ocean floor have not produced detrimental effects in marine organisms. The distinctive BOD pattern around the outfall has shrunken in recent years, creating an equilibrium with organic sediments from the outfall. The changes in benthic populations due to the changing organic content of the sediments appeared to be a response to the change in nutrient supply. Polychaetes and mollusks were stimulated by the outfall. Enchinoderms and crustaceans were less adaptable to the outfall environment, but were still prominent. The extreme resilience of the Bay environment, demonstrated by the recovery from high loadings of the 1960s, indicates that present load levels can be accepted without environmental deterioration. Increasing the plant's treatment efficiency was thought to be the key to increasing total flow treated and delivered to the Bay beyond present levels. (Collins-FIRL)
W77-09846

WASTEWATER MICROBIOLOGY,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W77-09893

FILTERING RATE INHIBITION OF DAPHNIA PULEX IN WINTERGREEN LAKE WATER,
Michigan State Univ., East Lansing. Dept. of Zoology.
P. H. Crowley.
Limnol Oceanogr. Vol. 18, No. 3, p 394-402, 1973.

Descriptors: *Anabaena, *Daphnia, Filtration, Inhibition, Plankton, Seston.
Identifiers: Anacystis, Daphnia-pulex, Rhodotorula-sp, Wintergreen Lake(Michigan).

The difference between the effects of seston concentration and dissolved substances on the rates of filtering and feeding by D. pulex in the water of a small eutrophic lake (Michigan) was studied during late summer (16-18 Aug. 1971). Low concentrations of 32P-labeled yeast, Rhodotorula sp., were added to whole lake water, lake water filtrate, and seston resuspended in filtered tapwater to measure razing by field-collected animals. Lake water seston limited grazing rates at ambient concentration; 'dissolved' inhibitors capable of limiting filtering rates at lower seston concentrations were also present, but their effects were masked by high seston concentration. Possibly these dissolved substances were excreted into solution by the dense phytoplankton population, notably including Anabaena and Anacystis. Mathematical expressions for filtering and feeding rates as functions of seston concentration are derived from Holling's disc equation and fit to the data.—Copyright 1974, Biological Abstracts, Inc.
W77-09910

PRODUCTIVITY OF CLARIAS BATRACHUS IN THE SEWAGE FERTILIZED FISH PONDS,
National Environmental Engineering Research Inst., Nagpur (India).
K. P. Krishnamoorthi, M. K. Abdulappa, and A. V. J. Rap.
Indian Journal of Environmental Health, Vol 18, No 4, p 292-298, October, 1976. 6 fig, 5 ref.

Descriptors: *Fish management, *Catfishes, *Sewage effluents, Fishkill, Algae, Oxidation lagoons, Fish stocking, Fish populations, Fish farming, Carp, Fertilization.

Two fish ponds, fertilized with stabilization pond effluent, were stocked with Clarias batrachus to reduce fishkill from seasonal algal blooming. A study was conducted to determine C. batrachus growth, as well as related chemical and biological parameters. Over a two-year period the fish ponds were 20-30 C, and pH ranged from 7 to 9.5. Observed pH fluctuations resulted from high photosynthetic activity and community respiration. C. batrachus were able to survive extreme environmental conditions and ammonia toxicity created at high pH values. The BOD, nitrogen, and phosphate ratio was 60:30:4 indicating excessive nitrogen and adequate phosphate concentrations to support a blooming proportion of algae. Indian catfish culture is quite young and there is no regular source of supply. It was concluded that large-scale catfish culture in ponds and swamps receiving sullage, sewage and treatment plant effluent could enhance the production of catfish as a food source. (Collins-FIRL)
W77-09922

CHARACTERISTICS OF THE ZOOPLANKTON OF THE LOWER REACHES OF THE IRGIZ AND TURGAY RIVERS, (IN RUSSIAN),
Kazakh Research Inst. of Fisheries, Balkhash (USSR).
T. A. Petrova.
Gidrobiol Zh 12(3), p 67-69, 1976.

Descriptors: *Mesotrophy, Eutrophication, Lakes, *Zooplankton, Food chains, Crustaceans, Copepods, Fish management.
Identifiers: Brachionus, Filinia, Irgiz, Keratella, *Rotifers, *USSR(Kazakh SSR).

In an effort to facilitate the rational use of fish resources and increase fish productivity, the zooplankton populations in 13 lakes in the lower reaches of the Irgiz and Turgay Rivers (Kazakh SSR, USSR) were studied. The greatest species variety was manifested by the rotifers, with Keratella, Brachionus and Filinia dominating in numbers. In general, the lakes were characterized by a rotifer-copepod zooplankton fauna in the spring and a cladoceran-copepod fauna in the fall. With the exception of Lake Baytakkol', which had eutrophic features, the lakes studied could be preliminarily designated mesotrophic.—Copyright 1977, Biological Abstracts, Inc.
W77-09940

PLANKTONIC CILIATES IN THE IVAN'KOVO WATER RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
N. V. Mamaeva.
Zool Zh 55(5), p 657-664, 1976.

Descriptors: *Protozoa, Reservoirs, *Plankton, *Heated water, *Thermal pollution, Water pollution effects, Mortality.
Identifiers: Codonella-cratera, Infusoria, Strombidium-viride, Strombilidium-velox, Tinninnidium-fluviatile, *USSR(Ivan'kovsky Reservoir).

Studies of planktonic ciliates were carried out in the Ivan'kovsky Water Reservoir (Russian SFSR, USSR) from April-Sept. 1972-1973. Of 80 spp. of Protozoa determined, 77 being to Infusoria. The faunal composition changed markedly by seasons. Some species (Tintinnidium fluviatile, Codonella cratera, Strombidium viride, Strombilidium velox) occurred constantly in large numbers. The maximum ciliate development fell on the 1st half of May when the greatest number of species and the high population density were registered. Observations in the heated water zone of the Konakovsky Electric Power Station show that the heat exerted a marked effect on the development of ciliates. The population density of ciliates in the heated zone is much higher both in spring and autumn. The summer species appear in spring earlier than outside the limits of this zone and survive much longer in autumn. The death of ciliates was noted in the water running through the equipment of the electric station. The saprobity of the reservoir was determined by the composition and population density of ciliates; it approaches the level of beta-mesosaprobic water bodies.—Copyright 1977, Biological Abstracts, Inc.
W77-10010

POTENTIAL ENVIRONMENTAL CONSEQUENCES OF TERTIARY OIL RECOVERY,
Energy Resources Co., Inc., Cambridge, Mass.
C. Braxton, R. Stephens, C. Muller, J. White, and J. Post.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 646. Price codes: A11 in paper copy, A01 in microfiche. Final Report to Environmental Protection Agency, Washington, D.C., Office of Planning and Evaluation, July 1976. 229 p, 41 fig, 46 tab, 2 append. 68-01-1912.

Descriptors: *Resources development, *Baseline studies, *Water quality control, *Oil industry, *Environmental effects, Oil pollution, Hazards.
Identifiers: *Oil recovery, Enhanced recovery, Environmental impact.

Potential environmental problems associated with the so-called tertiary or enhanced oil recovery methods (micellar-polymer flooding, polymer flooding, surfactant flooding, hydrocarbon miscible displacement, carbon dioxide miscible displacement, steam displacement (or drive), cyclic steam stimulation, and in-situ combustion (or fire flooding) are identified. Possible impacts on ambient air quality, groundwater supplies and water quality are assessed qualitatively, and where

possible quantitatively, using dispersion modeling and risk estimates. The report examines those potential problems which are unique to enhanced oil recovery as well as post-operational problems such as chemical degradation products. Forecasts of enhanced oil recovery activity are allocated by process and region for use in impact analysis. Research needs are described to evaluate the problem areas. (Sinha-OEIS)
W77-10023

IDENTIFICATION AND ANALYSIS OF MID-ATLANTIC ONSHORE OCS IMPACTS.
Resource Planning Associates, Cambridge, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 925, Price codes: A13 in paper copy, A01 in microfiche.
Federal Energy Administration, Office of Energy Resources Development, Report No FEA/G-76-279, February 1976. 283 p, 7 append, 13 exhibits. Prepared for the Middle Atlantic Governors' Coastal Resources Council.

Descriptors: *Continental shelf, *Resources development, *Baseline studies, *Water quality control, Leases, Land use, Oil industry, Oil pollution, Environmental effects.
Identifiers: *Outer Continental Shelf, Coastal zone, *Mid-Atlantic bight, *Environmental impact.

Because of uncertainty concerning the proposed lease sales, the manner in which the DOI and other federal agencies would implement existing OCS legislation, and the possibility of new OCS legislation being passed prior to the sales, the Middle Atlantic Governors' Coastal Resources Council (MAGCRC) felt that it was essential to identify the nature and magnitude of onshore socioeconomic and environmental impacts, the management decisions and associated informational needs that would be required under existing legislation and regulations if the MAGCRC states were to play a significant role in OCS energy resource planning and coastal zone development, and the possible effects on the states of the policy options contained in proposed legislation. Therefore, this report analyzes and evaluates critically the recent literature on onshore socioeconomic and environmental impacts to indicate required management decisions and policy choices for the next decade, and recommends additional study needs. (Sinha-OEIS)
W77-10027

STUDIES ON THE BOTTOM FAUNA OF FOUR LAKES IN EASTERN HIKKAIDO (LAKES KUSSHYARO-KO, AKAN-KO, TORO-KO AND NIKARIBETSU KO, (IN JAPANESE),
Tokken Science Education Center, Yokkaichi (Japan).
T. Kitagawa.
Jpn J Limnol 37(1), p 37-41, 1976.

Descriptors: Lakes, *Benthic fauna, *Dissolved oxygen, Hydrogen ion concentration, *Diptera, Aquatic animals.
Identifiers: Chaoborus-sp, Chironomus plumosus, Kusshyaro-ko, Procladius-sp, Sergentia-sp, Nikaribetsu-ko, Spaniotoma-sp, Toro-ko, Tufex-sp, *Japan(Eastern Hikkaido).

Lakes Kusshyaro-ko, Akan-ko, Toro-ko and Nikaribetsu-ko (Japan) were investigated in 1973 regarding their bottom fauna. In lake Kusshyaro-ko, only Spaniotoma sp. was found in the profundal zone. The dissolved O2 was rich and the pH value was 4.2 through the layers from the surface to the bottom at the central part of the lake. In lake Akan-ko, expecting the azoic zone deeper than 32 m, Chironomas plumosus, Sergentia sp. and Procladius sp. occurred widely; C. plumosus was dominant. In Lake Toro-ko Chaoborus sp. and C. plumosus are distributed widely almost all over the bottom. The former made up 59.5% and the latter 33.4% of the total bottom fauna. In Lake Nikaribetsu-ko macroscopic animals were scarce in the zone deeper than 95 m, where the dissolved O2 contents were 0.33 cm3/l. Tubifex sp. occurred abundantly on the bottom shallower than 75 m, but chironomid larvae were very scanty.--Copyright 1977, Biological Abstracts, Inc.
W77-10028

REPORT ON A BIOLOGIC AND SEDIMENTOLOGIC STUDY RELATED TO THE TYBEE ISLAND BEACH NOURISHMENT PROJECT AND THE OFFSHORE AREA FOR DREDGE MATERIAL DISPOSAL,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 2L.
W77-10029

THE EFFECT OF COPPER ON COMPETITION BETWEEN MARINE ALGAE,
Manchester Polytechnic (England). Dept. of Chemistry and Biology.
A. H. Fielding, and G. Russell.
Journal of Applied Ecology, Vol. 13, No. 3, p 871-876, 1976. 2 fig, 1 tab, 14 ref.

Descriptors: *Copper, *Marine algae, *Competition, *Plant growth, *Laboratory tests, Evaluation, Graphical methods, Testing procedures, Cultures.
Identifiers: Ectocarpus siliculosus, Erythrotrichia carnea, Ulothrix flacca.

Difficulties previously demonstrated in studying interspecific competition in laboratory algal cultures by the de Wit 'replacement series' method, where the length of the lag phase is related to the amount of inoculum supplied, were overcome by growing three marine algae species together in matched pairs. This 'triangular' method was applied to a copper non-resistant strain of Ectocarpus siliculosus, Erythrotrichia carnea and Ulothrix flacca with copper chloride additions ranging from 0 to 500 microgram/cu decimeter. The growth of all species decreased in the higher copper concentrations but interaction between pairs of species varied with the amount of copper concentration. Ectocarpus was strongly competitive against Ulothrix in all but the most concentrated copper solutions and apparently benefits from the presence of Ulothrix in small quantities. Ulothrix performs better against Erythrotrichia in the control and most dilute copper solutions; at higher copper concentrations erythrotrichia evidently benefited from the presence of Ulothrix. In the lower copper concentrations, Erythrotrichia was the dominant member of the pair when grown with Ectocarpus. This situation was reversed at the higher copper concentrations when Ectocarpus was the more successful. The data is presented as standard de Wit replacement series (log yield/density plots) and in a tabular form devised by the authors. The de Wit diagrams work better for data analysis. (Auen-Wisconsin)
W77-10051

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFGYL. PART 1, AVAILABLE PHOSPHORUS IN URBAN RUNOFF AND LAKE ONTARIO TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
W. F. Cowen, and G. F. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 974, Price codes: A11 in paper copy, A01 in microfiche. EPA-600/3-76-094a, October 1976. 230 p, 23 fig, 64 tab, 94 ref. 1BA608, EPA R-8000537-02.

Descriptors: *Lake Ontario, *Phosphorus, Cycling nutrients, Limiting factors, Runoff, Precipitation(Atmospheric), Algae, Urban runoff, Lakes, Nutrients.
Identifiers: *Nutrient availability, Particulate phosphorus, Phosphorus availability.

Research investigating the availability of phosphorus forms in urban runoff at Madison, Wisconsin was applied to the study of P availability in tributary waters of Lake Ontario. Total P, soluble P, particularate P and soluble reactive forms were measured in runoff, precipitation and riverine samples from Madison and from rivers in New York state; determinations were also made for acid-extractable, base-extractable and anion exchange resin inorganic P from the particularate fractions. Algal assays assessed portions of the P fractions available for Selenastrum capricornutum growth. Availability of particularate P from the runoff ranged from 8-55% at Madison, from 1-24% in the Genesee, Oswego and Black rivers. Precipitation samples showed less than 9% phosphorus availability. About 39, 24 and 15% of particularate P in urban runoff from Madison could be extracted by acid, base and anion exchange respectively. Results from urban areas in the Genesee River Basin in New York were similar. Resin extractions in long-term aerobic dark incubations produced results similar to short-term tests, indicating that physical and chemical processes rather than microbial mineralization processes were probably the key factors regulating release of inorganic P. (Harris-Wisconsin)
W77-10052

AN INVESTIGATION OF THE NEARSHORE REGION OF LAKE ONTARIO IFYGL.
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 268, Price codes: A13 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-115, December 1976. 282 p, 67 fig, 56 tab, 110 ref, 2 append. 1BA608, EPA 800701.

Descriptors: *Lake Ontario, *Baseline studies, *Cladophora, *Water quality, Zooplankton, Dissolved oxygen, Thermal stratification, Shores, Biomass, Benthos, Nutrients, Phytoplankton, Canada, New York, Great Lakes.
Identifiers: Genesee River(NY), Niagara River(NY), Welland Canal(Canada).

Biological, physical and chemical baseline data were gathered in the nearshore region of Lake Ontario from the Welland Canal to the area of Rochester, New York, between April 1972 and May 1973. The worst water quality conditions were seen at the Genesee and Niagara River mouths. A thermal bar, however, kept the most nutrient-enriched waters near the shoreward side. Wave action and a lack of suitable substrate for attachment, rather than chemical factors, were the key factors limiting Cladophora growth. The physical nature of the sediment was important in determining the type of benthos found in each part of the study area. Twelve previously unreported zooplankton species and one such phytoplankton species were collected in the lake during the study. Higher concentrations of nutrients, volatile solids and heavy metals were noted in sediments with higher clay contents. Measurements made during the study included: dissolved oxygen; light; temperature; phytoplankton; biomass; zooplankton; benthos; cladophora; sediment nutrients, toxicants, and quality indicators; and water chemical nutrients, toxicants and quality indicators. (Harris-Wisconsin)
W77-10053

RESTORATION OF LOWER ST. REGIS LAKE (FRANKLIN COUNTY, NEW YORK),
New York State Dept. of Health, Albany. Environmental Health Center.
G. W. Fuhs, S. P. Allen, L. J. Hetling, and T. J. Tofflemire.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 278, Price codes: A06 in paper copy, A01 in microfiche Report No. EPA-600/3-77-021, February 1977. 118 p, 39 fig, 24 tab, 50 ref. 1BA031, EPA R-801529.

Descriptors: *Eutrophication, *Algal control, *Phosphates, Cyanophyta, Aquatic weed control, Diatoms, Sewage treatment, Nutrient removal, Chemical precipitation, Iron, Lakes, *New York.
Identifiers: *Lake restoration, *Lower St. Regis Lake(NY), *Ferric chloride, *Phosphate removal, Sewage diversion.

Successful efforts to restore Lower St. Regis Lake in the Adirondack region of upstate New York by point-source phosphorus input control are described. Severe eutrophication had become evident by the presence of summer-long cyanophyta blooms caused by local phosphate discharges. Ferric chloride rather than alum was selected as a precipitant for phosphate to avoid possible stimulation of microbial sulfate reduction in the lake by sulfate additions. The ferric chloride was added and ferric phosphate sludge was removed from the lake basin during three periods from 1972-1974, and a year-around diversion project of the effluent to a sand bed 250 meters from the lake was initiated in mid-1974. Evidence of the recovery of the lake was seen in 1975, when the usual spring bloom of flagellates and diatoms did not occur. Additional evidence was seen in that the summer bloom was delayed in 1974 and was further reduced in duration and intensity the following summer. It is thought that the high iron content of the lake might be speeding its recovery. However, continued hypolimnetic oxygen depletion thought to be caused by methane formed in the sediments is seen as a delaying factor in the restoration. (Harris-Wisconsin)
W77-10054

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION: VOL. 4. PHYTOPLANKTON OF LAKE MICHIGAN,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
S. J. Tarapchak, and E. F. Stoermer.
Prepared for ERDA by Argonne National Laboratory, Argonne, Illinois, Report No. ANL/ES-40, Vol. 4, December 1976. 211 p, 89 fig, 37 tab, 249 ref. ERDA W-31-109-Eng-38.

Descriptors: *Lake Michigan, *Phytoplankton, *Eutrophication, Systematics, Primary productivity, Trophic level, Diatoms, Cyanophyta, Phosphorus, Spatial distribution, Temporal distribution, Speciation, Silica, Nitrogen fixation, Data collections, History, Varieties, Biological communities, Great Lakes.

A report summarizes published information on phytoplankton research in Lake Michigan, ranging from algal taxa and variations in phytoplankton standing crop and composition to primary productivity, limiting nutrient interactions, and trophic state evaluations of the lake. A line of evidence is presented--based on dominance shifts away from diatoms and in favor of chlorophyta abundance near Milwaukee and Chicago and toward the growth of chlorophyta and cyanophyta offshore in the southern basin--to suggest that the lake is undergoing serious cultural eutrophication because of phosphorus loading increases. Six major topics are covered in the report: (1) a historical synopsis of phytoplankton research and literature review; (2) spatial and temporal variations in phytoplankton abundance and species composition; (3) spatial and temporal variations of primary productivity; (4) an examination of the phosphorus-silica-eutrophication hypothesis in relation to nutrient concentrations and loading rates of nutrients; (5) dynamics of phytoplankton succession in Green Bay and the ecological significance of nitrogen fixation by plankton; (6) a general account of the sampling problems and limitations and advantages of various quantitative methods for use in planktonic lake studies. (See also W77-03566 and W74-09407) (Harris-Wisconsin)
W77-10056

BIOLOGICAL, CHEMICAL AND PHYSICAL RELATIONSHIPS IN THE STRAITS OF MACKINAC,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske, E. F. Stoermer, J. E. Gannon, and M. S. Simmons.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 993, Price codes: A13 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-095, October 1976. 283 p, 112 fig, 42 tab, 88 ref. 1BA608, EPA R 802721.

Descriptors: *Straits, *Great Lakes, *Flow, *Water quality, Lake Michigan, Lake Huron, Lake Superior, Subsurface flow, Statistical methods, Cyanophyta, Phytoplankton, Zooplankton, Crustaceans, Hydrology, Currents(Water).
Identifiers: *Straits of Mackinac(Lake Michigan-Lake Huron).

Investigations of inter-lake surface and subsurface water transfers in the straits of Mackinac area showed that movement of water eastward from Lake Michigan had a subtle deleterious effect on water quality in Lake Huron. Environmental conditions in the straits were influenced by: (1) net transport of water from Lake Michigan to Lake Huron; (2) an oscillatory flow of water produced by seiches between the two lakes; and (3) hypolimnetic transport of water from Lake Huron to Lake Michigan during periods of thermal stratification. Using data gathered during cruises in August-October 1973, four separate techniques were used to delineate water masses in the straits resulting from mixing of the waters of Lakes Michigan, Huron and Superior: (1) Multivariate statistical techniques showed that water masses could be identified with cluster analysis; (2) ordination analyses of plankton assemblages closely related data stations; (3) temperature-conductivity plots were useful in identifying surface water masses; (4) various analyses were made for single parameters, including values for silica, specific conductance, pH, nitrate and temperature. Phosphorus is transported into Lake Huron from Lake Michigan, but the latter waters are relatively depleted of silica and nitrate. During late summer these transported waters are dominated by cyanophyta distinct from those found in the open waters of either lake. Cladocerans were more prevalent in Lake Michigan than were calanoid cladocerans in Lake Huron. (Harris-Wisconsin)
W77-10058

UNDERWATER HABITATS FOR SCIENTIFIC RESEARCH IN THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
For prim... bibliographic entry see Field 7B.
W77-10060

LIMNOLOGICAL INVESTIGATION OF THE MUSKEGON COUNTY, MICHIGAN, WASTEWATER STORAGE LAGOONS. PHASE 1,
Western Michigan Univ., Kalamazoo. Dept. of Biology.
W. R. Frykberg, C. J. Goodnight, and P. G. Meier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 631, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/3-75-009, September 1975. 98 p., 23 fig., 16 tab., 42 ref.

Descriptors: Waste water treatment, Impaired water use, *Oxidation lagoons, *Sewage lagoons, Water quality, Biological properties, *Eutrophication, Sewage treatment, Seepage, Zooplankton, Cyanophyta, Chlorophyta, Diptera, Phytoplankton, Protozoa, Oligochaetes, *Limnology, Irrigation, *Michigan.
Identifiers: *Muskegon(Mich).

Special emphasis was given to biological aspects of the water quality and to the benthic and planktonic populations, in an investigation of the limnological effects of two 850-acre wastewater storage lagoons which form part of the Muskegon (Mich.) Wastewater Land Irrigation System. Turbidity, BOD, total organic carbon, nutrients, anions and metals (except for magnesium) were all higher in the East Lagoon than in the West Lagoon, and the former was also slightly less alkaline. Waters in the East Lagoon consisted primarily of semi-treated municipal and industrial wastewater, while those of the West Lagoon were usually only seepage and ground water. Chironomids accounted for 97% of the scant benthic fauna. The limited presence of the oligochaete Limnodrilus indicates the lagoons will support benthic organisms and that a more dense and diverse benthic community will develop later. The number of zoo-plankton per liter was consistently higher in the enriched East Lagoon. Green algae clearly dominated the phytoplankton and protozoan populations, with 55.4% in the East Lagoon and 67.4% in the West Lagoon. The proportion of this chlorophyta steadily increased with distance from the source of the wastewater discharge in the East Lagoon. Cyanophyta represented 25.3% of the phytoplankton and protozoan population in the West Lagoon. (Harris-Wisconsin)
W77-10061

TACONITE TAILINGS DISPOSAL, RESERVE MINING COMPANY, SILVER BAY, MINNESOTA.
Weston (Roy F.), Inc., West Chester, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 346, Price codes: A09 in paper copy, A01 in microfiche. Report October 1971. 169 p. 26 fig., 49 tab., 5 ref.

Descriptors: *Mine wastes, *Waste dumps, *Lake Superior, *Environmental effects, *Comparative costs, Installation costs, Maintenance costs, Operating costs, Treatment facilities, *Minnesota, Waste water(Pollution), Waste water disposal, Waste water treatment, *Evaluation, Great Lakes.
Identifiers: *Taconite tailings, Reserve Mining Co.(Minn), *Silver Bay(Minn).

Findings are presented from an independent evaluation of feasible wastewater treatment and disposal alternatives that might be used by the Reserve Mining Co., Silver Bay, Minnesota, whose processing plant for taconite ore deposits approximately 67,000 tons of taconite tailings into Lake Superior along its northern shore. It was previously found that the waste discharge without treatment had deleterous effects on the water quality of the lake. The present report includes: (1) a collection and review of all available pertinent information from prior studies and conferences in regard to the Reserve Mining Co. dispute; (2) a comparison of all previously proposed treatment and isposal schemes on the basis of economics and environmental impact; (3) an analysis of Reserve Mining and similar operations to determine the impact of various ore beneficiation processes on wastewater characteristics, quantities and variability; (4) a determination of optimum treatment parameters, including flocculant dosages, settling velocities and solids thickening and dewatering characteristics, on individual process streams and/or combined effluents; (5) development of conceptual treatment processes or methods for handling taconite wastes as based on parameters established in the previous steps; (6) evaluation of the long-range impact of tailings disposal on the environment; (7) review and analysis of economic and financial considerations relative to taconite processing and to the overall waste treatment objectives. (Harris-Wisconsin)
W77-10062

BIOLOGICAL EFFECTS AND PERSISTENCE OF METHYL PARATHION IN CLEAR LAKE CALIFORNIA,
Lake County Mosquito Abatement District, Lakeport, Calif.
C. S. Apperson, R. Elston, and W. Castle.

Environmental Entomology, Vol. 5, No. 6, p. 1116-1120, 1976. 3 fig., 1 tab., 9 ref.

Descriptors: *Pesticide residues, *Zooplankton, *Fish, Persistence, Insecticides, Sunfishes, Daphnia, Copepods, Lake sediments, Crustaceans, *California, Lakes.
Identifiers: *Methyl parathion, *Clear Lake(Calif), Diaptomus franciscanus, Cyclops, Mesocyclops, Daphnia, Bosmina longirostris, Diaphanosoma brachyurum, Ceriodaphnia reticulata.

Methyl Parathion was applied to Clear Lake, California, in dosages of 3.3 ppb to control effects of the non-biting Clear Lake gnat (Chaoborus astictopus) on zooplankton and fish, but little positive effect was achieved. Three treatments at 20-day intervals had no lasting impact on zooplankton; recovery was rapid for the examined oranisms, including copepod nauplii, Diaptomus franciscanus, Cyclops, Mesocyclops, Daphnia, Bosmina longirostris, Diaphanosoma brachyurum, and Ceriodaphnia reticulata. The first two treatments had no effect on the abundance of Cyclops and Mesocyclops. Diaptomus declined by 32% following the second treatment. A concomitant decrease in the average length of diaptomus suggested that mortalities among the larger organisms had occurred. Nauplii populations declined, then again after the last treatment, but Diaphanosoma continued to decline to a level reaching 55% of pretreatment. No methyl parathion residues were found in the sediment samples, suggesting that it is rapidly degraded. Highest residues were found in the bluegill sunfish (Lepomis macrochirus) and varied from 11 to 110 ppb which corresponded to a 39-28-fold increase in methyl parathion relative to the concentration residues in waste. Levels accumulated by the bluegills were expected to diminish as the concentration of methyl parathion in water declines following the final treatment. (Auen-Wisconsin)
W77-10063

DETERMINING PHOTOSYNTHETIC PRODUCTIVITY IN STREAMS,
Massachusetts Water Resources Commission, Westborough. Water Quality Section.
J. B. Erdman.
The Certificated Engineer, Vol 49, No 6, p 114-117, 1976. 4 fig, 3 ref.

Descriptors: Dissolved oxygen, Costs, Water quality standards, *Photosynthesis, Computers, Streams, *Massachusetts, *Productivity, Forecasting.

The question faced by the Water Quality Section of the Massachusetts Division of Water Pollution Control is: In what cost-effective manner can the Massachusetts Water Quality Standards be insured against violation. In the course of answering this question, vast amounts of data, both on the waterways and on the existing pollution discharges are obtained and analyzed. To make predictions, it is necessary to know the present state of affairs. Dissolved oxygen content is one important factor used in these predictions. The purpose of performing a dissolved oxygen analysis for a stream is to insure that the dissolved oxygen concentration in all parts of the stream will always remain above a certain level, prescribed by the Standards. The magnitude of all natural and man-induced factors, which at present significantly affect the dissolved oxygen concentration in the stream are determined. One such factor is photosynthetic productivity. A method is described for determining the productivity utilizing dissolved oxygen data from the stream. (So African Water Info Center)
W77-10080

THE CASE FOR THE EXPANDED STUDY OF FRESHWATER POLLUTION ZOOLOGY,
Zululand Univ., Empangeni (South Africa). Dept. of Botany.
P. E. Reavell.
South African Journal of Science, Vol. 72, No. 9, p 260-261, September 1976. 7 refs.

Descriptors: *Hydrobiology, *Freshwater, *Water pollution, *Aquatic animals, Aquatic weeds, *Research priorities, Invertebrates, Benthos, Environmental effects, *Bioindicators, Laboratory tests, On-site tests, Reservoirs, Rivers, Lakes, *Sampling, *Monitoring, *Ecosystems, Africa.
Identifiers: *South Africa.

A research program is suggested, including the following projects:- Annual sampling programs in various ecosystems, including the monitoring of the water, sediments and living material. Dominant species in terms of both biomass and standing crop must be established. Stress responses of test organisms to different combinations of pollutants, at all stages of the life cycle, must be determined experimentally. The effect of intermittent pollution must be determined. Effects of pollution on biological productivity must be studied. A serious study of the interrelations of pollution and the freshwater ecosystem is envisaged. (So African Water Info Center)
W77-10086

DEHYDRATION OF MARINE ZOOLOGICAL MATERIAL - VOLATILITY OF METABOLISED SELENIUM AT 105-120C,
Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries.
For primary bibliographic entry see Field 5A.
W77-10095

LAKE SIBAYA - A LAND-LOCKED ESTUARY,
Rhodes Univ., Grahamstown (South Africa) Inst. of Freshwater Studies.
For primary bibliographic entry see Field 2H.
W77-10099

5D. Waste Treatment Processes

SOME EFFECTS OF LIME ADDITION ON HIGH SOLIDS, COMPLETELY MIXED, ACTIVATED SLUDGE WASTE WATER TREATMENT,
Syracuse Univ., N. Y.
R. C. Faro.
PhD Thesis. 1975. 265 p.

Descriptors: *Sanitary engineering, *Activated sludge, *Lime, Sewage treatment, Sludge treatment, Domestic wastes, Aeration, Biochemical oxygen demand, Phosphorus, Nitrogen, *Waste water treatment.

An investigation was conducted to determine the effects of lime addition to the aeration basin of a heavily loaded activated sludge sewage treatment system. A domestic sewage was treated which was fortified with glucose and nutrient broth. Comparisons between control and lime addition indicated a BOD removal increase from 88.6% to 90.7%. Organic loading increased from 45.6 to 121 lb BOD applied/day/1,000 cu ft. These and other results indicated that lime aided BOD removal at high organic loadings, and high MLSS concentrations seemed to contribute to increased loss of effluent total suspended solids. Lime aided nitrification and phosphorus removal and increased waste sludge production. Cost comparisons indicated that the control treatment was $0.40/1,000 gallons and lime addition cost was $0.53/1,000 gallons. (Collins-FIRL)
W77-09601

EVALUATION OF PROCESS DESIGN PARAMETERS FOR PHOSPHORUS REMOVAL FROM DOMESTIC WASTE WATERS BY CHEMICAL CLARIFICATION,
Massachusetts Univ., Amherst.
S. P. Bowen.
PhD Thesis, 1975. 134 p.

Descriptors: *Phosphorus, *Analytical techniques, Coagulation, Flocculation, Sedimentation, Lime, *Waste water treatment, Hydrology, Sludge treatment, Hydrogen ion concentration, Chemical precipitation.
Identifiers: Alum, *Chemical treatment.

The increased use of chemical waste water treatment requires the development of optimum values, and a means for their determination, of design parameters. These parameters include the coagulant, dose, pH, flocculation intensity and duration, and sedimentation time. Alum and lime treatments were the subjects of investigations. Coagulation was studied in the treatment of raw domestic sewage by using jar tests and a column flocculation-sedimentation apparatus. Procedures were developed to determine the effect of coagulant dose and pH interaction on the removal of total phosphorus, suspended solids, turbidity, and total organic carbon. Results showed that alum coagulation produces optimum removal at a dose of about 175 milligrams/liter and a pH of 5.9. Small variations produce large alterations in pollutant removal. There was no optimum dosage for lime treatment coagulation and pollutant removal increased as the dose and pH increased. Coagulation at low lime dose, the use of ferric iron as a coagulant aid and sludge recycling were also studied. Studies on the effect of flocculation mixing intensity and sedimentation time on pollutant removal using the above data indicated that flocculation intensity was relatively unimportant. Overflow rate, dose, and pH for lime and alum produced enough energy to prevent floc settling during flocculation. A lighter, slower floc was produced by alum and alum coagulated water overflow rates must be lower to produce comparable results. Hydraulic variations more easily upset alum floc than lime floc. Alum sludge was more voluminous and more difficult to dewater than that of lime. (Collins-FIRL)
W77-09602

WASTEWATER TREATMENT BY NATURAL AND ARTIFICIAL MARSHES,
Wisconsin Univ., Oshkosh.
F. L. Spangler, W. E. Sloey, and C. W. Fetter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 992, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Technology Series EPA-600/2-76-207, September 1976. 182 p. 9 fig, 33 tab, 168 ref, 6 append. 1BC611. EPA R803794 and S801042.

Descriptors: *Waste water treatment, *Marshes, Marsh plants, Nutrient removal, Phosphorus, Bulrushes, Pilot plants, Harvesting, Model studies, *Wisconsin.
Identifiers: Brillion Marsh(Wis).

The uses of artificial and natural marshes as purifiers of municipal treatment plant effluent was investigated at various sites in Wisconsin. Harvesting plants was not a practical phosphorus removal technique as only a small portion of the phosphorus retained by a marsh system is incorporated into harvestable plant tissue, and then only in summer. The level of water quality improvement attained suggests that the process may be acceptable for polishing effluent from septic tanks of single or small clusters of buildings. Marshes remove phosphorus during the growing season but release it at other times, thus acting as buffers which may be managed to advantage. The natural marsh was moderately effective in removing phosphorus during the growing season but the annual phosphorus output was about equal to the input. Average concentrations of orthophosphate, total phosphorus, conductivity, and total solids were reduced by 13% or less by passage through some 1900 m of Brillion Marsh. The phosphorus concentration in water draining from the marsh ranged from a low of 0.43 mg/l in September to a high of 11.85 mg/l in July, and did not follow any discernable pattern related either to temperature,

rainfall or season. Reduction of most parameters did not vary when primary or secondary effluent was treated by a marsh. (Auen-Wisconsin)
W77-09606

CONTINUOUS ON-LINE MONITORING OF TOTAL ORGANIC CARBON,
Air Force Civil Engineering Center, Tyndall AFB, Fla.
For primary bibliographic entry see Field 5A.
W77-09635

WATER SYSTEM VIRUS DETECTION,
Organon Diagnostics, El Monte, Calif.
For primary bibliographic entry see Field 5A.
W77-09636

SOIL TEMPERATURES AND HEAT LOSS FOR A HOT PIPE NETWORK BURIED IN IRRIGATED SOIL,
Energy Resources Co., Cambridge, Mass.
J. E. Alpert, S. C. VanDemark, D. D. Fritton, and D. R. DeWalle.
Journal of Environmental Quality, Vol. 5, No. 4, p 400-405, October-December 1976. 5 fig, 3 tab, 15 ref.

Descriptors: *Heat, *Temperature, *Waste water disposal, *Soil temperature, Irrigation, Irrigation effects, Thermal conductivity, Heat flow, Model studies.
Identifiers: Waste water irrigation.

A 0.09-ha field prototype of a simultaneous waste heat and waste water disposal system was constructed and instrumented. Data are reported for soil, pipe, soil surface, and air temperatures; heat loss (0.068-0.117 cal cm(-2) min(-1); and soil thermal conductivity (3.61-5.63 mcal (cm sec degrees C)(-1). The data are used to evaluate the heat flow theory which is currently being used to predict the land area required for waste heat disposal with a buried hot water pipe network. Predicted heat loss was consistently lower than experimental heat losses. The results of the experiment indicate that substantial improvements need be made in the existing theory to account for the transient heat flow and heat storage. Research is currently being conducted to develop better predictive models. (Skogerboe-Colorado State)
W77-09654

THE RENOVATION AND RE-USE OF WASTEWATER,
National Inst. for Water Research, Pretoria, (South Africa).
G. G. Cillie.
Construction in Southern Africa, Vol 21, No 4, p 55-73, July 1976. 4 fig, 9 ref.

Descriptors: Water resources, *Water reuse, *Waste water treatment, Africa, Costs, Cooling water, Heavy metals, Sewage treatment, *Recycling, Water quality, Potable water, Pollution abatement, Pathogens, Industrial water, Steam, Nitrogen, Phosphorus, Pulp wastes, Cement.
Identifiers: Stander plant, Wastewater treatment plant(South Africa), Windhoek wastewater treatment plant(South Africa), *South Africa.

Current re-use practice, available processes for renovating effluents, and the need for further research are discussed. Direct re-use of effluents provides a positive answer to the demand for prevention of pollution, particularly in the upgrading of secondary purified sewage effluents. It is also an important augmentation system for producing water conforming to the quality requirements for a wide range of uses, and further constitutes an economically attractive method of providing a new source of water. The main problems presently restricting the direct re-use of wastewater are the economics of removing residual impurities after concentional sewage treatment, and the scrupulous destruction of toxicants and pathogens. Techniques for wastewater reclamation are discussed in detail, including the removal of nitrogenous compounds, phosphorus compounds, heavy metals, residual organic compounds, dissolved organic solids, and pathogens. Current re-use practices in South Africa include pasturage irrigation, power station cooling purposes, steam generation, in paper manufacture, the chemical industry, and cement manufacture, and for domestic purposes. The Winhoek and Stander purification plants are discussed, with detailed descriptions of the processes involved. (So. African Water Info Center).
W77-09686

DURBAN TUNNELS UNDER THE MICROSCOPE,
Durban City Engineers Dept. (South Africa).
For primary bibliographic entry see Field 8A.
W77-09689

TREATMENT OF DENIM TEXTILE MILL WASTEWATERS: NEUTRALIZATION AND COLOR REMOVAL,
Noonan (R.S.), Inc. of South Carolina, Greenville.
C. R. Froneberger, and M. J. Pollock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 478, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency Protection Technology Series, Report EPA-600/2-76-133, May, 1976. 113 p, 1 append, 23 fig, 39 ref, 40 tab.

Descriptors: *Textiles, *Waste water treatment, *Adsorption, *Water purification, *Neutralization, Fly ash, Color, Biochemical oxygen demand, Chemical oxygen demand, Wastes, *Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Calcium hydroxide, Carbon dioxide, Water pollution control, Coagulation, Flocculation, Separation techniques, Sludge.
Identifiers: Flue gases, Aluminum sulfate, Sulfur dioxide, Color removal(Water), *Fly ash absorption.

A description is given of a bench-scale investigation using fly ash adsorption and chemical clarification techniques to remove color from indigo and sulfur dyeing waste waters from a denim textile mill. The investigation also included a feasibility study of flue gas wet scrubbing techniques for neutralizing caustic waste waters. The adsorption studies demonstrated that fly ash from a coal-fired boiler can adsorb and subsequently remove color, 5-day BOD, and COD from biologically treated domestic and dyeing process waste waters. The limited adsorption capacity of the fly ash and problems related to fly ash-waste water contact made full-scale application impractical. The chemical clarification studies included investigation of 11 coagulants, chemical recycle, and various parameters associated with sludge handling and disposal. The studies showed that calcium hydroxide or aluminum sulfate could successfully remove color and produce a supernatant suitable for recycling. The practicality of using coal-fired boiler flue gases to neutralize caustic waste waters was demonstrated in full-scale tests. Caustic waste waters were used with a conventional wet scrubber to neutralize the waste waters by sulfur dioxide and carbon dioxide adsorption from the flue gas while simultaneously reducing the particulate emissions. (Witt-IPC)
W77-09724

RELATIONSHIP OF EFFLUENT LIMITATIONS TO FUTURE PULP MILL CLOSURES,
Environmental Protection Agency, Seattle, Wash.
R. L. Coughlin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 811, Price codes: A06 in paper copy, A01 in microfiche. EPA Working Paper No. 88, 100 p, December, 1972. 2 fig, 33 tab.

Descriptors: *Pulp and paper industry, *Water pollution control, *Economics, Regulation, Pollution abatement, Water pollution sources, Pacific Northwest U.S., Biochemical oxygen, Capital costs, Operating costs, Costs, Waste water treatment, Treatment facilities, Waste water(Pollution), *Industrial wastes, Pulp wastes, *Water reuse, *Pulp wastes, Recycling.
Identifiers: *Mill closures.

The growth of the Pacific Northwest wood pulp industry will be constrained in the future by the relatively complete utilization of raw materials that already exists. The industry is undergoing a process of concentration that features vertical integration of forest products output. Daily waste discharges from pulp and paper production amounts to almost 1,000,000,000 gallons of water, more than 3,500,000 pounds of 5-day BOD, and 1,300,000 pounds of settleable, floating and suspended solids. Costs of treating wastes vary with the volume of water to be treated, concentration, specific gravity, and rate of decay of pollutants to be reduced, and the degree of waste reduction required. Mills in the Pacific Northwest have invested about $96,000,000 (1967 purchasing power) in waste treatment by August, 1972, and were incurring more than $18,000,000/year in waste treatment costs. To achieve the equivalent of secondary waste treatment will require the investment of another $82,000,000 and add annual costs of $13,000,000. Substituting the best practicable control technology for the more general technological requirements utilized under prior law may add more than $90,000,000 to the region's pulp mills investment requirements over the next 5 years and about $12,000,000 ($1.70/ton of output) to annual costs. Although pulp mill closures anticipated over the next 5 years will be largely due to economic forces, water pollution control will play a part in such closures by (1) reinforcing competitive advantages, and (2) modifying the timing and purpose of investment programs. Two of the region's pulp mills will almost certainly close by July 1, 1977, two more have a definite probability of closure, and closure is possible though less likely in two other cases. (Witt-IPC)
W77-09727

FIBERBOARD MILL RECYCLES WATER.
H. R. Fraser.
World Wood, Vol. 17, No. 7, p 20-22, June, 1976. 2 fig, 3 illus.

Descriptors: *Water reuse, *Pulp and paper industry, Water conservation, Europe, Costs, *Recycling, Water pollution control, Foreign countries, Water pollution sources, Industrial water, Economics, *Pulp wastes.
Identifiers: Hardboard, Insulation board, Closed systems, *France.

The successful conversion to closed-circuit operation of a wet-process fiberboard mill was first achieved in France. This article describes briefly what was done and some of the environmental and cost factors of recycling process water for pollution control in a wet-process building board mill. Overflows from the mat former and press in the (high-density) hardboard line and from the web former of the (medium- or low-density) insulating board line are recycled to the defiberizer. The mill includes a surge pond large enough to hold all the process water. The cost of installing the closed system was 2,500,000 French francs (U.S. $540,000). (Witt-IPC)
W77-09728

BROWN (CO.) RECYCLES DE-INKING WATER ON TISSUE-GRADE PRODUCTS.
J. P. Hanson.
Pulp and Paper, Vol. 51, No. 1, p 136-138, January 1977. 1 fig, 6 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Water reuse, Industrial water, Pulp and paper industry, Suspended solids, Biochemical oxygen demand, *Recycling, Dissolved solids, Foaming, Slime, Chlorine, Scaling, Calcium, Silica, Wisconsin, Water pollution sources, Wastes, Industrial wastes, Waste treatment, Additives.
Identifiers: Waste paper, Tissue papers, Sulfuric acid, Aluminum sulfate, Foam inhibitors, Slimicides, Corrosion inhibitors, Clarifiers.

Brown Co. (Eau Claire, Wis.), which produces 150 tons/day of absorbent tissue products from 100% de-inked waste paper, is recycling about 85% of its mill process water. Sulfuric acid, Aluminum sulfate, an anionic polymer (not identified), and activated silica are added to the process water, and the effluent is treated in a primary clarifier. Suspended-solids removal averages 94-95%, and BOD removal is 50-60%. Recycling treated water raised the in-mill dissolved solids level by a factor of 3 to 1500-1700 ppm. BOD increased from 80-100 ppm to 200-250 oom. Foaming during the de-inking process is prevented by adding a defoamer in the water-supply tank. Slime growth is controlled by maintaining a chlorine residual of 0.2-0.3 ppm in the clarified water. Calcium scaling the screw extractors was reduced with chelating agents and by switching from calcium to sodium hypochlorite bleach. Two additional Voith Morden flotation cells and a secondary activated sludge treatment system will be added during 1977. (Witt-IPC)
W77-09732

APPLICATION OF REVERSE OSMOSIS AND ULTRAFILTRATION TO THE PURIFICATION OF PULP AND PAPER INDUSTRY EFFLUENTS (ZASTOSOWANIE ODWROCONEJ OSMOZY I ULTRAFILTRACJI DO OCZYSZCZANIA SCIEKOW Z PRZEMYSLU CELULOZOWO-PAPIERNICZEGO),
Instytut Inzynierii Ochrony Srodowiska Politechniki Slaskiej, Fliwice (Poland).
M. Bodzek, O. Kominek, E. Kowalsaka, and J. Zielinski.
Przeglad Papierniczy, Vol. 32, No. 12, p 466-472, December, 1976. 3 fig, 45 ref, 4 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Reverse osmosis, Wastes, *Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Costs, Water pollution control, Membrane processes, Water quality control.
Identifiers: *Ultrafiltration.

This article constitutes an introduction to a series of research reports on the use of reverse osmosis and ultrafiltration for the purification of pulp and paper industry effluent. The principles of the two methods are outlines, and pertinent literature on the applications of reverse osmosis ultrafiltration to the pruification of effluents is reviewed. Despite the still high costs, these two techniques, combined with preliminary purification, appear promising from the viewpoint of chemical recovery and the introduction of closed water cycles. (Stapinski-IPC)
W77-09733

HOW TO REDUCE WATER AND RAW MATERIAL CONSUMPTION IN PAPERMAKING (COME RIDURRE I CONSUMI D'ACQUA E DI MATERIE PRIME IN CARTIERA),
Cartiere Ambrogio Binda S.p.A., Milan (Italy).
For primary bibliographic entry see Field 3E.
W77-09738

CLOSED-CYCLE MILL ELIMINATES POLLUTION WHILE ALSO SAVING MONEY,
For primary bibliographic entry see Field 3E.
W77-09740

CHLORINATION REACTIONS OF FULVIC ACIDS IN NATURAL WATERS,
Municipal Water Works of Rotterdam (Netherlands).
For primary bibliographic entry see Field 5F.
W77-09741

ACTIVATED CARBON ADSORPTION PROCESS FOR PURIFICATION OF TEXTILE WASTE WATERS,
McGill Univ., Montreal (Quebec). Dept. of Chemical Engineering.
C. Roy, and B. Volesky.
In: Book of Papers, International Technical Conference, American Association of Textile Colorists and Chemists, October 13-15, 1976, Montreal, Quebec, Canada, p 241-255. 8 fig, 61 ref, 1 tab.

Descriptors: *Textiles, *Activated carbon, *Waste water treatment, Dyes, Dye releases, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, *Adsorption, Sludge, Capital costs, Color, Odor, Water purification, Operation and maintenance, Effluents, Toxicity, Waste treatment.

Until recently, biological oxidation was predominant in the treatment of textile waste waters. Its application to changing dyehouse effluents, however, has recently been widely discussed. Several advanced techniques have been proposed as alternatives to conventional treatment, specifically adsorption with activated carbon. Adsorption as a unit process offers many advantages compared to conventional biological processes; the adsorption system requires approximately one-seventh the land required for a biological process; no secondary sludge is produced; and even highly toxic wastes can be easily processed. The adsorption system allows flexibility in design and operation, producing esthetically effluent, free of color and odor, at lower capital investment. Treated effluent is suitable for reuse. (Sykes-IPC)
W77-09744

CHARACTERIZATION AND TREATMENT OF TEXTILE DYEING WASTEWATERS,
Crompton and Knowles Corp., Reading, Pa.
R. H. Horning.
In: Book of Papers, International Technical Conference, American Association of Textile Colorists and Chemists, October 13-15, 1976, Montreal, Quebec, Canada, p 100-104. 3 ref, 5 tab.

Descriptors: *Textiles, *Waste water treatment, *Dyes, Effluents, Dye releases, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Dyes, Biological treatment, Carbon, Adsorption, Oxidation, Coagulation, Biochemical oxygen demand, Color, Activated carbon, Waste identification.
Identifiers: Total organic carbon, Aluminum sulfate, Vat dyes, Disperse dyes, Reactive dyes, Basic dyes.

This study was conducted to characterize waste waters from textile dyeing operations; to evaluate biological oxidation, carbon adsorption, chemical oxidation, and chemical coagulation as treatment methods for selected dyeing waste waters; and to examine at the laboratory scale several combined methods as a first step in the development of treatments for textile dyeing waste waters. Biological treatment of dyeing effluents was effective for the removal of 5-day BOD and reduction of total organic carbon, but was not too effective for decolorization. Good decolorization of these waste waters could be accomplished either by coagulation with alum or by treatment with powdered activated carbon. Carbon treatment was not very effective with vat dyes and disperse dyes, but performed better than alum for reactive and basic dyes. Some inhibition of nitrification was observed for many of the samples examined. (Sykes-IPC)
W77-09745

WATER REUSE IN A PAPER REPROCESSING PLANT,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
L. E. Streebin, G. W. Reid, P. Law, and C. Hogan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 232, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency Technology Series, Report EPA-600/2-76-232, October, 1976. 93 p, 1 fig, 9 tab, 74 ref, 5 append.

Descriptors: *Pulp and paper industry, *Water reuse, Water conservation, Slime, Corrosion control, *Oklahoma, Roofing materials, Pulp wastes, Industrial wastes, Water pollution sources, Economics, Water supply, Costs, *Waste water treatment, Industrial wastes, Wastes, Water pollution sources.
Identifiers: Waste paper, Paper machines, Roofing felts.

The feasibility of water reuse was explored at Big Chief Roofing Co. (Ardmore, Oklahoma), a paper-reprocessing mill manufacturing organic felt (most of which is saturated with asphalt and converted to shingles and other roofing products). Before the project began, the mill was discharging 7.89 liters/second (125 gal/min). Normal operation is now zero discharge, with approximately 0.76 liters/second (12 gal/min). Normal operation is now zero discharge, with approximately 0.76 liters/second (12 gal/min) of fresh water replacing evaporative losses. A favorable cost/benefit ratio experienced at the mill demonstrartes advantages of in-plant control over end-of-pipe treatment. Economic benefits observed during zero-discharge operation include reduced water supply costs, reduced waste water treatment costs, improved yield, improved drainage, and greater dryer-section capacity due to increased operating temperatures, and resultant increased production. The benefits were partially offset by shorter felt lives, increased corrosion and slime control costs, and process modification cost. No degradation of production quality was observed. (Witt-IPC)
W77-09757

PAPER MILL WASTEWATER TREATMENT BY MICROSTRAINING,
Strathmore Paper Co., Turners Falls, Mass.
F. R. Bliss.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 265, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency Technology Series, Report EPA-600/2-76-252, September, 1976. 128 p, 43 fig, 12 tab, 8 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Waste treatment, Wastes, Water pollution sources, Water pollution treatment, Suspended solids, Color, Biochemical oxygen demand, Construction costs, Operating costs, Costs, Operation and maintenance, Coagulation, Flocculation, *Massachusetts, Turbidity, Filtration.
Identifiers: *Microstraining(Treatment).

Strathmore Paper Company and the adjacent Esleeck Manufacturing Company in Turners Falls, Massachusetts, have constructed a joint industrial waste treatment plant. The facility, consisting of two microstrainers preceded by coagulation and flocculation, removes suspended solids, turbidity, color, and BOD from an average 1,800,000 gal/day of waste water from the two mills. Plant operating efficiencies over the past year indicated substantial removal of the suspended solids and 5-day BOD. Effluent turbidities averages less than 30 Jackson turbidity units. The construction cost of the treatment facility was $689,000. First-year operating costs, including wages, power, supplies, chemicals, microfabrics, and maintenance totaled $36,175, which is approximately equivalent to $1.50/ton of paper produced. The operation of the treatment facility and some of the problems en-

countered in establishing the routine operation of the plant are discussed. (Witt-IPC)
W77-09758

TREATING WOOD PRESERVING PLANT WASTEWATER BY CHEMICAL AND BIOLOGICAL METHODS,
Environmental Science and Engineering, Inc., Gainesville, Fla.
J. T. White, T. A. Bursztynsky, J. D. Crane, and R. H. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 454, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency Technology Series, Report EPA-600/2-76-231, September, 1976. 108 p, 21 fig, 23 tab, 72 ref, append.

Descriptors: *Wood preservatives(Pesticides), *Waste water treatment, *Activated sludge, *Chlorination, *Phenols, Aromatic compounds, Organic compounds, Chemical wastes, *Industrial wastes, Water pollution sources, Creosote, Biochemical oxygen demand, Chemical oxygen demand, Waste treatment, Chlorinated hydrocarbon pesticides, *Biological treatment, Illinois.
Identifiers: *Pentachlorophenol, *Chemical treatment.

A completely mixed activated sludge system was designed for the Koppers Company wood preserving plant at Carbondale, Illinois, with an average daily waste flow of 27,000 liters/day (7,150 gal/day), a BOD concentration of 1,100 mg/liter, and a phenol concentration of 120 mg/liter. Included in the design were capabilities for prechlorination and post-chlorination. The activated sludge system alone was capable of removing 90% of the BOD, 75% of the COD, and 99% of the phenol, and 76% of the pentachlorophenol. Shock loadings had minor effects on BOD and COD removals but reduced the phenol removal and completely prevented pentachlorophenol removal. Post-chlorination dosages of over 50 mg/liter resulted in reductions of 50 and 52% for phenol and pentachlorophenol, respectively. There was no reduction of COD. Laboratory prechlorination studies showed removal of phenol and pentachlorophenol at chlorine dosages in excess of 250 mg/liter. (Witt-IPC)
W77-09759

RESEARCH AND DEVELOPMENT OF AN ELECTROCHEMICAL BIOCIDE, FINAL REPORT,
Life Systems, Inc., Cleveland, Ohio.
G. G. See, C. A. Bode, and K. K. Kachelia.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A018 176, Price codes: A06 in paper copy, A01 in microfiche. Report to Army Medical Research and Development Command, October, 1975. 106 p., 18 tab., 41 fig., 52 ref.

Descriptors: *Sewage treatment, Waste treatment, *Waste water treatment, *Water purification, *Water treatment, *Disinfection, *Electrochemistry, Bacteria, *Microorganisms, Viruses, Yeasts, Coliforms, Bioassays, Methodology, *Laboratory equipment, E coli, Pseudomonas.
Identifiers: *Electrooxidation, *Biocides, Water electrolysis, *Electrochemical biocides, Klebsiella, Saccharomyces.

The development and preliminary characterization of an electrolytic technique for destruction of microorganisms in potable and waste water were successfully completed. The technique has been termed the 'Electrochemical Biocide' process and employs low level cyclic voltages at chemically inert electrodes to pass an alternating current through the process water. The program was directed toward (a) expanding the design of the electrochemical biocide reactor, (b) determining the engineering parameters which affect process effectiveness and efficiency and establishing hypotheses for the microorganism kill mechanisms(s), and (c) preparing recommendations for scaling the process to both united States Army Medical Research and Development Command (USAMRDC) and the National Aeronautics and Space Administration (NASA) requirements. Described are the experimental hardware, the methodology and microorganism kill results with three bacteria: (Escherichia coli, Pseudomonas aeruginosa and Klebsiella pneumoniae) two viruses (Polio I and Coxsacki B), one yeast (Saccharomyces cerevisiae), and the normal flora of microorganisms found in domestic raw settled sewage. A literature search was conducted on prior research and development efforts related to the electrolytic disinfection of water and waste water. (Katz)
W77-09771

A STUDY TO EVALUATE THE INTENSITY OF AN ALTERNATE METHODS FOR NEUTRALIZATION OF DOD AIRCRAFT FUEL SPILLS, PHASE I,
Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Sanitary Sciences Div.
For primary bibliographic entry see Field 5G.
W77-09774

APPLICATION OF THE ROTATING FLIGHTED CYLINDER TO LIVESTOCK WASTE MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
J. R. Miner, and W. E. Verley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 357, Price codes: A02 in paper copy, A01 in microfiche. Oregon Agricultural Experiment Station, Corvallis, Technical Paper No. 3952, March 1975. 18 p, 4 fig, 6 tab, 5 ref. OWRT A-031-ORE(1).

Descriptors: Sedimentation, *Farm wastes, *Waste treatment, *Separation techniques.
Identifiers: *Livestock waste management, *Rotating flighted cylinder.

The rotating flighted cylinder was tested as both a solid-liquid separator and as a biological waste treatment device. As a solid-liquid separator, it was demonstrated to be effective in removing setteable particles from a dilute slurry and concentrating them into a low volume concentrated stream. As a biological waste treatment device, it effectively combined primary and secondary waste treatment into a single unit and produced an effluent comparable to that obtained from conventional secondary sewage treatment devices. The main advantages of this device are its mechanical simplicity, low power consumpton, and trouble-free operation.
W77-09795

DISTILLATION APPARATUS AND METHOD,
For primary bibliographic entry see Field 3A.
W77-09804

METHOD AND APPARATUS FOR AEROBIC SEWAGE TREATMENT,
C. E. Traverse.
U.S. Patent No. 4,002,561, 10 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 954, no 2, p 776, January 11, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Aerobic treatment, Water pollution control, Septic tanks, Oxygenation, Equipment.

An aerobic sewage treatment method and apparatus for use with a conventional septic system collection tanks has an inlet conduit and an outlet conduit. A separate treatment vessel is mounted horizontally above the septic tank with a tangential inlet and outlet at opposite ends. The inlet is connected to the output of a pump immersed in the main tank with the outlet from the treatment vessel returning to the septic tank. The vessel contains a baffle to contact floc particles and a way to inject an oxygen-containing gas into the liquid. Because of the configuration of the treatment vessel inlet and outlet and baffle, liquid in the vessel flows tangentially under conditions of hydraulic turbulence with large shear forces generated by the baffle to reduce the floc particle size. Maximum aerobic treatment of the contaminated liquid is achieved by reducing the size of the floc particles in the presence of an oxygen-containing gas. (Sinha-OEIS)
W77-09805

WATER PURIFYING SYSTEMS,
For primary bibliographic entry see Field 5F.
W77-09808

DETOXIFICATION OF AQUEOUS WASTE STREAMS CONTAINING CYANIDE,
Monsanto Co., St. Louis, Mo. (Assignee).
J. V. Cavender, Jr.
U.S. Patent No. 4,003,833, 4 p, 4 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 954, no 3, p 1203, January 18, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution control, Chemical reactions, Water quality control, Chemical wastes.
Identifiers: *Cyanide, Formaldehyde.

There are many industrial sources of aqueous cyanide wastes such as electroplating, steel and coke operations and the manufacture of chemicals. According to the invention, aqueous streams containing cyanide in a concentration of the order of up to about 1000 ppm are treated to reduce cyanide content by contacting the streams with formaldehyde and a compound which will generate the HSO3- ion at a temperature from about 80 to about 135C while maintaining the pH of the mixture in the range from 8-12 for a period of time sufficient to reduce the cyanide content to less than 1 ppm using a formaldehyde/CN- molar ratio of at least one and an HSO3-/CN- molar ratio from about 1.0 to about 1.5. Operation may be either on a batch or continuous basis. The reaction should be carried out under conditions which provide thorough mixing to achieve uniform composition and temperature, preferably in a reactor equipped for mechanical agitation. (Sinha-OEIS)
W77-09812

METHOD OF TREATING WASTE WATER CONTAINING SURFACTANT AND HEAVY METALS,
Lion Fat and Oil Co., Ltd., Tokyo (Japan). (Assignee).
M. Kinoshita, Y. Sekiguchi, and S. Ando.
U.S. Patent No. 4,005,009, 4 p, 1 tab, 10 ref; Official Gazette of the United States Patent Office, Vol 954, no 4, p 1655, January 25, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Heavy metals, *Separation techniques, Foam separation, Surfactants, Coagulation, Inorganic compounds, *Surfactants.

A method of treating a waste water containing anionic surfactant and heavy metals comprises the steps of: adding a specific inorganic coagulant and a specific salt to the waste water so as to make the respective concentration of inorganic coagulant and inorganic salt in the water be at prescribed levels, adjusting the pH value to be in the range of from 5 to 10 after adding the inorganic coagulant, further adding a cationic coagulant so as to make its concentration be at a prescribed level, and treating the processed waste water through the foam separating process. The method is suitable

for treatment of the industrial waste waters to be discharged from metal refinery works, plating shops and metal processing shops. (Sinha-OEIS)
W77-09815

METHOD FOR TREATING EFFLUENT RESULTING FROM THE MANUFACTURE OF SYNTHETIC DYESTUFFS AND RELATED INTERMEDIATE CHEMICALS,
American Color and Chemical Corp., Lock Haven, Pa. (Assignee).
C. D. Sweeny.
U.S. Patent No. 4,005,011, 6 p, 2 fig, 6 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 954, no 4, p 1655, January 25, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, Industrial wastes, Chemical wastes, Dyes, Separation techniques, *Activated carbon, Adsorption, Biological treatment, *Activated sludge.
Identifiers: Recycled carbon.

A method for treating effluent resulting from the manufacture of synthetic dyestuffs and related intermediate chemicals includes a multistage treatment process. The process includes equalization of the effluent followed by the chemical treatment with a material such as lime to reduce levels of heavy metals. The chemically treated effluent is then subjected to clarification to remove the solids and then to further equalization. The further equalized effluent is then passed through carbon adsorption columns to reduce levels of nitrobenzene and the color of the effluent to a predetermined level. The thus treated effluent is then subjected to further treatment where the BOD is reduced using activated sludge and then subjected to further clarification after which it can be discharged back into the ecological system. The spent carbon used in the carbon adsorption is recycled using a carbon regeneration furnace to produce fresh carbon which then may be used in the carbon adsorbers. (Sinha-OEIS)
W77-09816

SEMIPERMEABLE MEMBRANES AND THE METHOD FOR THE PREPARATION THEREOF,
Department of the Interior, Washington, D.C. Office of the Secretary.
For primary bibliographic entry see Field 3A.
W77-09817

WATER TREATMENT SYSTEM WITH PROLONGED AERATION,
For primary bibliographic entry see Field 5G.
W77-09818

AERATING APPARATUS,
For primary bibliographic entry see Field 5G.
W77-09819

LIQUID FILTERING APPARATUS,
Thermo-Kinetics, Inc., Greenville, S.C. (Assignee).
J. H. Wyman, and J. E. Chambers.
U.S. Patent No. 4,005,018, 8 p, 7 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 954, no 4, p 1651, January 25, 1977.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Water pollution treatment, Water quality control, *Filtration, Separation techniques, Filters, Water reuse textiles, Pulp and paper industry.

The water used in washer sections of air handling systems of textile and paper mills contains contaminants in large volume necessitating frequent cleaning of the entire system. The filer of this invention operates as a result of the difference in head between the contaminated liquid outside the hollow filter and the lower level of filtered liquid inside the filter. It has been found that a simplified filter with increased filter area may be achieved by using a continuous medium carrying frame defining an open space within a tank containing the contaminated liquid. By filtering the surrounding liquid from the tank, through the media which is carried by driven squeeze rolls, into the bottom of the filter and removing it while maintaining a liquid level outside the frame higher than the liquid level within the frame, greater filter surface area is provided and a simplified structure with easier operation is afforded. The filter utilizes a single chamber open to the atmosphere within a larger receptical for receiving the contaminated liquid. The filtered liquid is withdrawn from the lower portion within the filter. (Sinha-OEIS)
W77-09820

GRAVITATIONAL SEPARATOR,
Love (L. S.) Associates Ltd., Brampton (Ontario). (Assignee).
J. N. Parlette.
U.S. Patent No. 4,005,019, 26 p, 27 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 954, no 4, p 1658-1659, January 25, 1977.

Descriptors: *Patents, *Waste water treatment, *Domestic wastes, *Industrial wastes, *Settling basins, Aeration, Water purification, *Separation techniques, Sludge, Sludge disposal, Equipment.

A clarifier is described which is used to remove from liquids such as industrial or domestic waste water, suspended particles having a specific gravity greater than that of the liquid in which they are suspended. The resulting mass of settled particles which do not degrade must be removed. The clarifier includes a tank for receiving a liquid to be clarified. The bottom of the tank has an outlet through which material can be removed. A gantry is supported for movement above the surface of liquid in the tank. Gantry drive means are provided to perform repeated passes over the surface. A conveyor device for settled material is submerged and positioned at a clearance above the bottom of the tank. Conveyor drive means are coupled to the support means arranged so that the device moves with the gantry and sweeps over the bottom of the tank. The conveyor device has at least one settled-material contacting surface which, when the device is in operation, moves in a direction transverse to the direction of movement of the gantry so as to move material which has settled on the bottom of the tank in a transverse direction towards the outlet. (Sinha-OEIS)
W77-09821

URBAN RUNOFF POLLUTION CONTROL--TECHNOLOGY OVERVIEW,
Municipal Environmental Research Lab., Cincinnati, Ohio. Wastewater Research Div.
R. Field, A. N. Tafuri, and H. E. Masters.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 452, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-77-047, March 1977. 103 p, 23 fig, 17 tab, 273 ref.

Descriptors: *Urban runoff, *Overflows, *Combined sewers, Water quality, *Pollution abatement, Sewage treatment, Waste treatment, Costs, Cost comparisons, Water management(Applied), Waste water treatment.

An overview was presented of methods for handling and treating urban runoff and the pollution problems which result from it. Discharge types considered were combined sewer overflow, storm drainage in separate systems, and overflows from infiltrated sanitary sewers. The report describes completed work, ongoing work, and future work needed to combat wet-weather flow pollution. Various study areas included user assistance tools (instrumentation and computers), management alternatives, collection system control, and storage and treatment. Highlights were presented from more than 150 research projects. Capital cost comparisons were provided for storm and combined sewer control and treatment. In-line storage in Seattle was used to demonstrate a cost-effective solution for urban runoff pollution control. Cost-effective control alternatives for Des Moines were also considered in comparison with the costs of frequent violations of dissolved oxygen standards. (Collins-FIRL)
W77-09823

STORM WATER MANAGEMENT MODEL: LEVEL I--COMPARATIVE EVALUATION OF STORAGE-TREATMENT AND OTHER MANAGEMENT PRACTICES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Science.
J. P. Heaney, and S. J. Nix.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 571, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-77-083, April 1977. 105 p, 24 fig, 13 tab, 18 ref, 2 append.

Descriptors: *Storm water, *Water management(Applied), Drainage systems, Pollution abatement, Analysis, Cost comparisons, Urban runoff, Storage requirements, Water treatment, Evaluation.

A simplified method was presented for the evaluation of management practices in conjunction with storage-treatment means of storm water pollution control. Section 208 planning requires procedures which are simpler than the EPA Storm Water Management Model (SWMM), and four levels of management models were developed. A procedure for the comparison of selected alternative control techniques was presented in this report. Control options included storage and treatment, street sweeping, sewer flushing, and catch-basin cleaning. The graphical solution technique described could evaluate these factors in series and/or in parallel with one another. A reference area, Anytown, U.S.A., with a population of 1,000,000 was incorporated in this evaluation. Final conclusions were based on a control cost function for the study area that presented the optimal means of achieving a desired level of control. Application of the technique to the hypothetical community indicated the mix of treatment, storage, street sweeping, and sewer flushing needed. (Collins-FIRL)
W77-09824

TREATMENT OF COMBINED SEWER OVERFLOWS BY HIGH GRADIENT MAGNETIC SEPARATION,
Sala Magnetics, Inc., Cambridge, Mass.
D. M. Allen, R. L. Sargent, and J. A. Oberteuffer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 935, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-600/2-77-015, March 1977. 127 p, 23 fig, 18 tab, 15 ref, 6 append.

Descriptors: *Combined sewers, *Overflow, *Separation techniques, *Waste water treatment, Flocculation, Sewage treatment, Filtration, Suspended solids, Biochemical oxygen demand, Coliforms, Coagulation, Hydrogen ion concentration, Performance, Evaluation, Costs, Water purification.
Identifiers: *Magnetic separation, *Combined sewer overflows.

High gradient magnetic separation was evaluated as a treatment for combined sewer overflows (CSO). Bench-scale and continuous pilot plant tests were performed. The method maximized the magnetic forces to increase separation performance. Process efficiency was greatest for removal of suspended solids (98.7%), turbidity (96.3%), apparent color (92.8%), BOD5 (92+%), and fecal coliform bacteria (99.85%). COD removal averaged 74%. The relative importance,

sensitivities, and interactions of parameters were determined. Removal efficiency was found to have an important relationship to the coagulant and the pH level. Comparisons with other secondary treatment methods proved the system to be substantially more efficient. It was also economically competitive. Other favorable factors included high processing rates, decreased land requirements, and lower chlorine demand. (Collins-FIRL)
W77-09825

CONTINUOUS FILTER PRESS.
Effluent and Water Treatment Journal, Vol 17, No 4, p 199, April, 1977. 1 fig.

Descriptors: *Filters, *Separation techniques, Equipment, Suspended solids, Dewatering, *Sludge treatment, Domestic wastes, Industrial wastes, Polyelectrolytes, Economics, Costs, Mechanical engineering, *Waste water treatment.
Identifiers: *Continuous filter press.

A newly developed continuous filter press is described. It consists of a single lower endless belt and a shorter upper belt. Secondary and final dewatering stages are located between the belts. Sludge or slurry was pumped through a feed box with a polyelectrolyte injector and into a rotary drum with a fine mesh surface. About 60% of the total moisture content was drained at this point. Sludge was passed to the belt for dewatering by secondary and final squeeze stages. The final squeeze pressure was adjustable. It is possible for the final moisture content to be in excess of 40% solids. The filtrate can be used for belt washing or it can be discharged for additional treatment. The system can be used for most domestic sewage and water treatment sludges, as well as for industrial effluent and metal hydroxide sludges. Improved stability of polyelectrolytes has contributed to the reduction of costs for the system. Other benefits include simple design, low working speed and built-in variations to pressure, belt speed, sludge and flocculation dose. (Collins-FIRL)
W77-09826

GEAR MOTOR SOLVES PLANT'S NOISE PROBLEM.
For primary bibliographic entry see Field 8C.
W77-09827

SPRAY IRRIGATION-WASTE WATER TREATMENT FACILITY. NORTH BRANCH FIRE DISTRICT NO. 1, WEST DOVER, VERMONT.
Consulting Engineer. Vol 48, No 5, p 86, May, 1977.

Descriptors: *Irrigation, *Treatment facilities, Waste disposal, Activated sludge, Tertiary treatment, Ultimate disposal, Design criteria, Pumps, Chlorination, Dewatering, Storage, Municipal wastes, *Waste water treatment.
Identifiers: West Dover(VT), *Spray irrigation, *Land application.

A waste water treatment and disposal system, employing spray irrigation/land application, was completed in West Dover, Vermont. The ski resort community could not afford an expensive, technologically advanced treatment system. Activated sludge treatment and holding ponds were designed. The irrigation and land application portions provided means for tertiary treatment and ultimate disposal. A winter flow of up to 820,000 gallons/day was expected. Spraying could be used in winter because early snowfalls and the loose forest mat prevent frost penetration of soil. The spray field was located on a 55-acre hilly area. Nearly 4 miles of insulated steel spray laterals and a system of 600 fixed point spray nozzles at 25-foot intervals composed the automated system. Treatment facilities were placed in a control building that was designed as a barn. This is the first application of the system in New England. The demands for low-cost operation and maintenance of high quality surface and groundwater resources were met. Construction costs of $2,050,000 were less than estimates of $2,110,000. (Collins-FIRL)
W77-09828

PROBLEMS AND SOLUTIONS FOR SLUDGE TREATMENT. PART 2,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. E. Smith, Jr.
Water and Sewage Works, Vol 124, No 5, p 81-85, May, 1977. 2 fig, 8 tab, 25 ref.

Descriptors: *Treatment facilities, *Municipal wastes, *Design criteria, *Sludge treatment, Sludge disposal, Chemical treatment, Dewatering, Physical properties, Chemical properties, Polymers, Polyeletrolytes, Lime, Filtration, Equipment, Activated sludge, *Waste water treatment.

Experiments, pilot plants, and municipal treatment facilities are discussed in terms of current sludge treatment methods. Fe(+3), Al(+3), polymers, polyelectrolytes, and ferric chloride were used to test the effects on sludge treated in primary stages by chemical conditioning. Polymer conditioning produced good thickening results, and, with Fe(+3), a dry sludge cake was obtained. For sludge stabilization, lime addition was condedered a relatively simple, inexpensive, and quick procedure useful in stabilizing large amounts of sludge. The use of sludge incinerator ash improved dewatering and produced a high-quality filtrate. For filtration, a top-feed rotary vacuum filter, moving belt filter presses, and a pressure filtration installation were studied. Top-feed vacuum filters produced a filter cake discharge that was superior to that of bottom-feed units. Little performance data were available for moving belt filters. Their operation depended on chemical addition, solids loading, and screen mesh size. Pressure filtration experience has been limited in the United States. A Cedar Rapids, Iowa, installation has used this system; treatment efficiencies and operating difficulties are described. (See also W75-10398) (Collins-FIRL)
W77-09829

PILOT-SCALE INVESTIGATIONS INTO THE USE OF RANDOM-PACK PLASTICS FILTER MEDIA IN THE COMPLETE TREATMENT OF SEWAGE,
Aston Univ., Birmingham (England).
A. D. Wheatley, and I. L. Williams.
Water Pollution Control, Vol. 75, No. 4, p 468-486, 1977. 11 fig, 4 tab, 28 ref.

Descriptors: *Packed beds, *Filtration, *Plastics, Performance, Biological treatment, Equipment, Flow, Design, Evaluation, *Filters, Biochemical oxygen demand, Suspended solids, Microorganisms, Nitrification, Organic matter, *Waste water treatment.
Identifiers: Plastic filter media.

Two pilot-scale biological filters were used to evaluate a new random-pack plastics filter medium for treating municipal sewage. Two loadings were tested, at 1.2 and 2.4 cu m/cu m d. Results indicated no major difference between the experimental plastic media and mineral media ecology. The number of grazing organisms was influenced by the organic matter levels of the filters. Film accumulation was significantly controlled by macrofauna and microfauna, with the numbers of microfauna being inversely related to the macrofauna. Psychoda and mites were the major macro-invertebrates during the first year of operation. Psychoda and Enchytraeidae were dominant as grazers in the second year. Major microfauna during both years were Opercularia and nematodes. Fungi and bacteria were dominant in the film of the high-rate filter and algae and bacteria dominated the low-rate filter. While film composition differed, quantity fluctuations were similar in both filters. Changes in ambient temperature and in sewage strength did not directly affect the amount of film in filters. This fluctuation could not be linked to filter performance changes. Average BOD removals were 87% for the low-rate filter and 83% for the high rate filter. Results suggest that a large-scale plant could meet effluent quality standards at the low filter rate. Nitrification was not good, but it was speculated that ammonia removal might be maintained over the long term, especially at the lower flow. (Collins-FIRL)
W77-09830

CONTINUOUS COMPOSTING OF ORGANIC W W WASTE--BY AUTOMATIC CONTROL OF FERMENTATION TEMPERATURE AND HUMIDITY OF PRODUCT AND CONTROL OF CARBON DIOXIDE OR OXYGEN IN WASTE GASES,
For primary bibliographic entry see Field 5E.
W77-09831

CORROSION AVOIDANCE IN WATER AND SEWAGE PIPELINES,
For primary bibliographic entry see Field 8F.
W77-09832

STATIC CALCULATION OF DRAINAGE CHANNELS AND PIPES (DIE STATISCHE BERECHNUNG VON ENTWASSERUNGSKANALEN UND-LEITUNGEN),
For primary bibliographic entry see Field 8G.
W77-09833

DEMONSTRATING THE FEASIBILITY OF VACUUM AND PRESSURE SEWERS,
C and G Engineering, Salem, Oreg.
L. K. Clark, and J. E. Eblen.
Public Works, Vol. 108, No. 4, p 81-84, April, 1977. 1 tab.

Descriptors: *Sewers, *Sewer construction, Costs, Conduits, Equipment, Monitoring, Interceptor sewers, Pumping plants, Excavation, Cities.
Identifiers: *Vacuum sewers, *Pressure sewers.

A study was conducted in Bend, Oregon, to determine the feasibility of using vacuum and pressure sewers. A concurrent study attempted to develop construction techniques other than drilling and blasting for sewers in rocky areas. The pressure sewers were designed to tap septic tank effluent lines upstream from boreholes or trench drainage systems. Multiple residential connections were also investigated. There were three residences on one unit, two on each of three units, and two residences were connected to single pumping installations. The system had a total of eleven service connections. The PVC pressure lines were buried at a depth of no less than three feet. The pumping units included a submersible centrifugal pump (25 gpm) in a 30-inch vertical culvert with a tight cover. Two head conditions were used for the six connections, 25 and 37 feet. Discharge lines had check and gate valves and gates were fitted with extension rods. An alarm system was included, but even in the event of pump failure, liquids back up into the original diposal system and householders are not inconvenienced. Monitoring was at the point of discharge into the trunk sewer. Gravity lines did not require rock excavation. A rock trencher was used to place about 25% of the pressure lines. Operation, maintenance and repair costs are being evaluated. The vacuum system also served eleven residenced. The central station drew air from small diameter pipes connected to small sumps that received residential waste water. The waste water was collected by vacuum in a receiving tank and pumped through a pressure line to a force main that terminates in the main interceptor. The system was limited by elevation differences.

Vacuum release valves were built into the collection system, but electrical or hydraulic valves would also work. Sumps were connected to building sewers by a line upstream from the septic tank. Costs for the vacuum system piping were about $9.75/foot and, for the pressure sewers, about $5/foot. About 50% of the excavation for the vacuum system was done with the rock trencher. These systems show promise as alternatives to gravity systems in areas requiring excessive underground work in heavily built-up areas, in locations with high groundwater tables, or where buildings are inaccessible for gravity service. (Collins-FIRL)
W77-09834

PVC LINING--THE ANSWER TO CORROSIVE ATTACK BY H2S IN CONCRETE SEWERS AND STRUCTURES.
For primary bibliographic entry see Field 8G.
W77-09835

GO AHEAD FOR LONG SEA OUTFALL.
Water Services, Vol. 82, No. 973, p 126-127, March, 1977.

Descriptors: *Outfall sewers, Drainage, Monitoring, Testing, Bacteria, Planning, Sewage treatment, Waste disposal, Domestic wastes, Waste water treatment.
Identifiers: Weymouth(England), Portland(England).

After much investigation, the Wessex Water Authority, England, has decided to construct a long sea outfall as part of a drainage system to solve sewage problems in Weymouth and Portland. Further testing and study will determine the optimum location and length of the outfall. Environmental conditions are to be continuously monitored. Tests will be conducted with harmless bacteria to determine the time they take to reach land from the outfall. Sewage is an extreme problem and it is expected that a long outfall discharging into deep waters will provide the most economical solution. Inland treatment facilities would be more expensive and an outfall would be necessary in any case. Total costs for all systems involved are estimated to be about 8.8 million pounds; the outfall will cost 2.4 million pounds of this amount. Construction should begin about 1978. (Collins-FIRL)
W77-09836

CHELLASTON TRUNK FOUL SEWER. SOME INTERESTING ASPECTS OF THE SCHEME,
Derby Borough Council (England) Drainage Section.
J. G. Fisher.
Chartered Municipal Engineer, Vol. 104, No. 4, p 53-59, April, 1977. 4 fig, 2 ref.

Descriptors: *Sewers, *Sewage disposal, Analysis, Outfalls, Design criteria, Construction, Treatment, Flow, Odor, Canals.

An increase in the population served by the sewage disposal works in Derby Borough, England, and in projected increased industrial operations created a need for development of a drainage plan. This included abolishing the old system and constructing the new Chellaston trunk foul sewer scheme. The proposed scheme involved a gravity trunk foul sewer to the borough's sewage disposal works, laid to minimum falls with a self-cleaning velocity, and routed through developing areas. This would relieve the existing overloaded system and eliminate five existing pumping stations. Design criteria were chosen to satisfy needs until the year 2000. New residential development was assumed to be on a separate system with standards for domestic properties of 0.23 cubic meters per head/day with 3.5 persons per house, and a maximum discharge of six times dry weather flow allowed for 30 dwellings per hectare. Various aspects of construction were described. These included solutions to problems created by noise, ground conditions, outfall construction, excavation processes, culvert construction, river crossings, and canal construction. (Collins-FIRL)
W77-09837

CHICAGO PLAN DESIGNED FOR POLLUTION AND FLOOD CONTROL.
For primary bibliographic entry see Field 4A.
W77-09838

DESIGN PROPOSALS FOR SUBMERSIBLE SEWAGE LIFT STATIONS,
For primary bibliographic entry see Field 8C.
W77-09839

PENNSYLVANIA WASTE WATER PROJECT PROGRESSES QUICKLY.
Water and Sewage Works, Vol. 124, No. 5, p 73, May, 1977.

Descriptors: *Sewers, *Construction, Planning, Water districts, Equipment, Excavation, Trenches, Performance, Pipes, Hydraulic structures, Pennsylvania.
Identifiers: Valley Forge Joint Sewage Authority(PA).

The Valley Forge Joint Sewerage Authority has been responsible for one of the largest American sewer projects. Nine local governments, six contractors, and seventeen contracts were involved. The project consisted of an $11 million treatment plant, a new interceptor main, and hundreds of miles of sewer pipe. Construction was 40% ahead of schedule, in spite of simultaneous Bicentennial celebrations. Good planning contributed to this success. Lines across the Valley Forge National Park were completed before the summer of 1976. Sewer construction along highways coincided with low traffic periods. Excavation was accomplished by extendable-boom drills and portable compressors, with dynamite blasting in rocky areas. Community disturbances due to drilling were minimized. About 275-325 linear feet of pipe were laid daily. Project completion was expected to be earlier than the target date set for the fall of 1977. (Collins-FIRL)
W77-09840

CRITICAL AND BRINK DEPTHS IN ELLIPTICAL SEWERS,
For primary bibliographic entry see Field 8B.
W77-09841

CITY OF MINNETONKA WING LAKE TRUNK SEWER: CITY OF MINNETONKA, MINNESOTA.
Consulting Engineer, Vol. 48, No. 5, p 89, May, 1977.

Descriptors: *Sewers, *Sanitary engineering, Construction, Environmental control, Excavation, Dewatering, Aquatic life, Conveyance structures, Leaching, Pipes, Minnesota.
Identifiers: Minnetonka(MN).

Fifteen thousand feet of 6 to 24-inch sewer and force main, and a lift station were installed as part of a trunk sewer system in Minnetonka, Minnesota. The installation was to eliminate individual soil adsorption disposal systems and sewage leaching into four lakes. An 18-inch diameter gravity sewer was placed across Wing Lake. The lake was drained and cleaned for pipe installation. Clean water from the city water system was used as refill water. Environmental effects of alternative proposals were considered. Sewer construction adjacent to the lake might have destroyed trees. Excessive groundwater movement could have resulted from trench dewatering. The lake's ability to hold water was in danger of disruption due to the breakage of bottom seals by excavation. Negative effects on aquatic life were considered when lake dewatering was investigated. Public meetings were conducted, and a biological assay provided information so that final decisions could be made. Inclusion of the public in pre-construction planning avoided possible lawsuits from those disturbed about possible environmental hazards, while providing the best solution to the extreme environmental problem of maintaining an intact lake ecosystem. (Collins-FIRL)
W77-09842

NEW SEWER SYSTEM RESISTS INFILTRATION.
Public Works, Vol. 108, No. 5, p 130, May, 1977.

Descriptors: *Sewers, *Infiltration, Design, *Pipes, Construction materials, Sanitary engineering, Joints(Connections), Chemical properties, Physical properties, *Design criteria, Metal pipes, Plastic pipes, Missouri.
Identifiers: Caruthersville(MO).

Caruthersville, Missouri, has completed a sanitary sewer system which resists infiltration. The city is located along the Mississippi River and has a soil which is mostly river and glacial silt. The area also possesses a high water table. Infiltration-proof piping was needed because of its installation several feet below the water table at several points. The major requirements of piping were tight joints and beam strength which would withstand probable subsurface structural movement. Chemical bonding was used to solve the jointing problems; longer pipe lengths necessitated fewer joints. The choice of a pipe which allowed connection to house lines at random levels and increment was important. About 13,500 feet of 8-inch diameter pipe, 4,000 feet of 10-inch diameter pipe, and 1,400 feet of 12-inch diameter pipe were supplied by the Armco Steel Corporation. Another 5,300 feet of 4 and 6-inch diameter extra-strength, solid wall ABS pipe were used in reconnecting house lines. (Collins-FIRL)
W77-09843

HIGHLY EFFICIENT AERATING SYSTEM--FOR AN ACTIVATED SLUDGE EFFLUENT TREATMENT PLANT, WITH RESTRICTED LIQUID CIRCULATION IN AERATING TANK.
French Patent FR 2311-758. Issued January 1, 1977. Derwent French Patents Abstracts, Vol. Y, No. 11, p D3, April, 1977.

Descriptors: *Patents, *Aeration, *Activated sludge, Treatment facilities, Sewage effluents, Equipment, Pumps, Design, Performance, *Waste water treatment.

A patent was issued for an activated sludge treatment aeration system. Domestic or industrial waste effluents are treated by diffusing an oxygen-containing gas through aerators into an aeration tank containing bacterial sludge. The tank bottom aerators are fixed to a movable platform for continuous motion. Air lift pumps hold the settling sludge in suspension. Baffles limit the circulation of tank contents, but do not interfere with aeration. A portion of the aerated effluent is supplied by a connection with a sedimentation tank while the rest of the separated effluent can be recycled to the aeration tank for solids content regulation. (Collins-FIRL)
W77-09844

WASTE WATER BIOCHEMICAL PURIFICATION CONTROL--BY AUTOMATED DETERMINATION OF CARBON DIOXIDE CONCENTRATION WITH BARIUM HYDROXIDE SOLUTION.
Soviet Patent SU 517-845. Issued August 2, 1976. Soviet Inventions Illustrated, Vol. Y, No. 11, p D1, April, 1977.

Descriptors: *Patents, *Water purification, *Monitoring, *Equipment, *Carbon dioxide, Hydrogen ion concentration, Temperature, Automation, Oxidation, Organic compounds, Gases, Electrodes, *Waste water treatment.

A patent was issued for a method to control biochemical treatment of waste water using automated determination of carbon dioxide concentrations. The carbon dioxide monitor includes a circulating pump, respirometric flask, a vessel of barium hydroxide solution with pH meter electrodes and temperature sensor, automatic titration, and a digital analogue transducer with a register. The barium hydroxide solution is kept constant. Carbon dioxide production is monitored during biological oxidation of organic compounds in waste water. The carbon dioxide gas reacts with the barium hydroxide to create a pH change while the temperature is monitored. A reagent flows to a dispenser to keep the pH at a constant value. (Collins-FIRL)
W77-09845

RECYCLING OF ALUM USED FOR PHOSPHORUS REMOVAL IN DOMESTIC WASTE WATER TREATMENT,
Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
D. A. Cornwell, and J. Zoltek, Jr.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 600-612, April, 1977. 6 fig, 4 tab, 21 ref.

Descriptors: *Recycling, *Phosphorus, *Separation techniques, Domestic water, Coagulation, Chemical treatment, Hydrogen ion concentration, Treatment facilities, Economics, *Waste water treatment.
Identifiers: *Alum.

A solvent extraction process was developed for alum recovery. The product was phosphorus-free and the same concentration as commercial liquid alum. An equal molar mixture of mono- and di(2-ethylhexyl) phosphoric acid was the most efficient extractant for aluminum recovery. Equilibrium curves were developed which could be used for countercurrent extraction systems design on the same scale that the curves were first developed. Aluminum recovery was 89-95%. The process necessitated low sludge flows and small detention times which would result in low capital costs. The process should be applicable to either large or small treatment facilities, but has thus far been tested only at the laboratory scale. Benefits include ease of operation, small amounts of required capital outlay, and a large decrease in sludge volume. (Collins-FIRL)
W77-09847

NITROGEN CONTROL: DESIGN CONSIDERATIONS FOR SUPPORTED GROWTH SYSTEMS,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
K. L. Murphy, P. M. Sutton, R. W. Wilson, and B. E. Jank.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 549-557, April, 1977. 11 fig, 4 tab, 10 ref.

Descriptors: *Nitrogen, *Control, *Design criteria, *Biological treatment, Microorganisms, Pilot plants, Treatment facilities, Nitrification, Denitrification, Analysis, *Waste water treatment.

A review is presented of design criteria for nitrogen control in two supported growth biological reactors, a rotating biological contactor (RBC) and a submerged packed column (SPC). Nitrification and denitrification pilot plant studies were conducted with municipal waste water. The RBC process produced efficient and predictable TKN removal at all temperatures normally found in municipal waste water treatment. It was concluded that the nitrification rate in the RBC was not a function of filterable TKN concentrations. Nitrification in the RBC showed a relatively low temperature sensitivity. Covers should be installed on treatment units in cold climates to reduce icing problems and prevent the reduction of biological activity. Removal of NO3 + NO2 - N was efficient and predictable under all temperature conditions with the submerged RBC reactor. Denitrification rates were not a significant function of this concentration. Low suspended solids concentrations were found in the effluent, even without clarification. Packed column reactors containing highly porous media removed significant quantities of NO3 + NO2 - N. Inconsistent, unpredictable denitrification efficiencies were produced by nonsteady state hydraulic conditions in packed column reactors. The problem was not solved by flushing the system. Such biological reactors were not recommended when high quality effluent is required. (Collins-FIRL)
W77-09848

LOW COST PHOSPHORUS REMOVAL AT RENO-SPARKS, NEVADA,
Kennedy Engineers, Inc., San Francisco, Calif.
L. E. Peirano.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 568-574, April, 1977. 8 fig, 1 tab, 2 ref.

Descriptors: *Phosphorus, *Costs, Biological treatment, *Separation techniques, Lime, Hydrogen ion concentration, Treatment facilities, *Waste water treatment.
Identifiers: Reno(NV), Sparks(NV).

Low cost phosphorus removal by the PhoStrip process has been implemented at Reno-Sparks, Nevada. The process uses activated sludge microorgansisms for phosphorus concentration from waste water flow into a small sub-stream. Phosphorus removal by chemical precipitation from this stream is much less expensive than conventional methods. The lime-phosphorus reaction is pH dependent, not stoichiometric. Thus the quantity of lime needed is dependent upon the quantity of liquid treated rather than the quantity of phosphorus contained in the liquid. This factor produces savings. Return activated sludge (RAS) is held under anaerobic conditions to release phosphorus and create a phosphorus-rich supernatant. Phosphorous taken up by microorganisms in the aeration tank is released under anaerobic conditions. The supernatant liquor from this process is fed to the stripping tank where it settles, becomes anaerobic, and releases phosphorous. A portion of the anaerobic RAS, with phosphorous deficient microorganisms and phosphorous rich liquor, is continuously recirculated to the aeration tank. The microorganisms take up phosphorous and the cycle is repeated. Part of the anaerobic RAS is recirculated through the stripping tank so that supernatant from the surface will contain a maximum phosphorous concentration. Control parameters are the biomass quantity moving through the stripping tank, biomass detention time in stripping tank, and the withdrawal rate of supernatant from stripping tank surface. The plant-scale test at the Reno-Sparks treatment facility produced more than 90% phosphorous removal. The PhoStrip process produced a more stable and better settling activated sludge than conventional processes. Savings of $600-800,000 annually are expected for a 40 mgd treatment capacity. (Collins-FIRL)
W77-09849

ORGANIC MATTER REMOVAL BY POWDERED ACTIVATED CARBON ADDED TO ACTIVATED SLUDGE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
F. B. DeWalle, E. S. K. Chian, and E. M. Small.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 593-599, April, 1977. 5 fig, 1 tab, 19 ref.

Descriptors: *Organic matter, *Separation techniques, *Activated carbon, *Activated sludge, Chemical oxygen demand, Biological oxygen demand, Adsorption, Physical properties, Chemical properties, Sedimentation, *Waste water treatment.
Identifiers: Powdered activated carbon(PAC).

Investigations were conducted on organic matter removal through the addition of powdered activated carbon to activated sludge. It was shown that powdered activated carbon added to activated sludge units with 5 and 10 day residence times decreased effluent organic matter concentrations. This was also true when additions were at low equilibrium concentrations. Powdered activated carbon was equally effective at both residence times. Organic matter reductions in the 5-day PAC units were partially biologically mediated. This was possibly attributable to formation of a denser sludge particle. Reduction in concentration of low-molecular-weight amino acids and carbonyl compounds excreted by bacteria during substrate removal is probably due to their restricted diffusion into the solution and subsequent rapid uptake. Removal of organic matter in the 10-day units were of a more physical nature due to removal of an intermediate molecular weight fraction, characterized by aromatic hydroxyl groups. (Collins-FIRL)
W77-09850

NITRIFICATION IN A CHLORINATED ACTIVATED SLUDGE CULTURE,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
P. F. Strom, and M. S. Finstein.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 584-592, April, 1977. 6 fig, 4 tab, 35 ref.

Descriptors: *Nitrification, *Activated sludge, *Chlorination, Treatment facilities, Performance, Trickling filters, Bacteria, Microorganisms, Evaluation, *Waste water treatment.

The effects of chlorination on nitrification in an activated sludge culture were investigated. A hospital activated sludge treatment plant in Marbaro, New Jersey, was used for the study. It was found that this underloaded activated sludge plant treating institutional waste water nitrified practically all of the ammonium during the first 6-8 hours of treatment. Nitrification was not decreased by the use of chlorination (30-40 milligrams of C12/liter return sludge) for bulking control. Nitrite concentration decreases were attributed to nonbiological reactions with the disinfectant. Laboratory incubations resulted in a nitrification end product accumulation of 1 milligram of nitrate nitrogen/hour/gram MLSS (dry weight). Nitrification rates were not affected by chlorine doses of 0, 5, 15, 25, or 50 mg/liter of return sludge. Total organic carbon and BOD removal were not significantly affected by these chlorine doses. MLSS settleability was improved. It was concluded that although chlorination can solve various biological treatment operational problems without harm to nitrification, it may create other undesired effects. (Collins-FIRL)
W77-09851

DISINFECTION OF WASTE WATER BY PHOTODYNAMIC OXIDATION,
Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology.
C. P. Gerba, C. Wallis, and J. L. Melnick.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 575-583, April, 1977. 8 fig, 9 tab, 18 ref.

Descriptors: *Disinfection, *Light, *Oxidation, Pathogenic bacteria, Viruses, Fungi, Toxicity, Dyes, Coliforms, Hydrogen ion concentration, Temperature, Organic matter, *Waste water treatment.
Identifiers: *Photoinactivation.

Waste water disinfection by photodynamic oxidation was investigated. Methylene blue was chosen as the test dye from those which render viruses, bacteria, and fungi sensitive to damage and destruction by light in the presence of molecular oxygen. The amount of coliforms and poliovirus inactivated by methylene blue photodynamic oxidation was affected by dye concentration, temperature, pH, and sensitization time. A pH of at least 9.0 was required, with the greatest effect on sensitization occurring between pH 9.5 and 10.0. Other heterotricyclic dyes are capable of sensitizing viruses in a neutral pH range, but were too expensive or not available in bulk. Optimal dye concentrations for viral photoinactivation were between 1 and 10 mg/liter. A range of 1 to 5 mg/liter would be preferable because higher concentrations absorbed most of the light near the surface. Light would penetrate deeper with lower concentrations and more light exposure would be necessary to inactivate given amounts of viruses than at higher dye concentrations. Organic matter concentrations did not affect the dye action or microorganisms. However, ultraviolet light would be ineffective for effluents with high organic matter concentrations. Wavelengths of 670 nm are not absorbed by organics and can penetrate to greater depths. Turbidity has an effect on visible light penetration into fluids, but turbidities of 4.5 to 10 JTU did not affect coliform or poliovirus inactivation. Photoinactivation would be most advantageous in advanced waste water treatment plants where high effluent quality is required. Plants using lime flocculation could be easily adapted to this process, as well as those with high pH levels for ammonia stripping. Dye removal by activated carbon would be productive for land disposal sites. The use of energy from sunlight was a practical alternative to artificial light, particularly for areas with year round daylight. The process has its greatest applicability in systems which require large reductions of pathogenic bacteria and viruses. (Collins-FIRL)
W77-09852

RAPID SAND FILTRATION FOR BEST PRACTICAL TREATMENT OF DOMESTIC WASTE WATER STABILIZATION POND EFFLUENT,
Oklahoma Univ. Health Sciences Center, Oklahoma City.
O. T. Boatright, and C. H. Lawrence.

Descriptors: *Filtration, *Soil filters, *Oxidation lagoons, Domestic wastes, Biochemical oxygen demand, Coliforms, Economics, Design, Operation, Maintenance, Treatment facilities, Nutrients, Pollution abatement, *Waste water treatment.

Investigations were conducted to determine sand filtration modifications which would permit the use of a compact unit to improve waste stabilization pond effluents. Filtration efficiency, filtration rate, and the length of the filter run were evaluated for a range of sand sizes- 0.92, 0.50, 0.35, and 0.17 mm. A 5 to 7 foot hydraulic head, under continuous flow conditions, was used during periods of highest suspended solids concentrations in pond effluent. Efficiency was determined by comparison of influent and effluent BOD5, suspended solids, and fecal coliform concentrations. Filters of 0.50 to 0.35 mm were successful when operated at rates of 1 to 3 gallons/sq ft/min for minimum filter runs of 5 weeks. Effluents produced met the standards of 30 mg/liter of BOD5 and suspended solids and 200 fecal coliform/100 ml. Average BOD5 efficiencies were 70-94%. Reductions of fecal coliform ranged from 92 to 98%. Effluent concentrations were 6-37 mg/liter of BOD5, 9-43 mg/liter of suspended solids, and 42-173 fecal coliform/100 ml. Towards the lower end of the 0.35-0.50 filter range, efficiency increased and the stability of filtration rates and length of filter run substantially decreased. Filtration efficiency decreased and filtration rates and filter run length were acceptable and stable for the 0.50 millimeter filter size. These units were technically and economically feasible for small communities. Maintenance requirements were minimal and the system was considered applicable to rural effluents. (Collins-FIRL)
W77-09853

UPGRADING A COMPLEX MIX ACTIVATED SLUDGE WASTEWATER TREATMENT PLANT,
Brown and Caldwell, Walnut Creek, Calif.
W. R. Uhte.

Descriptors: *Treatment facilities, *Performance, *Activated sludge, Trickling filters, Oxidation lagoons, Industrial wastes, Sedimentation, Aeration, Chlorination, Disinfection, Operations, Equipment, Control, *Waste water treatment.

Modifications have been made to upgrade a complex mix activated sludge treatment plant where effluent suspended solids loadings and coliform MPN counts were near violation levels. The Sacramento County Central Wastewater Treatment Plant processes both domestic and industrial wastes and was subject to heavy organic loads during an approaching canning season. Major problems included an unstable activated sludge process, an inadequate waste solid processing and disposal system, and the unknown magnitude of industrial waste loadings. The first was the subject of this study and contributing factors were: the inability of plant aeration and settling to operate as a single system; inadequate control of return activated sludge (RAS); inability to maintain regulated waste activated sludge (WAS) flow rates; no chemical feed facilities to improve mixed liquor settling and control filamentous growths; insufficient maintenance of DO in aeration tanks; and varying mixed liquor flows to final clarifiers. Primary effluent and RAS were mixed before distribution to aeration bays and all secondary clarifier RAS flows were completely mixed before return to primary effluent. Operation was possible at higher solids levels with lower feed:solids ratios during peak cannery load periods. RAS was aided by the installation of two independent RAS pumps at each clarifier. For WAS control an aeration bay was changed into a reaeration bay, the WAS pump discharge header was raised, and a WAS magnetic meter with a higher peak capacity was installed. Ferric chloride and chlorine chemical feed facilities were constructed to provide flexibility during critical operational periods. Hydraulic losses were minimized and the use of equalizing overflow weirs in the aeration tank 'H' produced equal distribution of mixed liquor to the clarifiers. After two years, plant operation was significantly improved. (Collins-FIRL)
W77-09854

AN APPROACH TO REDUCE WATER CONSUMPTION IN NEIGHBORHOODS THROUGH REUSE,
Sir Venkateswara Univ., Tirupati (India). Dept. of Civil Engineering.
P. P. Mowli.
Indian Journal of Environmental Health, Vol. 18, No. 4, p 299-304, October, 1976. 1 fig, 3 tab, 5 ref.

Descriptors: *Water reuse, *Water demand, Water consumption(Except consumptive use), Domestic water, Water treatment, Water purification, Filtration, Equipment, *Waste water treatment, Urban areas.
Identifiers: *India.

A two-year study was conducted in India on the feasibility of waste water reclamation and reuse to lower domestic water consumption. The test site was a college residential area whose water consumption patterns were similar to that of developing upper income neighborhoods. It was suggested that waste water from baths, water closets, and washing could be used for gardening purposes when suitably treated. This would reduce fresh water demands by 20-34% depending upon gardening needs. Design criteria for a successful reuse scheme included: waste water treatment to a satisfactory level; construction of septic tank and other treatment units adjacent to the water closet and bath; construction of treatment units partially or fully above ground level so that treated effluent could flow into a storage tank; and using hose pipes to transport treated waste water to the plant beds. Open drains would be eliminated. In the test system, septic tank effluent was further treated in reverse filters before storage. Common-wall, compact construction resulted in cost and area savings. Elimination of house drains and head pressure conservation were accomplished by constructing the unit adjacent to the water closet and bath. The final effluent was very clean and had no objectionable odor or color. Hoses were supplied to avoid complaints against direct handling of reclaimed water in gardening applications. (Collins-FIRL)
W77-09855

SEWAGE EJECTORS AVOID MANUAL UNBLOCKING OF PIPES.
For primary bibliographic entry see Field 8C.
W77-09856

HYDROGEN PEROXIDE SUBDUES WASTE WATER PLANT PROBLEMS.
Public Works, Vol. 108, No. 5, p 105, May, 1977.

Descriptors: *Treatment facilities, *Sewers, *Performance, Hydrogen sulfide, Odor, Corrosion control, Chlorine, Dissolved oxygen, Biochemical oxygen demand, Sewers, *Waste water treatment, California.
Identifiers: *Hydrogen peroxide treatment(Waste water), Stockton(CA).

Stockton, California, has used hydrogen peroxide to solve several waste water treatment problems. Chlorine usage was reduced, hydrogen sulfide was eliminated, crown corrosion was prevented, and so was the septicity of raw sewage in the force mains. Use of hydrogen peroxide was instituted to prevent odors and concrete sewer corrosion. It was later used to ensure the operation of an overloaded treatment facility until the completion of a higher capacity plant. Prevention of septic waste water was accomplished by hydrogen peroxide addition at three lift stations. This raised DO concentrations at the primary clarifier and kept the wastes fresh. Hydrogen peroxide prevented corrosive H2S reactions in sewers and completely eliminated the need to use chlorine for odor control. Application of hydrogen peroxide is planned for trunk lines to the new plant which will handle flows having high H2S and BOD concentrations. (Collins-FIRL)
W77-09858

THURROCK TEST-BED FOR ICI DEEP SHAFT,
B. Appleton.
New Civil Engineer, No. 239, p 24-25, April, 1977. 1 fig.

Descriptors: *Aeration, *Treatment facilities, Sanitary engineering, Water purification, Biochemical oxygen demand, Oxygen, Industrial wastes, Domestic wastes, Costs, *Waste water treatment, Bubbles.
Identifiers: ICI deep shaft, *Oxygen transfer, Anglian Water Authority(England).

The ICI deep shaft treatment process uses air injection to drive raw sewage down a central shaft and back up the space around the shaft annularly. It then overflows for a final clarification after about 20 circuits. The system creates a longer air bubble contact time to produce a higher oxygen transfer efficiency. Purification rates are several times that of normal aeration and energy needs are reduced. The Thurrock facility of the English Anglian Water Authority will test the process. The 130 meter-deep, 1.86 meter-diameter shaft is expected to remove 7,000 kg of BOD/day from a

mixture of industrial and domestic sewage equivalent to a 130,000 population sewage load. Cost comparisons indicated that the 750,000 pounds to be expended would equal the cost of an extended aeration program to treat the normal domestic sewage of a 30,000 population to Royal Commission standard.
W77-09859

VIRUS AND BACTERIA REMOVAL FROM WASTE WATER BY RAPID INFILTRATION THROUGH SOIL,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
S. A. Schaub, and C. A. Sorber.
Applied and Environmental Microbiology, Vol 33, No 3, p 609-619, March, 1977. 6 fig, 6 tab, 15 ref.

Descriptors: *Viruses, *Bacteria, *Infiltration, *Soil disposal fields, Adsorption, Soil contamination, Water pollution, Groundwater, Separation, Microorganisms, *Waste water treatment.

The removal of viruses and bacteria from waste water by rapid infiltration following land disposal was investigated. The study site was a disposal field which has been operated continuously since 1942. Viral adsorption and enteric indicator bacteria studies were performed. It was found that all soil layers held viruses poorly (in primary effluent) and bacteriophage adsorption was minimal. Viral adsorption was significant, except in high organic content surface layers, when deionized water with metal cation was used. In unrenovated cells, adsorptive sites in upper soil layers were depleted. The f2 bacteriophage stabilized in groundwater at almost 50% of the applied virus concentration. Recovery of enteric viruses was about 10% of the waste water virus concentration. Laboratory tests indicated greater soil adsorption of enterovirus as compared to poliovirus. Indicator bacteria studies indicated a different behavioral pattern. Large concentrations of total coliform, fecal coliform, and fecal streptococcus were retained in surface soils. Bacterial concentrations dropped significantly, declining at slower rates than viruses, in subsequent layers. It was doubtful that adsorption played a large role in these results. Fecal streptococcus in groundwater did not correspond with tracer bacteriophage occurrence. This could be attributed to different migration times and to previous waste water applications. (Collins-FIRL)
W77-09860

NIRMALI SEED--A NATURALLY OCCURRING COAGULANT,
Bhagalpur Engineering Coll. (India). Dept. of Civil Engineering.
P. N. Tripathi, M. Chaudhuri, and S. D. Bokil.
Indian Journal of Environmental Health, Vol 18, No 4, p 272-281, October, 1976. 6 fig, 4 tab, 15 ref.

Descriptors: *Polyelectrolytes, *Coagulation, *Flocculation, *Clays, Bacteria, Evaluation, Water purification, Chemical treatment, Separation techniques, *Waste water treatment.
Identifiers: *Nirmali seed(Treatment), India.

Nirmali seeds and nuts have long been used in crushed form to clarify muddy water in India. An extract from the seeds was found to be an anionic polyelectrolyte which was effective as a coagulant and coagulant aid in the clarification of natural turbid water. The two main groups on the polymer were carboxyl and hydroxyl. It was an efficient flocculant for turbidity that was of an inorganic, hydrophobic nature. The extract performed poorly as a flocculant and coagulant for natural biocolloids, such as bacteria. (Collins-FIRL)
W77-09861

WASTE WATER TREATMENT BY ANAEROBIC CONTACT FILTER,
National Environmental Engineering Research Inst., Nagpur (India).
A. N. Khan, and R. H. Siddiqi.
Indian Journal of Environmental Health, Vol 18, No 4, p 282-291, October, 1976. 2 fig, 5 tab, 7 ref.

Descriptors: *Aerobic conditions, *Filtration, *Filters, Performance, Evaluation, Bacteria, Costs, Chemical oxygen demand, Liquid wastes, Anaerobic bacteria, Suspended solids, *Waste water treatment, Equipment.
Identifiers: *Anaerobic contact filter.

Laboratory studies were conducted to test the performance of an anaerobic contact filter unit. This was an upflow filter with waste introduced from the bottom. The filter was completely submerged. It contains a stone-filled bed, on which anaerobic microorganisms grow, that allows higher loading rates. Results showed an 80% reduction in applied COD at a loading of 225 pounds of COD/1000 cubic feet/day. Liquid detention time at this loading was 8 hours. The anaerobic contact filter compared favorably with other biological treatment methods. Performance was not significantly improved with a height greater than 4 feet. Treatment of soluble wastes with BOD concentrations as low as 500 mg/liter was feasible and the system was considered as an alternative to septic tanks themselves, or as a secondary treatment method for septic tank effluents in water-logged or compact areas. (Collins-FIRL)
W77-09862

EVALUATION OF CELLULOSE ACETATE MEMBRANES FOR REVERSE OSMOSIS SEPARATION,
National Environmental Engineering Research Inst., Nagpur (India).
A. S. Bal, and S. L. Lutade.
Indian Journal of Environmental Health, Vol 18, No 4, p 253-271, October, 1976. 10 fig, 4 tab, 10 ref.

Descriptors: *Reverse osmosis, *Membranes, *Polymers, *Evaluation, Membrane processes, Temperature, Evaporation, Humidity, Physical properties, Chemical properties, Separation techniques, Water purification, *Waste water treatment.
Identifiers: Cellulose acetate membranes.

The performance of cellulose acetate membranes was evaluated for use in reverse osmosis separation. A spread casting solution of cellulose acetate, formamide, and acetone was spread on a suitable surface and allowed to evaporate. The film was immersed in cold water and the formamide was leached away, thus forming a highly porous membrane. Shrinkage was accomplished by heating under water. The membrane was tested to determine the effect of casting parameters such as casting temperature and relative humidity of the casting atmosphere. Results indicated that the most useful casting formula was, by weight, 25% of cellulose acetate, 30% of formamide, and 45% of acetone. Trends relative to temperature indicated an increase in product rate with increased casting temperatures. An increase in percent salt rejection was observed with increasing casting temperatures, Higher percent relative humidities are accomplished by higher flux rates and low rejection through the membrane. With casting temperatures of 23-26C, a relative humidity of 65-78% produces the most productive membranes. (Collins-FIRL)
W77-09863

PASTEUR V CURIE.
The Consulting Engineer, Vol 41, No 4, p 43, 45, April, 1977. 1 fig.

Descriptors: *Irradiation, *Heat treatment, *Fertilizers, Sewage treatment, Sewage disposal, Temperature, Equipment, Sludge disposal, Physical properties, Biological properties, *Waste water treatment.
Identifiers: *Pasteurization.

Sterilization is a necessity before sewage can be used as an agricultural fertilizer. This can be accomplished by either irradiation or pasteurization. A German irradiation plant claims to produce results comparable to those of conventional pasteurization plants. It is composed of a sludge irradiation shaft, a built-in central pipe, and a recirculation system. Components requiring regular inspection and maintenance are remote from radiation sources and are safe during periods of operation. Varied safety measures have been taken and the source rods do not contact the sewage. A closed loop system is provided for cooling and leakage monitoring. The operation is a batch process. Irradiated sludge is discharged to a storage tank for separation of sludge and water. Operation is automatically controlled. A Danish pasteurization plant included mechanical and biological treatment, and anaerobic stabilization of the sludge. The plant treated about 40% of the sludge produced from the related municipal treatment plant. Sludge was passed to a spiral heat exchanger for indirect heat exchange preheating and was dispatched as pasteurized sludge. Radiation doses of 150 krad for 5 minutes was considered adequate for sludge dried to 25% solids and a 500 krad dose at the same exposure time was necessary for sludge dried to 10% solids. This was calculated to equal pasteurization at 80C for 30 minutes. The pasteurization process with a shorter heating time does not claim complete bacterial destruction, but does destroy salmonella and escherichia bacteria. Operation was at 80C for 5 minutes. The total bacterial count was reduced by 65-85%. COD was increased 200-300% during pasteurization at 75-85C and by a minimum 900% at 90-95C. (Collins-FIRL)
W77-09864

WASTE PURIFICATION PROCESS.
Indian Chemical Journal, Vol 11, No 7, p 33, January, 1977.

Descriptors: *Treatment facilities, *Biological treatment, Ammonia, Odor, *Oxygen, *Aeration, Sedimentation, Biochemical oxygen demand, Oxygen demand, Costs, Water purification, *Waste water treatment.

A German installation of the Lindox biological waste water treatment process is described. The treated waste is highly contaminated with ammonia and has a strong odor. The process involves the introduction of waste into a stirred balancing tank and then into a two-stage activation basin. Oxxygen is injected by two surface aerators to a concentration of 5-15 mg/liter. Waste is passed through a sedimentation basin and a 99.5% pure effluent is produced for disposal into a river. A 31-hour aeration time produces an effluent with a BOD of 23 mg/liter from an influent BOD of 5230 mg/liter. Specific oxygen demand is about 1.04 kg/kilogram of BOD. Low operating costs are produced from an electrical consumption of 0.32 kilowatt hours/kilogram of BOD. (Collins-FIRL)
W77-09865

OXXIDATION DITCH GIVES LOW-COST SECONDARY TREATMENT.
The American City and County, Vol 92, No 5, p 87-88, May, 1977. 1 fig, 1 tab.

Descriptors: *Oxidation, *Treatment facilities, *Sewage treatment, Biochemical oxygen demand, Suspension solids, Toxicity, Organic matter, Nitrification, Denitrification, Activated sludge, Separation techniques, *Waste water treatment, *Oxidation lagoons.
Identifiers: Oxidation ditches.

A survey of secondary treatment facilities was conducted in EPA Region VII. Thirty facilities were evaluated for BOD5, COD, NFS, total P, NH3-N, TKN, NO2-NO3-N, and influent and effluent water temperatures. Activated sludge facilities and oxidation ditches presented the best per-

formance, reaching 99% removals. Trickling filter plants were not as efficient. Nitrogen conversion was used as the measure of optimal performance. At temperatures less than 5C, properly operated activated sludge plants and oxidation ditches can produce effluents containing less than 0.5 mg/liter of ammonia. Most secondary treatment plants did not perform efficiently. Collected data indicated that oxidation ditches could provide excellent treatment at low costs. These plants did not require highly trained operators for good performance. They could also be designed to provide complete nitrification in the coldest weather and a significant degree of denitrification. Unsatisfactory performance in some oxidation ditches could be traced to problems such as frozen sludge return lines and poor design. (Collins-FIRL)
W77-09866

GROWTH OF TULIPS TREATED WITH SLUDGE CONTAINING DEWATERING CHEMICALS,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W77-09867

ELEMENTAL COMPOSITION OF SLUDGE-FERTILIZED CHRYSANTHEMUMS,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W77-09868

HOW SLUDGE CHARACTERISTICS AFFECT INCINERATOR DESIGN,
Hydroscience, Inc., Knoxville, Tenn.
For primary bibliographic entry see Field 5E.
W77-09869

REVIEW AND EVALUATION OF AERATION TANK DESIGN PARAMETERS,
Donohue and Associates, Inc., Waukesha, Wis.
G. A. Gagnon, C. J. Crandall, and A. E. Zanoni.
Journal Water Pollution Control Federation, Vol 49, No 5, p 832-841, May, 1977. 4 fig, 8 tab, 39 ref.

Descriptors: *Aeration, *Treatment facilities, *Design criteria, Storage, Loads(Forces), Biomass, Organic matter, Time, Biochemical oxygen demand, Evaluation, *Waste water treatment.
Identifiers: *Aeration tanks(Design).

The development of aeration tank design parameters was reviewed and these parameters were evaluated. The relationship between detention time and BOD removal has been a widely recognized parameter since the early 1900s. Organic loading per unit of volume and per unit of biomass have recently been recognized as more important parameters, in light of the activated sludge processes developed within the past thirty years. These parameters are more indicative of aeration tank conditions, such as the amount of biomass available for stabilization and the amount of organic matter to be stabilized. This study evaluated the efficiency of an activated sludge treatment plant as a function of three parameters. These were organic loading per unit volume, organic loading per unit of biomass, and organic loading per unit of biomass per unit time. There was no evident correlation between effluent BOD concentration and aeration tank loading in the range of 0.1-0.7 grams of BOD/gram of MLVSS/day. Percent BOD removals increased as aeration tank loading increased. Plant performance was more predictable at loadings above 560 grams of BOD/cu m/day, 0.3 grams of BOD/day/gram of MLVSS per day, and 35 grams of BOD/kg of MLVSS per day, than at lower loadings. Loadings up to 1,120 grams of BOD/cu m/day, 0.7 grams of BOD/gram of MLVSS per day, and 95 grams of BOD/kg of MLVSS per hour/per day produced BOD removals between 92 and 98%. Operation at these loadings is considered to be within the most effective range. Aeration tank size and construction costs would be reduced by a design for these higher rates. This would also provide the plant operator with a wide range from which to choose the plant loading rate. (Collins-FIRL)
W77-09870

CHEMICALLY ASSISTED BIOLOGICAL OXIDATION OF WASTES AND EXCESS SLUDGE,
Oklahoma State Univ., Stillwater. Bioenvironmental Engineering Labs.
A. F. Gaudy, Jr.
Water and Sewage Works, Reference Issue, p 48, 50-52, 54-56, April, 1977. 11 fig, 10 ref.

Descriptors: *Aeration, *Oxidation, *Hydrolysis, *Activated sludge, Metabolism, Effluents, Suspended solids, Waste disposal, Acidity, *Waste water treatment.
Identifiers: *Chemical treatment.

Extended aeration was investigated as a reliable means of producing a quality effluent without creating excessive biological sludge. It has been postulated that a process that did not involve sludge wasting would balance endogenous cellular metabolism and incoming sludge concentration by using the incoming waste for synthesis and growth. This would produce total waste oxidation. Those who have refused this basic theory suggest that any success was due to solids going over the clarifier weir. A three-year investigation was conducted in which effluent was held in a holding tank, centrifuged, and returned to the holding tank to avoid solids being lost over the clarifier weir. The results revealed that neither a balanced condition between autodigestion and new sludge synthesis, nor a steady increase in biological solids concentration occurred. There were periods of solids accumulation and de-accumulation. The de-accumulation period was found to result from autodigestion exceeding sludge accumulation. Experimentation revealed that process malfunction would probably be due to impaired separation in the clarifier. Since centrifugation would not be practical in a field situation, solids would be channeled to the receiving stream. The insoluble portion of microbial cells released upon cell breakage, such as cell walls and membranes, consisted of polymers of compounds which were good substrates. Acid hydrolysis of these materials provided a substrate which was used to initiate autodigestion during de-accumulation periods. Further development of this 'hydrolytic assist' procedure could make extended aeration a more cost-competitive sludge disposal method. (Collins-FIRL)
W77-09871

SAFFRON WALDEN OPENS ITS LOW PROFILE SEWAGE WORKS,
J. Pullin.
Surveyor, Vol 149, No 4426, p 3, April, 1977.

Descriptors: *Treatment facilities, *Sewers, Design criteria, Performance, Costs, Screens, Settling basins, Pumps, Filters, Biological treatment, Pumping plants, Sensors, *Waste water treatment.
Identifiers: Saffron Walden(England).

A new treatment plant was opened at Saffron Walden, England. The former facility, located near a park, was overloaded. There was opposition to expansion of the old plant and demands that there be no environmental or aesthetic disturbance created by the new one. The routing of a footpath along the new site was also a problem. A revised design centralized the treatment works on one side of the path and the storm overflow and final effluent treatment area on the other side. Added costs incurred by the redesign have not been determined. High and low level gravity sewer systems provided sewage flow to the new plant. The first was fed by a new relief trunk sewer that intercepted the older system. The second discharged at the old site where effluent is pumped to the new works. Screenings from the inlet works were disintegrated and returned to the main flow through a detritor. A measuring flume diverted flows exceeding 3 mgd to storm water tanks. A central hopper received settled sludge. Settling tank overflow was mixed with humus tank effluent in the main pumping station and lifted to biological filters. Pump operation was automatically controlled. The biological filters were constructed as four beds. Flow then passed to humus tanks where effluent was divided for passage to the pumping station and recirculation. THe remainder of this flow was passed to the river in winter or to microstrainers for polishing in the summer. A sludge consolidation unit received sludge from primary settling tanks. It was then stored for final treatment at a regional sludge center. The plant was constructed to a high architectural standard and its components were compact. (Collins-FIRL)
W77-09872

BIOLOGICAL FLUIDIZED-BED TREATMENT FOR BOD AND NITROGEN REMOVAL,
Ecolotrol, Inc., Bethpage, N.Y.
J. S. Jeris, R. W. Owens, R. Hickey, and F. Flood.
Journal Water Pollution Control Federation, Vol 49, No 5, p 816-831, May, 1977. 14 fig, 8 tab, 12 ref.

Descriptors: *Filtration, *Biological treatment, *Biochemical oxygen demand, *Nitrogen, Filters, Biomass, Pilot plants, Oxygen, Suspended solids, Sludge, Nitrification, Ammonia, Dissolved oxygen, Hydrogen ion concentration, Denitrification, Evaluation, *Waste water treatment, Treatment facilities.
Identifiers: *Fluidized-bed treatment.

Results of BOD and nitrogen removal studies in three fluidized bed pilot plants were summarized. The basic operation consists of an upward flow of waste water through a sand bed at a velocity which imparts motion to the sand. Test facility sizes ranged from 40,000 gpd for denitrification to 80,000 gpd for carbonaceous BOD removal and nitrification. Systems were operated independently of each other. Testing showed that conventional biological treatment design parameters could be applied to fluidized bed treatment. These included food/mass ratio, solids retention time, and oxygen utilization. Very high biological organism concentrations could be maintained in the reactor. Treatment times were reduced so that 93% BOD removals were achieved in 16 minutes, 99% NH3-N removals were produced in 11 minutes, and 99% NO3-N removals were obtained in less than 6.5 minutes. Space requirements were less than 5% of what is necessary for conventional treatment; intermediary clarifiers were eliminated. Oxygen transfer is the major technological area being optimized. About 40 to 50 mg/liter of oxygen can be dissolved in waste water under atmospheric conditions at most operating temperatures. Recycling would be advantageous in completing treatment when the oxygen demand is high. Many methods of oxygen transfer were being investigated. Flow equalization, used during the pilot study, was a more favorable operating condition as compared to plants which do not employ constant flow. The system combines the best aspects of activated sludge and trickling filtration into one process. Costs should be less expensive than conventional treatment costs due to the space and time savings of the process. (Collins-FIRL)
W77-09873

NATIONWIDE EVALUATION OF COMBINED SEWER OVERFLOWS AND URBAN STORMWATER DISCHARGES. VOLUME II: COST ASSESSMENT AND IMPACTS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. P. Heaney, W. C. Huber, M. A. Medina, Jr., M. P. Murphy, and S. J. Nix.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 005, Price codes: A17 in paper copy, A01 in microfiche. Report EPA-600/2-77-064, March 1977. 380 p, 62 fig, 73 tab, 109 ref.

Descriptors: *Combined sewers, *Overflow, *Storm water, Urban runoff, Pollution abatement, Treatment facilities, Costs, Model studies, Sewage treatment, *Waste water treatment, Economics.

Costs associated with various degrees of wet-weather pollution control were determined as part of a nationwide study. The quality and quantity of urban storm flow was assessed in nearly 248 American urban areas. Continuous simulation runs were used to determine pollution control levels for specified storage volumes and treatment rates in Atlanta, Denver, Minneapolis, San Francisco, and Washington, D.C. Equations derived from the collected data were combined into an optimization model that could determine the best mix of storage and treatment for any viable level of control in any city. Determinations suggested that annual costs would be about $297 million for 25% pollution control and $5,029 million for 85% control. Corresponding capital costs would be $2,476 million and $41,968 million. Potential savings were indicated if wet-weather quality control were integrated with dry-weather sewage treatment plants and/or storage facilities for storm water quantity control. The use of best management practices (BMP) was suggested as an alternative means for reducing control costs. (Collins-FIRL)
W77-09874

TWO-STAGE SETTLING IMPROVES SLUDGE REMOVAL EFFICIENCY,
Seelye, Stevenson, Value, and Knecht, New York.
C. R. Lee, L. T. Fan, M. C. Kuo, and T. Takamatsu.
Water and Sewage Works, Vol 124, No 5, p 41-44, May, 1977. 6 fig, 2 tab, 16 ref.

Descriptors: *Sedimentation, *Settling basins, *Design criteria, Suspended solids, Flow, Model studies, Separation techniques, Sludge , Performance, *Waste water treatment.

Flow patterns and geometric design have a great effect on sludge removal in sedimentation basins. A theoretical approach which divides basins into two or more stages was developed to improve removal efficiency. Modeling and simulation studies have indicated better performance in multi-stage settling tanks. Experiments were conducted to verify these results. One set of experiments was designed to identify axial dispersion from oscillating nets which generated different flow patterns and the second was to confirm performance of a two-stage tank. Results indicated that a two-stage settling tank was superior in performance, especially when axial dispersion was great. Every degree of dispersion was found to have an optimal first and second stage volume allocation. Well-designed weir troughs could improve overflow effluent quality from the first stage. Circular tanks could be used for both stages because weir loadings were smaller than those of rectangular tanks with similar capacities. Sludge spreading in single-stage rectangular settling tanks creates a long travel distance to the hopper in the sludge collector. This allowed a greater probability of sludge re-suspension in the tank. Long sludge residence times in the tank could create a septic or anaerobic state. In a two-stage tank, the first could be used as a thickener to produce fresher and denser sludge for recirculation and later dewatering. (Collins-FIRL)
W77-09875

RADIATION TREATMENT OF SEWAGE SLUDGE--EXPERIENCE WITH AN OPERATING PILOT PLANT,
Bayerische Landesanstalt fuer Bodenkultur, Pflanzenbau und Pflanzenschuts, Munich (West Germany).
A. Suess, and T. Lessel.
Radiation Physics and Chemistry, Vol 9, No 1-3, p 353-370, 1977. 5 fig, 11 tab, 9 ref.

Descriptors: *Irradiation, *Pathogens, *Plant growth, *Treatment facilities, Temperature, Physical properties, Chemical properties, Design, Fuels, Economics, Equipment, Nutrients, *Waste water treatment, *Sludge treatment, *Pilot plants.

A 2 1/2-year pilot study was conducted to evaluate sludge treatment by irradiation. The West German plant was constructed with the irradiation area underground to minimize costs. Regulatory equipment, control instruments, and a laboratory were housed above ground. System economics, pathogenic destruction, effects on sedimentation properties, and effects of treated sludge on plants were evaluated. Several advantages were noted. Operation at temperatures of 25-30C reduced component corrosion. No breakdown of organic nitrogen was induced and sludge volume was not increased. Good dewatering properties could reduce flocculation chemicals and decantation facilities. Plant energy requirements could be reduced and nuclear fuel cycle wastes could possibly be used. The process prevented weed seed germination and could be used to destroy parasites in fresh sludge. The simple design required no additional service staff. The prime disadvantage was the steady decay of the Cobalt 60 employed. Irradiation was found useful only if sludge was to be treated during the entire year and the plant capacity was greater than 50 cu m/day. A treatment of 210 minutes at 300 krads reduced enterobacteria by 3-4 log units. Total bacterial count and enterococces were reduced by 2 log units. Different comosition was evident in the irradiated sludge; plant germination accelerated slightly after application of irradiated sludge, and yields were the same or slightly lower than control studies. Pasteurized sludge, however, showed a nitrogen loss, a decline in plant germination, and lower yields. Soil type and water capacity influenced sludge effects. Studies indicated that nutrients and minor elements of sewage sludge may be used by plants, and mineral fertilizer may be replaced. (Collins-FIRL)
W77-09876

REDUCTION AND RECOVERY: KEYS TO ENERGY SELF-SUFFICIENCY,
Metcalf and Eddy, Inc., New York.
A. Jacobs.
Water and Sewage Works, Reference Issue, p 24-26, 28-30, 32-34, 37, April, 1977. 15 fig, 6 tab, 17 ref.

Descriptors: *Energy, *Fuels, *Electric power costs, Treatment facilities, Electrical power demand, Hydraulic machinery, Flow, Dewatering, Incineration, Heat, Gases, Sludge digestion, Polymers, Operation and maintenance, *Waste water treatment, Economics.

Energy self-sufficiency was discussed for waste water treatment facilities. The economic savings potential from reducing electrical energy demand is substantial, since energy costs are second in magnitude only to salary expenditures. Prime consideration was given to reduction of energy consumption and to recovery of waste heat and energy. Suggested steps included the reduction of peak demand loads; the use of energy efficient processes and equipment; improvement of plant control and operations; and preventive maintenance schedules. Proper selection of pumps, improvement of heat value of incineration products, and improved dewatering would provide savings. Flow equalization, reduction of sludge processing side streams, and minimized hydraulic losses were considered for improving energy utilization in treatment processes. The use of sludge conditioners, such as organic polymers which do not reduce heat value, was suggested. Heat from incinerators could be used to preheat sludge and combustion air. Heat recovered from high temperature gases could provide an added energy source. Aerobic digester gas, and the liquid, gas, and solid residues of pyrolysis could be developed into fuel sources. Adopting any of these practices could reduce the requirements for outside power and fuel. (Collins-FIRL)
W77-09877

POLYMER ADDITION IMPROVES WASTE WATER TREATMENT PROCESS,
Petrolite Corp., St. Louis, Mo. Tretolite Div.
R. J. Churchill, and R. L. Rybacki.
Water and Sewage Works, Reference Issue, p 10-12, 14-17, 20, April, 1977. 8 fig, 2 tab, 5 ref.

Descriptors: *Polymers, *Water quality, Performance, *Treatment facilities, Sludge treatment, Biochemical oxygen demand, Suspended solids, Dewatering, Coagulation, Flocculation, Activated sludge, Filters, *Waste water treatment.

Polymers are added to waste water treatment processes to improve performance and effluent quality. They have been used to balance intermittent fluctuations of influent characteristics. Polymers function as the primary chemical conditioning agent or as an aid to the primary conditioner. They are commonly applied for sludge conditioning in elutriation, thickening, and dewatering; enhancement of alum coagulation/flocculation; and improvement of alum, ferric, or calcium precipitation of phosphorus in waste water. Their use does not create additional sludge and they may be reused at several points in the treatment system. Solids control can be obtained in primary and secondary clarification, and in activated sludge system bulking can be reduced. As a pretreatment additive, polymers can substantially decrease BOD load on the biological system through increased BOD and suspended solids removal. Polymer addition can increase the solids retention capacity of filters. Sludge settling rates and the underflow sludge concentration are also increased by polymer addition. Case studies were conducted to evaluate the benefits and limits of polymer addition. It was concluded that polymer addition could enhance treatment performance by smoothing temporary imbalances. It should not be considered the answer to all performance problems. (Collins-FIRL)
W77-09878

CONCURRENT WASTE WATER RENOVATION AND SOLID WASTE COMPOSTING,
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
G. R. Lightsey, A. L. Hines, and R. W. Henderson.
Compost Science, Vol 18, No 2, p 14-16, March/April, 1977. 2 fig, 2 tab, 10 ref.

Descriptors: *Water reuse, *Waste disposal, Biochemical oxygen demand, Chemical oxygen demand, Heavy metals, Nitrogen, Ion exchange, Ultimate disposal, Phosphorus, Trickling filters, Waste water treatment.
Identifiers: *Composting(Solid wastes).

A study was conducted to determine the effectiveness of using bark in a trickling filter medium to reduce BOD and COD in waste water before its land disposal. Bark used in trickling filters for this purpose is converted into a useful nitrogen enriched compost. Raw bark and composted bark, minus nitrogen, were evaluated. A waste water with high BOD and COD concentrations, and one with heavy metal concentrations similar to that in municipal waste water, were tested. Raw bark achieved constant BOD removals of 60-70% and COD removals of 35-40%. Composted bark

produced much lower removal percentages. The small particle size of composted bark was the apparent reason for its poor performance. Composted bark absorbed more than 40% of heavy metal ions and raw bark removed nearly 13%. More than 75% of copper, cadmium and nickel was removed from the waste water by composted bark. Raw bark nitrogen concentrations increased from 0.28% to 0.9%. Trickling filters with raw bark media were judged to be potentially low cost means of pretreating waste water for land disposal. Further study should determine the optimum method for concurrent waste water pretreatment and conversion of solid wastes into useful compost. Maximizing the ion-exchange and adsorptive capacities of organic solid wastes by composting should also be investigated. (Collins-FIRL)
W77-09879

INACTIVATION BY IONIZING RADIATION OF SALMONELLA ENTERITIDIS SEROTYPE MONTEVIDEO GROWN IN COMPOSTED SEWAGE SLUDGE,
Sandia Labs., Albuquerque, N. Mex.
J. R. Brandon, W. D. Burge, and N. K. Enkiri.
Applied and Environmental Microbiology, Vol. 33, No. 4, p 1011-1012, April, 1977. 1 fig, 3 ref.

Descriptors: *Ionization, *Irradiation, *Pathogenic bacteria, *Salmonella, Sludge treatment, Disinfection, Waste water treatment, Economics, Performance, Evaluation.
Identifiers: *Composted sludge.

Ionizing radiation was evaluated as a polishing process to eliminate viruses, parasite ova, and pathogenic bacteria from composted sludge. Salmonella enteritidis ser. montevideo were inoculated into sterile composted sewage sludge to produce a count greater than 1,000,000,000/gram. A dosage rate of 15 krads/minute was used to irradiate the material to various levels. This material was then blended in physiological saline at a saline/sludge ratio of 4:1. The absorbed dosage needed per 90% reduction in population was found to be about 30 krads. The resistance of bacteria in the drier material, while expected to be greater, was about the same as that in liquid sludge treatments. This treatment should be very effective since a dose of 1 to 2 M rads would be used. (Collins-FIRL)
W77-09880

CHARACTER AND DEWATERING PROPERTIES OF SLUDGES FROM WATER TREATMENT,
Missouri Univ.-Columbia.
J. T. Novak.
AIChE Symposium Series, Vol. 73, No. 162, p 62-73, 1977. 15 fig, 3 tab, 13 ref.

Descriptors: *Dewatering, *Coagulation, *Filtration, Metals, Ions, Physical properties, Magnesium, Calcium, Sludge treatment disposal, Equipment, Treatment facilities, *Waste water treatment.
Identifiers: Specific resistance.

Sludges from various Missouri treatment plants were analyzed to determine their character and dewatering properties. Two types of sludges were found to be dominant - coagulant sludges and softening sludges. Sludge characteristics would determine the best process for improving dewaterability or reducing sludge volumes. The parameters used for sludge characterization were the rate of dewatering and the solids content of dewatered slurry. Dewaterability was determined by specific resistance measurements. Sludges containing substantial $CaCO_3$ filtered readily and those with no softening residues had greater resistances. Sludges from plants that combined softening and coagulation in a single basin filtered better than pure coagulant sludges. Increased magnesium content increased specific resistance slightly. Coagulant metal cation levels greatly influenced specific resistance. Dewatering was found to depend upon the coagulant metal ion used, the calcium/magnesium ration of the sludge, and the 'purity' of the coagulant in the sludge. Increased magnesium levels decrease the capacity for obtaining high solids concentration levels. No pattern was found for sludge compressibility data. Four dewatering processes were evaluated. These included sand bed draining, centrifugation gravity thickening, lagooning, and vacuum filtering. A handleable sludge was produced by vacuum filtering, but the other methods dewatered sludges to a highly viscous sludge that could not be handled by conventional earth moving equipment. The study parameters were quite adequate for the prediction of process performance. A final choice of dewatering method should depend upon the sludge type, landfill location, available land, and equipment. (Collins-FIRL)
W77-09881

LAND APPLICATION OF MUNICIPAL SLUDGE,
New Jersey Inst. of Tech., Newark.
For primary bibliographic entry see Field 5E.
W77-09882

PHOTODYNAMIC INACTIVATION OF INFECTIOUS AGENTS,
FMC Corp., Santa Clara, Calif. Environmental Engineering Lab.
M. F. Hobbs, C. P. Gerba, C. Wallis, J. L. Melnick, and J. S. Lennon.
Journal of the Environmental Engineering Division-ASCE, Vol. 103, No. EE3, p 459-472, June, 1977. 9 fig, 3 tab, 13 ref.

Descriptors: *Disinfection, *Irradiation, *Viruses, *Dyes, *Hydrogen ion concentration, Sewage effluents, Water purification, Equipment, Treatment facilities, Evaluation, Performance, Costs, *Waste water treatment.
Identifiers: Methylene blue.

Investigations were conducted to develop operating parameters and equipment for the disinfection of sewage effluents by continuous photodynamic inactivation. Tests were performed with clarified tap water and secondary sewage effluents which were inoculated with poliovirus. The parameters evaluated were a pH of 10 and methylene blue, a photoreactive dye. Technical grade methylene blue was added to produce a concentration of 1 to 5 mg/liter methylene blue. A plug flow cell and a flow-through cell operated in an upflow mode were used. Brief plug flow tests indicated effective photoinactivation in tap water at pH 10 with 5 mg/liter of methylene blue. Sewage effluent was treated with 2 mg/liter of methylene blue, at 22C, with a 5 hour holding period. Results showed that treatment was effective, but the rate was about 50% of that achieved with clarified tap water. It was found that sewage effluents could be treated by high intensity lamps in direct contact with water to increase the inactivation rate. Inactivation rates were sensitive to heat and subsequent irradiation during sensitization. It was also proved that 1-2 mg/liter of dye was as effective as 5 mg/liter of dye. The increased rate and lower dye requirements could provide cost savings when considered as a unit process for waste water treatment. It was suggested that the process could easily be incorporated into physical-chemical treatment plants. It was also suggested for secondary treatment plants where tertiary treatment for nutrient and carbon removals was used. Water treatment plants using lime-softening would also benefit from this process. Chlorination and ozonation have lower capital costs. The facility's size would be about that of a tertiary plant for phosphorus and added carbon removal. (Collins-FIRL)
W77-09883

METHOD FOR THE DETERMINATION OF THE CONDITIONABILITY OF SEWAGE SLUDGE (ERARBEITUNG VON METHODEN ZUR ERMITTLUNG DER KONDITIONIERBARKEIT VON KLAERSCHLAEMMEN),
R. Leschber, and W. Niemitz.
Vom Wasser, Vol. 47, p 187-207, 1977. 9 fig, 3 tab, 10 ref.

Descriptors: *Sludge treatment, *Analytical techniques, Particle size, Flocculation, Capillary action, Filtration, Physical properties, Chemical properties, Dewatering, Municipal wastes, *Waste water treatment.

A method for the determination of sludge amenability to conditioning processes was developed. The method was based on measurement of capillary suction time (CST) of sludge after the addition of water and two standard flocculants, $FeCl_3$ and Praestol 444K, in three dosages. Measurement was made after addition and specified periods of stirring in a standard device. Specific resistance to filtration of sludge samples treated is measured at reduced atmospheric pressure. Standard dosages for treatment were 10, 5, and 2.5% $FeCl_3$ and 0.5, 0.25, and 0.125% praestol, as measured against the dry sludge residue. The resultant determinations are most useful in creating a more efficient sludge treatment process, especially for thickening and dewatering. (Collins-FIRL)
W77-09884

MIXER CUTS SOLIDS UP AND TIME DOWN FOR WASTE TREATMENT.
Process Engineering, p 79, March, 1977.

Descriptors: *Sewage effluents, *Mixing, *Aeration, Equipment, Industrial water, Domestic water, Solid wastes, Pumps, Pumping plants, Biochemical oxygen demand, Costs, *Waste water treatment.

A mixer-disintegrator has been developed which could be applied to the improvement of effluent treatment. One application involved comminution. Industrial and domestic effluent debris, such as rags, rubber, and plastics, could be reduced to particles small enough to be pumped with the effluent. Such a mixer was used in a South African pumping station to reduce reeds growing in a channel from a nearby dam to the pumping station outlet. The same device was used in England to improve the homogeneity of a sampling stations's samples. It was also applied in the aeration process for BOD reduction. Air introduced into a disintegrating head at a low level in the liqud is finely homogenized and dispersed through the container. This increases air surface area and, presumably, oxygen transfer. Contact time is also increased. The strong action of the head prevents clogging with activated sludge or other solids. Oxygen transfer levels of up to 30% are possible with this mechanism. (Collins-FIRL)
W77-09885

NEW WASTEWATER TREATMENT SYSTEMS.
Modern Power and Engineering, Vol 71, No 3, p 34-35, March, 1977.

Descriptors: *Treatment facilities, *Filters, Pumps, Chlorination, Sludge treatment, Municipal wastes, Industrial wastes, Costs, Design, *Waste water treatment.

New waste water treatment systems are being developed for effluent pollution reduction. A plant using high rate direct filtration is now operating in Ontario and serves a population of 100,000 with expansion provisions for 165,000. The plant cost was $15.8 million and expansion will add another $12.7 million. A river intake pipe provides a 40 mgd inflow which passes through a filtration and collection system at 5 gpm/square foot. Two systems, a mixed media and a dual media filter system, are used for comparison of plant opera-

tion and the development of information for future expansion. Six high-lift pumps with a 64 mgd capacity offset limited storage capacity. Elsewhere in Ontario, a 50 mgd filtration plant is being constructed with plant, reservoir and pumping station entirely underground. The cost of the $20 million project was raised by $1 million by the underground construction. Liquid chlorine will be used as disinfectant instead of chlorine gas. The system will utilize a 5,000 foot underground water intake pipe and sophisticated control devices. Future plans include remote operation of the plant from a filtration plant five miles away. A holding tank will allow treatment of backwash wastes and sludge will be discharged into sanitary sewers for treatment. Other innovative projects for industrial waste treatment and water recycling were surveyed. (Collins-FIRL)
W77-09886

A NEW RAPID DIGESTION PROCESS FOR SEWAGE SLUDGE UTILIZATION (EINNEUES SCHNELLROTTE-VERFAHREN ALS BEITRAG ZUR WEITERGEHENDEN KLAERSCHLAMM-VERWERTUNG),
P. Widmer, and H. G. Konstandt.
Gas-Wasser-Abwasser, Vol. 57, No. 3, p 297-303, March, 1977. 5 fig, 5 ref.

Descriptors: *Sludge digestion, *Sludge disposal, *Fertilizers, Pathogens, Nutrients, Safety, Odor, Sludge treatment, Nitrogen, Carbon, Temperature, *Waste water treatment.

A rapid sludge digestion process to prepare sludge for use in agricultural applications was described. Any such process should inactivate pathogenic and parasitic germs; preserve important plant nutrients, such as nitrogen and phosphorus; produce dry matter (less than 20% water) for storage purposes; and prevent unpleasant odors. The Fermentechnik/Roediger quick-rotting process fulfills these requirements. The nitrogen/carbon ratio of the product was evaluated and a flow sheet of individual process phases was provided. Cost estimates were given for a plant which would serve a population of 13,500 people. (Collins-FIRL)
W77-09887

STUDY OF THE DECOMPOSITION OF ORGANIC MATTER BY THE RESPIROMETRIC DILUTION METHOD (UNTERSUCHUNGEN UEBER DAS ABBAUVERHALTEN ORGANISCHER STOFFE MIT HILFE DER RESPIROMETRISCHEN VERDUENNUNGSMETHODE),
R. Wagner.
Vom Wasser, Vol 47, p 241-265, 1977. 12 fig, 2 tab, 29 ref.

Descriptors: *Biodegradation, *Kinetics, *Organic matter, Analytical techniques, Domestic wastes, Nutrients, Evaluation, Chemical properties, *Sewage treatment, *Waste water treatment.

The decomposition of organic matter sewage was investigated with emphasis on biodegradation kinetics by the respirometric dilution method. This method used a nutritious matrix which contained great amounts of organic substances to compete as nutrients with the test substrate. A linear relationship was found between the reaction velocity constant logarithm and the time shift constant when adaptation by selection was not necessary. This indicated that biodegradation of individual compounds proceeded proportionately faster as degradation was delayed. A preferential sequence of chemical substances was found in the biodegradation of the nutrient matrix. Among tested substances, n-propanol was first and methanol was last in this sequence. Proper test substances would make possible quality checks for any nutrient matrix used in biodegradation studies. (Collins-FIRL)
W77-09888

PURIFICATION PLANT PROJECT,
ASEA Electric (Australia) Pty Ltd., Lilydale.
G. Bainbridge.
ASEA Journal, Vol 49, No 6, p 141-142, 1976. 5 fig.

Descriptors: *Treatment facilities, Water purification, Filtration, Pumping plants, Separation, Sedimentation, Aeration, Biological treatment, Electrical equipment, *Waste water treatment.
Identifiers: Melbourne(Australia).

The largest and most modern Australian sewage treatment plant, serving the Melbourne area, recently became operational. Its design capacity is 291,000 cubic meters/day and a similar-capacity second stage will be needed in the early 1980's. A 32-kilometer gravity main trunk sewer, interceptor sewers, a purification plant, and a 56-kilometer outfall compose the treatment system. Activated sludge purification processes are used at the purification plant. Effluent is filtered for large objects by mechanically cleaned screens; pumped to other similar screens for textile and similar waste material removal; and subjected to grit removal, pre-aeration, sedimentation, aeration, digestion, biological treatment, and secondary sedimentation. Supply and distribution of electrical energy are handled by a power distribution plant and low-voltage switchgear. Eight unit substations are provided for power reticulation, including 415 V equipment and 6.6 kV/415 V dry type power tranformers and associated isolating switches. The plant's equipment is of a standardized design, supplied in modular form for construction to minimize future modifications or extensions. All portions of the facility were constructed to strict specifications. (Collins-FIRL)
W77-09889

ADVANCE SEWER PLANNING FOR RIO DE JANEIRO COASTLINE,
ENCIBRA South America, Rio de Janeiro (Brazil).
R. G. Ludwig, and S. A. S. Almeida.
Water and Sewage Works, Vol. 124, No. 4, p 70-72, April, 1977. 3 fig, 3 tab, 4 ref.

Descriptors: *Planning, *Sewers, *Treatment facilities, *Outfalls, Design criteria, Economics, Analysis, Waste disposal, Sewage treatment, Waste water treatment.
Identifiers: Rio de Janeiro(Brazil).

Rapid development along the Rio de Janeiro coastline created a need for a comprehensive sewage treatment plan. The 15,000 hectare area has 20 kilometers of beach front on the Atlantic Ocean and a network of lagoons. Variations in tides, ocean currents, density structure, and coliform disappearance rates were studied to evaluate ocean disposal alternatives. Water and sediment quality, as well as profiles and seabed soundings, were evaluated to assist predesign and cost estimations. Seasonal variation of ocean currents was a major area of concern. Lagoon disposal was considered, but the difficulty of controlling eutrophication by nutrient removal and of maintaining a high degree of effluent quality made this alternative doubtful. Comparison showed that ocean disposal after treatment was more feasible. Two sewerage schemes were proposed: concentration of regional sewage at a single disposal point, and independent systems at the eastern and western poles of the area. The second was more economical in sewer costs, but the necessary treatment facilities would be more costly; collection and single-site disposal seemed most effective. Proper diffuser design and dilution values of 150 to 1 can produce waste concentrations less than those required for protection of the ocean environment. This and a diffuser with small ports for field submergence, aided by water currents, can produce diffusion of wastes along an extended ocean area. Interim treatment, collection, and trunk sewer systems were proposed for areas which are developing more rapidly. (Collins-FIRL)
W77-09890

CHEMICAL TREATMENT OF SEWAGE,
Military Engineering Services, Chandigarh (India).
U. C. Thakur, S. M. Dhabadgaonkar, and W. M. Deshpande.
Indian Journal of Environmental Health, Vol. 19, No. 1, p 16-29, January, 1977. 10 fig, 1 tab, 14 ref.

Descriptors: *Water purification, Chemical oxygen demand, *Sewage treatment, Coagulation, Analysis, *Lime, Sludge, Treatment facilities, *Waste water treatment.
Identifiers: *Alum, *Chemical treatment(Sewage).

A report was presented on the reduction of raw sewage COD by alum, ferric chloride, ferrous sulfate, and lime. Chemical treatment is an important part of advanced treatment systems used to produce highly purified effluents. COD was chosen as the parameter for measurement of pollution strength reduction because the test sewage contained industrial wastes and refractory compounds with non-biodegradable substances. Samples were analyzed for pH, temperature, and alkalinity and a portion was fixed with sulfuric acid to measure raw sewage COD. All coagulants were added in dosages of 0, 30, 60 and 90 mg/liter, except lime which was added to increase pH to 11.0. Results indicated an optimum alum dosage of 60 mg/liter for COD removals of 52-62%. Ferric chloride and ferrous sulfate optimum dosages were 30 mg/liter for COD removals of 60-70%. It was found that COD reductions for the coagulants above COD reductions without coagulation were 25-35% for 30 mg/liter of ferric chloride and ferrous sulfate. There was no significant COD removal above '0' dosage for alum up to 30 mg/liter; increasing dosages from 60-90 mg/liter produced no substantial benefits. Observations indicated that, at all dosages, there was an increase in percentage removal of COD with increased raw sewage COD up to 700 -800 mg/liter. Lime at pH 11 caused a 78-88% COD reduction in raw sewage. The addition of alum to lime treatment increased COD reduction by 4-5% and improved effluent clarity. Without coagulants, raw sewage COD reductions varied from 35-55%. Alum was considered most suitable when sludge volume production was a major consideration. The ratio of sludge volume was highest when lime coagulation was used. (Collins-FIRL)
W77-09892

WASTEWATER MICROBIOLOGY,
Texas A and M Univ., College Station. Dept. of Biology.
Annual Review of Microbiology, Vol. 30, p 263-277, 1976. 238 ref.

Descriptors: *Microbiology, *Microorganisms, *Yeasts, *Waste water treatment, Industrial wastes, Bacteria, Biochemical oxygen demand, Temperature, Nutrients, Nitrogen, Methane, Gases, Biological treatment, Chemical wastes, Pulp wastes, Algae, Anaerobic conditions, Aerobic treatment, Tertiary treatment, Treatment facilities, Water purification, *Reviews.

Microbiological aspects of waste water composition and treatment are reviewed. Taxonomic classification of bacteria and yeasts present in waste water remains problematic. Little is known about the effect of environmental conditions and mixed nutrients on substrate utilization, or about possible interactions among microorganisms. Considerable advances have been made in the use of microorganisms for reducing BOD and nitrogen content of waters. Microbial waste water treatment mineralizes organic matter, lowering BOD; removes minerals by removing cells growing on wastes; and inactivates pathogenic bacteria, yeasts, and viruses. In activated sludge treatment, it is believed that the zoogloea matrix or floc is produced by the bacterium Zoogloea ramigera Itz. There is also the possibility that the taxon does not exist or that the floc is produced by conventional bacteria. A zoogloeal mass is desired since it settles out and allows discharge of clarified supernatant with

lowered BOD. Conventional bacteria are undesirable because they deter settling. High concentrations of flagellates reflect overloading of the system. Yeasts and molds are present, but play a minimal role in BOD reduction; however, fungi play a major role in the trickling filter. In addition, bacteria and algae are abundant in the trickling filter treatment. Algal growth in aerobic lagoons favors BOD removal during the day due to oxygen production, but inhibits BOD removal at night due to oxygen consumption. In anaerobic treatment systems, methane is produced from microbial activity and algae and photosynthetic bacteria are often present. The protozoa present are not useful in reducing BOD. Fungi and yeasts which may metabolize certain substrates are also in evidence. (Collins-FIRL)
W77-09893

EXPERIENCES WITH THE ORGANIC CARBON ANALYZER (TOC) BY MERZ FOR ROUTINE MONITORING AT THE BASF PURIFICATION PLANT (ERFAHRUNGEN MIT DEM TOC-SCHNELLBESTIMMER NACH MERZ IN DER ROUTINEUEBERWACHUNG DER BASF),
For primary bibliographic entry see Field 5A.
W77-09894

EFFLUENT TREATMENT VERSUS DISPOSAL THROUGH LONG SEA OUTFALLS,
Watson (J. D. and D. M.), High Wycombe (England).
For primary bibliographic entry see Field 5E.
W77-09895

FERMENTATION TECHNOLOGY,
Pennsylvania Univ., Philadelphia. Coll. of Engineering and Applied Science.
A. E. Humphrey.
Chemical Engineering Progress, Vol 73, No. 5, p 85-91, May, 1977. 15 fig, 18 ref.

Descriptors: *Fermentation, *Waste treatment, Sludge treatment, Activated sludge, Sedimentation, Physical properties, Anaerobic conditions, Biomass, Biochemical oxygen demand, Denitrification, Phosphates, *Waste water treatment, Gases, Foods, Energy.

The incorporation of fermentation into waste water treatment processes was considered among several applications of fermentation technology. These processes have been found to be important in the activated sludge treatment. Research during the development of the UNOX system showed that BOD could be controlled by the food/biomass ratio. It was noted that a sludge with much better settling characteristics could be produced. Waste water denitrification could be achieved with a one-pass system rather than the usual two-step system. Placing the anaerobic stage first, followed by an aerobic treatment, produced a high internal recycle system that required no carbonaceous energy source. Influent BOD drove the reaction and the process had a lower oxygen demand than a conventional activated sludge system. A system which involved the removal of phosphate in a polymeric form such as polymetaphosphate was recently investigated. It was shown that this form could perform as a phosphagen analogous to the energy transfer compound, creatine phosphate. The perfection of this system could avoid the banning of phosphate detergents. The production of methane gas was investigated as an energy source. Fermentation as a means of generating food and feed from raw material sources was also studied. (Collins-FIRL)
W77-09896

IDENTIFICATION OF THE VIRUCIDAL AGENT IN WASTE WATER SLUDGE,
Sandia Labs., Albuquerque, N. Mex.
For primary bibliographic entry see Field 5A.
W77-09897

LACEY, OLYMPIA, TUMWATER, AND THURSTON COUNTY WASTEWATER TREATMENT,
A. L. Kimbel.
Consulting Engineer, Vol. 48, No. 5, p 79, May, 1977.

Descriptors: *Treatment facilities, *Sewers, Water purification, Infiltration, Organic matter, Water quality control, Storm water, Costs, Flow, Planning, Water resources development, *Waste water treatment.

A study was conducted to develop cost effective waste water collection, treatment, and disposal processes for a complex treatment facility in Olympia, Washington. The objective was to upgrade receiving water to a state fit for water recreation and shellfish harvesting. The study had to provide a treatment program for a combined population of 50,000 and a brewery which produced major organic discharges. Water quality analysis, planning criteria development, environmental evaluation, treatment and disposal alternatives, and institutional and financial considerations were involved. The poor quality of the receiving waters was due to primary treatment, insufficient system capacity, and high inflow-infiltration in the collection system. This resulted in frequent and substantial overflows of untreated storm water and raw sewage mixtures into the inlet. Final recommendation was for a unified, upgraded, and enlarged treatment facility at the present primary treatment plant. This facility, with an improved and repaired collection system, would be sufficient. Equalization basins would store peak storm flow from all sources. Pure oxygen and ozone would be used to decompose organics and destroy bacteria and viruses. This plan would reduce treatment scale and plant site site, while eliminating the costs and problems of chlorine usage. (Collins-FIRL)
W77-09898

MICROFLOTATION IN EFFLUENT PURIFICATION (MIKROFLOTATION IN DER ABWASSERAUFBEREITUNG),
B. Dobias.
Vom Wasser, Vol 47, p 210-217, 1977. 4 fig, 1 tab, 20 ref.

Descriptors: *Flotation, *Water purification, Separation techniques, Suspended solids, Particle size, Treatment facilities, Urban areas, Municipal wastes, *Waste water treatment.
Identifiers: Stockholm(Sweden), *Microflotation(Waste water).

The theory and technology of microflotation in waste water treatment were reviewed. The foam separation method was found to remove finely dispersed particles from water or aqueous solutions. A summary of Stockholm's utilization of the flotation cell for waste water treatment was presented. (Collins-FIRL)
W77-09899

THE HANDLING OF NITROGENOUS WASTES IN RURAL INDIA,
Andhra Univ., Waltair (India). Dept. of Environmental Engineering.
T. S. Rao.
Ambio, Vol 6, No 2-3, p 134-136, 1977. 1 fig, 1 tab, 13 ref.

Descriptors: *Nitrogen compounds, *Oxidation lagoons, *Water tables, *Waste disposal, Sewers, Drainage, Nutrients, Fertilizers, Methane, Gases, Soil types, *Waste water treatment, Rural areas.
Identifiers: *India.

The disposal of nitrogenous wastes in rural India was discussed. Human, agricultural, and animal wastes can be recycled so that their nitrogenous contents may be applied for useful purposes. Domestic human waste disposal systems were proposed depending upon depth of ground water tables. High groundwater areas allow the use of flushing toilets and public latrines. Wastes can be transported to oxidation lagoons via sewers and lined, open surface drains. Stabilized effluent may be discharged to waterways, used to recharge groundwater, or to fertilize crops. Treated effluent may also be pumped to a reservoir to provide ntrients for algal growth and increased fish production. Areas with low water tables could utilize less expensive disposal alternatives such as bore-hole latrines with or without water seal, pit-latrines, or leaching cesspools with earthen rings or bamboo-matting for lining. Aqua privies with reverse filters, septic tanks with soakage pits, or dispersion trenches could be used in hard and rocky areas with low water tables. The latter could be used in community bio-gas plants to produce methane gas for cooking and lighting. The sludge from this method has a high nitrogen content and could be used for composting. In sandy soils, latrines and cesspools must be well above the water table to avoid contamination. Drainage well above flood level was suggested. costs for treatment plants were estimated to be about five times greater than that of oxidation ponds. (Collins-FIRL)
W77-09900

EFFECT OF SORBED ORGANICS ON THE EFFICIENCY OF AMMONIA REMOVAL BY CHLORAMINE-CARBON SURFACE REACTIONS,
Westvaco Corp., North Charleston, S. C. Charleston Research Center.
A. B. Scaramelli, and F. A. DiGiano.
Journal Water Pollution Control Federation, Vol 49, No 4, p 693-705, April, 1977. 14 fig, 4 tab, 15 ref.

Descriptors: *Chemical reactions, *Organic matter, *Activated carbon, *Ammonia, Kinetics, Separation techniques, Adsorption, Nitrogen, Organic compounds, *Waste water treatment, Design, Hydrogen ion concentration.

There are several limitations in existing physical-chemical methods for removing ammonia from waste water. A process was developed to remove nitrogen which used chlorination followed by activated carbon contact. The stoichiometry and kinetics of mono- and dichloramine-carbon reactions were investigated to opimize the process design of this removal method. The interaction of organic adsorption and chloramine-carbon reactions was also studied. Chlorine and ammonia were mixed and the chloramine-containing solution was passed upward through a carbon column. The rate of the monochloramine-carbon reaction was of the first order. The rate decreased with increased reactor operating time up to 140 hours. Methylene blue and alum-clarified waste water reduced the mono-chloramine rate constant to lower steady-state values. Alkylbenzenesulfonate produced a lesser rate reduction. there was no reduction with dinitrophenol. Organics also reduced the rate of nitrogen gas production. The presence of monochloramine in the column influent reduced the organic adsorption capacity of the carbon. Both mono- and dichloramine were converted to nitrogen gas by surface reactions. Dichloramine showed a near 100% conversion to nitrogen gas. Decreases in conversion with continued operation suggested carbon surface poisoning due to surface oxide buildup. Pore diffusion rather than surface reaction controlled the dichloramine conversion rate. Several process alternatives were suggested for handling the problematic elements of this method. (Collins-FIRL)
W77-09902

COMPUTER APPLICATION IN WATER AND WASTE WATER MANAGEMENT: A PANEL DISCUSSION,
Houston Univ., Tex. Dept. of Civil Engineering.
J. F. Andrews, J. Radziul, H. D. Gilman, H. D. Gilman, and H. J. Graeser.

American Water Works Association Journal, Vol 69, No 5, p 246-255, May, 1977. 4 fig.

Descriptors: *Water management, *Automatic control, *Computers, Design, *Automation, *Waste water treatment, Personnel, Operations, *Treatment facilities, Water quality control, Economics.

A panel discussion was conducted on the application of computers in water and waste water management. The participants represented groups responsible for design engineering, installation, and computer use. Facilities in Philadelphia, Pennsylvania, and in Dallas, Texas, were described as examples of the usefulness of computers. The justifications for computer usage were the improvement of effluent wate quality to meet new standards, the facilitation of data collection and subsequent evaluation of treatment processes, and cost savings. The use of automated pumping could produce a $1420/month savings in one Philadelphia district. Experience in Dallas suggested that development of computer operations should be progressive, well-planned, and held within reasonable expectations of performance. An operations system was suggested, as well as an information system at the management level. Feasibility studies should be conducted prior to the implementation of a computer program. In evaluating automated systems, it should be noted that the cost of software is rising, while hardware costs have been falling about 30% each year. Both remote and in-plant instrumentation are considered necessary, and more reliable sensors must be developed. (Collins-FIRL)
W77-09903

AERATION: PROPER SIZING IS CRITICAL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
J. H. Sherrard.
Water and Wastes Engineering, Vol. 14, No. 4, p 62, 66-67, 71, April, 1977. 4 fig, 4 tab, 6 ref.

Descriptors: *Aeration, *Treatment facilities, *Design, Performance, Activated sludge, Mechanical equipment, Oxygen, Temperature, Microorganisms, Operations, Biochemical oxygen demand, Nitrogen, Nitrification, *Waste water treatment.
Identifiers: Mechanical aerators.

The selection of low speed mechanical aerators was considered. Any aeration method must produce enough mixing to maintain activated sludge floc in suspension and supply sufficient oxygen transfer to meet the demands of microbial growth. Equations were provided to help judge a given aerator's performance. Mechanical aerators must meet two standards: power, and sufficient oxygen for microbial metabolism. The first depends upon the type of aerator and the geometry of the basin. The latter involves oxygen for organic removal and nitrification, and depends on plant operation and the BOD5/org-N + NH(+4) - N ratio. Biokinetic coefficients should be established to make quality and oxygen needs predictable as a function of treatment process operating conditions. Several examples of typical solutions were presented. It was concluded that the use of a ratio of 1 mg/liter of oxygen to 1 mg/liter of BOD5 could be misleading and result in a faulty selection. Nitrogenous oxygen demand from nitrification should be used for aerator selection if higher mean cell residence time values are used. Oxygen transfer requirements can be met in some instances by lowering process mean cell residence time to decrease oxygen needs. (Collins-FIRL)
W77-09905

ANALYSIS OF ECONOMIC SEWAGE LIFT STATION DESIGN,
Stanley Associates Engineering, Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 8C.
W77-09906

CHANGES IN INORGANIC NITROGENOUS COMPOUNDS FROM SEPTIC TANK EFFLUENT IN A SOIL WITH A FLUCTUATING WATER TABLE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-09907

ZETA POTENTIAL MEASUREMENT,
For primary bibliographic entry see Field 5A.
W77-09908

ATOMIC ABSORPTION IN WATER AND WASTE WATER ANALYSIS,
Perkin-Elmer Corp., Lombard, Ill.
For primary bibliographic entry see Field 5A.
W77-09909

GRAVITY THICKENING OF WATER-TREATMENT-PLANT SLUDGES,
Dorr-Oliver, Inc., Stamford, Conn.
P. Kos.
American Water Works Association Journal, Vol. 69, No. 5, p 272-282, May, 1977. 10 fig, 30 ref, 2 append.

Descriptors: *Sludge treatment, *Model studies, *Flocculation, Pressure, Physical properties, Suspended solids, Loads(Forces), Treatment facilities, Performance, Design, Evaluation, *Waste water treatment.
Identifiers: *Gravity thickening, Water treatment wastes.

Conclusions from previous studies of gravity thickening prefaced this report of a study on sludge behavior during steady-state continuous thickening. Steady state conditions were established, and contraction and pressure distribution measurements were made relative to thickening zone depth. Equations were developed to analyze solids-handling capacity and the movement of planes of constant concentration in the thickening of nonflocculant suspensions. The major difference between these and flocculant suspensions is that larger concentrations of the latter occur in channeling and compression processes which do not occur in nonflocculant suspensions. The developed channeling and compression study methods were too simple for the complete description of continuous gravity thickening. A model of flocculant porous medium was constructed to describe water treatment plant sludges during gravity thickening. The mathematical description of flocculant porous medium was based on intrinsic conductivity, or the filtration characteristic of sludge, and the modulus of linear compressibility, which is its consolidation characteristic. Equations for determining the effective pressure changes with time were used to describe the batch and unsteady continuous thickening processes. The coefficient of linear compressibility was revealed to be a function of the suspended solids concentration. Filtration characteristics were dependent upon flocculant porous medium flow conditions, in addition to being concentration dependent. Channeling was described as a non-Darcian flow. A computer simulation of steady-state continuous gravity thickening was used to establish design parameters. (Collins-FIRL)
W77-09912

BOD5 REMOVAL FROM AERATED LAGOON SYSTEMS,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
L. G. Rich, and S. C. White.
Water and Sewage Works, Reference Issue, p 21-23, April, 1977. 6 fig, 7 ref.

Descriptors: *Oxidation lagoons, *Biochemical oxygen demand, Suspended solids, *Aeration, Dissolved oxygen, Treatment facilities, Algae, Model studies, Flow rates, Hydraulic properties, *Waste water treatment, *Aerated lagoons.
Identifiers: *BOD removal.

Design and operation criteria were suggested for BOD removal in aerated lagoon systems. A four-cell, dual-power system could achieve effluent quality with a lower retention time than a two-cell, dual-power level system. Lagoons presently used are of two types. Completely suspended lagoons maintain all setteable solids in suspension. Partially suspended systems hold only a portion of setteable solids in suspension. Power levels depend upon lagoon geometry and size, as well as the type of aerator involved. A completely suspended cell followed by a partially suspended cell uses less lagoon volume to attain a desired soluble BOD5 effluent concentration than either type used individually. Various equations were used to determine total retention times for both systems. An infinite retention time was calculated for both systems, but the four-cell system produced shorter retention times. This system would not produce any significant algal growth with retention times under 2 or 3 days. Algal growth at any retention time would be greatly reduced by the system. It was found that the system showed greatest enhancement when the cell number was increased from one to three. Multicellular construction resulted in much smaller cells. Flow variations could create some system instability. The dynamic behavior of the two systems was studied, at various flows, with the aid of a modeling program. The four-cell system was slightly more sensitive to flow variations, but recovery time could be twice as long. This system's surface-overflow rate in the last cell would help to maintain a stability in its effluent suspended solids. Results of the model study and laboratory studies produced several design criteria which related settling characteristics of biomass solids, hydraulic retention times, and flow rates to BOD removal. (Collins-FIRL)
W77-09913

THE IDENTIFICATION AND ADAPTIVE PREDICTION OF URBAN SEWER FLOWS,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 5B.
W77-09914

REMOVAL OF NUTRIENTS FROM TREATED MUNICIPAL WASTE WATER BY WETLAND VEGETATION,
Water and Wastewater Technical School, Neosho, Mo.
F. L. Boyt, S. E. Bayley, and J. Zoltek, Jr.
Journal Water Pollution Control Federation, Vol. 49, No. 5, p 789-799, May, 1977. 9 fig, 7 tab, 17 ref, 2 append.

Descriptors: *Nutrients, *Municipal wastes, *Filtration, *Vegetation, *Wetlands, Water quality, Bacteria, Sediments, Hydrologic aspects, Economics, Waste disposal, *Waste water treatment.

A study was conducted, in Florida, to determine the ability of wetland vegetation to remove nutrients from treated municipal waste water. Effluent from a 0.25 mgd secondary treatment trickling filter plant was discharged into a mixed hardwood swamp. Poor plant operation has produced only primarily treated effluent for the past few years. The study involved monthly water chemistry sampling, coliform and fecal streptococci sampling, sediment analysis, and recording of tree growth data. Hydrologic data were used to develop a nutrient budget. Study results revealed 98.1% total phosphorus reductions and 89.5% total nitrogen reductions. Heavy metal concentrations were low due to the absence of industrial wastes; the amounts of lead were 0.03 mg/liter, and of copper, 0.02 mg/liter. Dissolved oxygen in the experimental swamp averaged 2.8 mg/liter in a range of 0.3-6.3 mg/liter. The control swamp averaged

2.4 mg/liter in a range of 2.0-4.0 mg/liter. Sediments were normally anoxic. Anoxic conditions were best for nutrient uptake by plants. The sediment nutrient levels were similar in both experimental and control swamps. A layer of clay in the sediment prevented exchange between waste water-containing surface water and groundwater. The dominant soil allowed little filtration, and groundwater recharge was slight. The fecal coliform count in the control area was 200 per 100 millimeters, which was above national potable and recreational water standards. The fecal coliform/fecal streptococci ratio was less than 1, suggesting that high fecal bacterial counts were of livestock origin. Human fecal bacteria were removed in the wetlands after the effluent travelled less than a mile. Tree growth indicated quicker nutrient uptake in the experimental area. It was concluded that the wetland system could be substituted for tertiary treatment and save area residents the $79,500/year costs for a new treatment facility. (Collins-FIRL)
W77-09916

OPTIONS FOR SLUDGE--TO LAND, SEA OR FIRE,
For primary bibliographic entry see Field 5E.
W77-09918

SOUTH BEND'S INDUSTRIAL SURVEILLANCE WASTE WATER MONITORING PROGRAM,
South Bend Bureau of Wastewater, Ind.
For primary bibliographic entry see Field 5A.
W77-09919

CONSTRUCTION MANAGEMENT FOR WASTE WATERTREATMENT PLANTS,
CM Associates, Inc., Houston, Tex.
W. Strang.
Public Works, Vol 108, No 5, p 82-84, May, 1977. 2 fig.

Descriptors: *Construction, *Treatment facilities, *Management, Decision making, Personnel, Structural engineering, Design, Equipment, Contract administration, Costs.
Identifiers: Construction management.

The construction management approach was applied to waste water treatment facilities. This approach was found to alleviate several problems of past decision making processes. Problems such as selecting designers and subcontractors, procuring equipment, and funding cost overruns, can be more efficiently handled. Under this management process, a construction manager and designer are hired at about the same time. The manager does cost estimation, cost consulting, and scheduling in the early stages. He provides contract management, field supervision, and scheduling during construction. Fast-tracking may then be used for permit bidding and for some construction. Fast-tracking are completely designed. This considerable reduces construction time. The approach facilitates communication between users and subcontractors. Cost reductions can be achieved through bid selection by the owner rather by a general contractor. Direct negotiations between the manager and the lowest bidder may result in additional savings. General managers, who would include allowances for contingencies in their bids, are avoided. The owner, however, accepts the responsibility for risks. There is also the liability of extending funds, as a result of fast-tracking, before a final cost is known. Construction management has so far been applied mainly for schools and health facilities. While general contractors or designers may be hired as construction managers, there are some organizations which will provide this management as their sole function. (Collins-FIRL)
W77-09920

IMPACT OF MUNICIPAL WATER AND SEWAGE CHARGES ON INDUSTRY,
Packard and Anderson Engineers, Auburn, N. Y.
For primary bibliographic entry see Field 5G.
W77-09921

CROSS CANADA REPORT,
For primary bibliographic entry see Field 5G.
W77-09923

SYNTHETIC AGGREGATES MADE FROM SEWAGE PLANT SLUDGE.
For primary bibliographic entry see Field 8F.
W77-09924

COLORADO RIVER BASIN SALINITY CONTROL PROJECT--TITLE I,
Bureau of Reclamation, Yuma, Ariz. Yuma Projects Office.
J. F. Rhinehart.
Arizona Water Resources Project Information, Project Bulletin No 16, May 1977. 4 p, 4 fig.

Descriptors: *Saline water, *Water quality control, *Colorado River Basin, *Arizona, *Desalination, Mexican water treaty, Treaties, Drainage water, Canals, Concrete-lined canals, Water resources development, Water management(Applied), Groundwater resources, Pumping, Electrodialysis, Reverse osmosis, Irrigation effects, Irrigation efficiency.

Background and general information are presented on Title I of the Colorado River Basin Salinity Control which involves three major projects, the central one being construction of a 100 million gallon-per-day desalting plant at Yuma, Arizona. The problems of water quality have been especially acute for Mexico, which has received water of increasing salinity in diverting procedures allowed by a 1944 treaty with the United States. The reasons for increased salt concentration are explained, along with remedies provided in treaty agreements since 1965. Title I of the Colorado River Basin Salinity Control Act authorized a desalting complex to reduce salinity of the Wellton-Mohawk drainage, a new concrete-lined canal or lining of the existing canal to replace the first 49 miles of the Coachella Canal, and a protective and regulatory groundwater pumping program for the South Yuma Mesa and southwestern Yuma Valley. The proposed desalting plant will be the largest in the world, with membrane type desalting units (either a reverse osmosis or electrodialysis process) used. Plant design and uses are discussed, along with preliminary tests to determine ways of increasing irrigation efficiency. The groundwater pumping program will produce a yearly net water savings of about 125,000 acre-feet, while the desalting complex will salvage 123,000 acre-feet. (Jahns-Arizona)
W77-09931

LIMNOLOGICAL INVESTIGATION OF THE MUSKEGON COUNTY, MICHIGAN, WASTEWATER STORAGE LAGOONS. PHASE 1,
Western Michigan Univ., Kalamazoo. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-10061

TACONITE TAILINGS DISPOSAL, RESERVE MINING COMPANY, SILVER BAY, MINNESOTA.
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5C.
W77-10062

MAKING SURE OF PIPELINE PERFORMANCE,
For primary bibliographic entry see Field 8A.
W77-10068

SEWER-MAINTENANCE PRACTICE AND EQUIPMENT,
Durban City Engineers Dept. (South Africa).
For primary bibliographic entry see Field 8G.
W77-10078

CLARIFIER FOR UNDERGROUND USE,
W. E. Schlitter.
S.A. Mining and Engineering Journal, Vol. 89, No. 116, p 70-71, May 1976. diagr.

Descriptors: *Underground structures, Suspended solids, *Flocculation, Lamellae, Sedimentation rates, Mine water, Uniform flow, *Waste water treatment, *Treatment facilities, Africa.
Identifiers: South Africa.

The design, construction and operation of a clarifier for underground use is described. The use of flocculants and the insertion of inclined lamella plates to increase the settling velocity and thus the efficiency of the clarifier is advocated. Relative directions of plate inclination and water flow, i.e. countercurrent, uni-directional and cross-flow are discussed. (So African Water Info Center)
W77-10081

CONTROLLING THE ACCESS OF NUTRIENTS FROM POINT AND DIFFUSED SOURCES WITH SPECIAL REFERENCE TO THE PRETORIA/WITWATERSRAND/VEREENIGING REGION,
Johannesburg City Council(South Africa).
For primary bibliographic entry see Field 5G.
W77-10082

THE ACTIVATED SLUDGE PROCESS, PART 1 - STEADY STATE BEHAVIOUR,
Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering.
G. V. Marais, and G. A. Ekama.
Water SA, Vol. 2, No. 4, p 164-200, October 1976. 29 fig, 3 tab, 33 ref.

Descriptors: *Waste water treatment, *Activated sludge, Oxygen demand, Nitrification, Metabolism, Design criteria, Kinetics, Temperature effect, Aerobic digestion, Mixing, Nutrient requirements, Nitrogen, Suspended solids, Chemical oxygen demand.
Identifiers: South Africa.

The activated sludge process theory is comprehensively investigated at steady state in terms of the sludge age. Equations are presented for calculating the masses of active, endogenous residue and inert volatile material in the reactor. These are integrated with the oxygen demand. Nitrification kinetics investigation indicates that the rate limiting step in municipal wastewaters is the conversion of organic TKN to the NH4-form. A procedure for design in terms of sludge age is set out. (So African Water Info Center)
W77-10094

5E. Ultimate Disposal Of Wastes

SOIL TEMPERATURES AND HEAT LOSS FOR A HOT PIPE NETWORK BURIED IN IRRIGATED SOIL,
Energy Resources Co., Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W77-09654

DILUTION CHARACTERISTICS OF EFFLUENTS IN DEEP WATER RESERVOIRS DETERMINED WITH A RADIOACTIVE INDICATOR (ON THE EXAMPLE OF LAKE BAIKAL), (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W77-09735

JET-FLAME SAVES SLUDGE DISPOSAL COST WITH DEODORIZING EFFECT,
Tokyo Univ. (Japan). Dept. of Mineral Development and Engineering.
Z. Hokao.
Japan Pulp and Paper, Vol. 14, No. 3, p 37-43, September, 1976. 11 fig, 1 tab.

Descriptors: *Pulp wastes, *Sludge treatment, *Dewatering, *Odor, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Sludge, Costs, *Sludge disposal, *Incineration.

The jet-flame process for dewatering and deodorizing paper mill effluent sludge is described. In the process, sludge is exposed to a jet flame having a temperature of 1,800-2,000 K and a velocity of 1,200 m/sec. Special features and benefits of the process are outlined. Jet-flame treatment costs less than incineration. A description is given of the jet burner, and pilot plant trials and experimental results are discussed. Some possible uses of the sludge residue are indicated. (Witt-IPC)
W77-09737

A REPORT ON STUDIES OF THE EFFECTS OF DREDGING AND DISPOSAL IN THE GREAT LAKES WITH EMPHASIS ON CANADIAN WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-09794

SPRAY IRRIGATION-WASTE WATER TREATMENT FACILITY. NORTH BRANCH FIRE DISTRICT NO. 1, WEST DOVER, VERMONT.
For primary bibliographic entry see Field 5D.
W77-09828

CONTINUOUS COMPOSTING OF ORGANIC W W WASTE--BY AUTOMATIC CONTROL OF FERMENTATION TEMPERATURE AND HUMIDITY OF PRODUCT AND CONTROL OF CARBON DIOXIDE OR OXYGEN IN WASTE GASES,
F. X. Kneer.
Netherlands Patent NL 7604-357. Issued March 17, 1977. Derwent Netherlands Patents Abstracts, Vol. Y, No. 13, p D1, May, 1977.

Descriptors: *Patents, *Sludge disposal, Organic matter, Automatic control, Fermentation, Temperature, Humidity, Carbon dioxide, Oxygen, Equipment, Aeration, Microorganisms, *Waste water treatment, Ultimate disposal, *Waste disposal.
Identifiers: *Composting.

A patent was issued for a continuous composting process for organic waste water sludge. Major features of the system are automatic control of fermentation temperature, product humidity, and carbon dioxide or oxygen in the waste gases. The waste/sludge flows down through a closed aeration reactor. Reactor readings determine the amount of air contracted with the waste stream. The air bubbles flow upward through the waste. Quantity and flow rate are controlled based on comparisons of the pre-set and real values of CO2 and O2 in the waste air. Water is supplied as a function of humidity measurements made in the upper and lower third of the waste stream. Air heated to 30-50C is supplied to the base of the waste. The process operates for long periods under optimum conditions and a minimum of labor. The compost contains a high degree of biologically active microorganisms and is free of pathogenic organisms and weed seeds. (Collins-FIRL)
W77-09831

GO AHEAD FOR LONG SEA OUTFALL.
For primary bibliographic entry see Field 5D.
W77-09836

CHELLASTON TRUNK FOUL SEWER. SOME INTERESTING ASPECTS OF THE SCHEME,
Derby Borough Council (England) Drainage Section.
For primary bibliographic entry see Field 5D.
W77-09837

CO-BURNING OF SLUDGE AND REFUSE WITH WASTE HEAT RECOVERY,
Cosulich (William F.) Associates, Woodbury, N. Y.
W. F. Cosulich.
Public Works, Vol. 108, No. 5, p 76-79, May, 1977. 2 fig.

Descriptors: *Incineration, *Waste disposal, *Sludge disposal, Equipment, Design, Costs, Temperature, Treatment facilities, Ultimate disposal, Cooling water, Steam, Electric power, Waste water treatment.

The co-burning of sludge and refuse is being developed by Glen Cove, N.Y., because of an EPA ban on ocean disposal and a New Jersey ban on out-of-state refuse dumping. Heat from the incineration process will be used to produce steam and electrical power for the waste water treatment plant and the incinerator. The facilities will consist of an 8 mgd activated sludge nitrification plant and a 200 ton/day incinerator. Four different incineration systems were considered: pyrolysis, multi-hearth, fluidized bed, and stoker fired. Pyrolysis was judged to be uneconomical for the community, and developmental multi-hearth incinerators showed no economic advantage over stoker fired incinerators. Fluidized bed incinerators were also in developmental stages and there was, again, no economic advantage. The stoker fired incinerator was recommended after examination of a plant in Norwalk, Connecticut. A mixture of 87% refuse and 13% sludge, by weight, provided excellent combustion efficiency. The system's major aspects include the method of feeding sludge to the furnace, the stoker, and the control system for combustion air. Sludge, fed into the furnace as a thin layer on top of refuse dries and burns during the 30 minute furnace residence time. The stoker should not have large openings but should provide a gentle agitation. Controlled temperatures minimize slagging on the refractory walls and are essential for steam and electricity production. The chosen system uses two 100 ton/day furnaces with double reciprocating stokes and a modulating air system. The high heat value of the refuse-sludge mix was estimated at 4,120 Btu/pound. This is expected to produce 34,000 pounds/hour of steam which will power a 2.2 megawatt multi-stage condensing turbine generator set. Air pollution controls are to be included and settled sewage or treated effluent could serve as condenser cooling water. Three 1,000 KW diesel generators will provide standby power. (Collins-FIRL)
W77-09857

VIRUS AND BACTERIA REMOVAL FROM WASTE WATER BY RAPID INFILTRATION THROUGH SOIL,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
For primary bibliographic entry see Field 5D.
W77-09860

PASTEUR V CURIE.
For primary bibliographic entry see Field 5D.
W77-09864

GROWTH OF TULIPS TREATED WITH SLUDGE CONTAINING DEWATERING CHEMICALS,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
M. B. Kirkham.
Environmental Pollution, Vol 13, No 1, p 11-20, May, 1977. 1 fig, 4 tab, 31 ref.

Descriptors: *Plant growh, Chemicals, *Sludge disposal, *Waste disposal, Sludge treatment, Dewatering, Chlorides, Lime, Chemical treatment, *Waste water treatment.
Identifiers: Tulips.

A greenhouse study was conducted to determine the effect of a ferric chloride-lime treated, dewatered sludge on tulip growth. Comparisons were made on the growth of plants receiving dried organic sludge, liquid organic sludge, primary effluent, and tap water. No additional chemicals were added to either of the organic sludges. Results revealed that tulips grown in chemical sludge had an average height shorter than that of the other tulips, with no buds or flowers. Liquid organic sludge, tap water, and primary effluent produced plants which flowered in 46 days. Dry organic sludge produced plants of a height intermediate to that of the others; these tulips had buds but no blooms. Growth was better with liquid organic sludge than with dry organic sludge. This suggested that more sludge could be applied to soil surfaces than could be mixed with or injected into the soil. The chemical sludge-treated soil produced highest soil nitrogen levels; phosphorus levels were medium to high in all soils. Extractable concentrations of trace elements and phosphorus were lower in soils treated with chemical sludge than those treated with dried or liquid organic sludge. Calcium was highest in soil treated with chemical sludge. Lime, in acidic soils, aids plant uptake of phosphorus; an excess of lime decreases available boron, iron, potassium, manganese, phosphorus and zinc. Ferric chloride in chemical sludge did not appear to be soluble. It was concluded that conditioned sludge containing ferric chloride and lime could not be used to grow tulips. (Collins-FIRL)
W77-09867

ELEMENTAL COMPOSITION OF SLUDGE-FERTILIZED CHRYSANTHEMUMS,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
M. B. Kirkham.
Journal of the American Society for Horticultural Science, Vol 102, No 3, p 352-354, May, 1977. 2 tab, 14 ref.

Descriptors: *Plant growth, *Fertilizers, *Sludge, Nitrogen, Potassium, Phosphorus, Nutrients, Trace elements, Toxicity, Hydrogen ion concentration, *Waste water treatment.
Identifiers: Chrysanthemums.

Chrysanthemums were treated with liquid sludge for 84 days to determine its effectiveness as a fertilizer. Liquid sludge contains nutrients needed by field crops, but no data are available on the applicability of sludge to greenhouse plants. These plants were treated with either liquid sludge or inorganic fertilizers at doses of 50, 100, and 200 ml/week. Tap water was also used. The growth media were soil, sand, and peat. The variously fertilized plants were analyzed for concentrations of elements found in their leaves, stems, roots and flowers. Sludge-treated plants, regardless of the medium, had the highest nitrogen and lowest potassium concentrations in their leaves. Zinc concentrations in leaves increased with the sludge application rate. Elemental concentrations in stems and flowers, however, did not vary significantly with any particular fertilizer treatment. Concentrations of N, Ca, and Mg in roots were greater in sludge-treated plants. Iron and copper concentrations were high in roots. Iron and copper in the leaves of plants grown in sand increased with the sludge application rate. Plants treated with 50 and 100 milligrams of sludge/week had similar nutrient concentrations, but the leaves were healthier in the 50 ml/week plants. Sludge raised the pH level in all the media, but especially in peat. Extractable concentrations of potassium were usually lower

and copper concentrations higher, in the sludge-treated media. Sand and peat media concentrations of calcium and magnesium increased as the sludge application rate increased. Trace element concentrations were not increased by using sludge fertilizer, nor was there any evidence of trace element toxicity. These experimental results indicated that chrysanthemum growth with liquid sludge as the only nutrient source was possible. (Collins-FIRL)
W77-09868

HOW SLUDGE CHARACTERISTICS AFFECT INCINERATOR DESIGN,
Hydroscience, Inc., Knoxville, Tenn.
R. G. Novak, J. J. Cudahy, M. B. Denove, R. L. Standifer, and W. E. Wass.
Chemical Engineering, Vol 84, No 10, p 131-136, May, 1977. 3 fig, 5 tab.

Descriptors: *Incineration, *Design criteria, *Sludge, Chemical properties, Physical properties, Dewatering, Equipment, *Sludge treatment, Polyelectrolytes, *Waste water treatment, Costs.

Incinerator design criteria are established based upon sludge characteristics. The moisture content of dewatered sludge directly influences incinerator size and auxiliary fuel costs. Various dewatering and conditioning systems were compared to determine the differences in sludge moisture content produced by each. Pressure filters produce the driest cake. This is an expensive dewatering method, but it conserves fuel. The resultant sludge can be burned in a relatively small incinerator. Dual-cell gravity/multi-roller press and belt press units require the lowest capital and labor expenditures. Centrifuge and vacuum filter methods are slightly more costly. All, except the pressure filter, produce cakes of approximately the same moisture content. The effects of conditioning chemicals on the quantity and composition of sludge, and on the ash produced, should also influence incinerator design. Multiple-hearth, fluidized, and rotary-hearth incinerators were described. The chemical composition of the sludge will determine whether or not secondary combustion on a multiple-hearth furnace is necessary. Other data necessary for choosing a particular incineration and disposal system are the ash content of the dry solids, the thermal characteristics of the ash, and the fraction of volatile and fixed carbon in the dry solids. (Collins-FIRL)
W77-09869

CONCURRENT WASTE WATER RENOVATION AND SOLID WASTE COMPOSTING,
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W77-09879

LAND APPLICATION OF MUNICIPAL SLUDGE,
New Jersey Inst. of Tech., Newark.
G. Dakes, and P. N. Cheremisinoff.
Water and Sewage Works, Reference Issue, p 38, 40-44, 46-47, April, 1977. 4 fig, 9 tab, 19 ref.

Descriptors: *Sludge disposal, *Municipal wastes, Incineration, Landfills, Fertilizers, Design, Economics, Water quality standards, Nutrients, Heavy metals, Pathogens, Monitoring, Microorganisms, Public health, Waste water disposal.
Identifiers: Land application, Ocean dumping.

A summary was presented of information on the land application of municipal sludge. A brief history of sewage land application and an analysis of sludge characteristics were reviewed. Primary sludge contains high concentrations of fecal coliforms and lesser amounts of disease-causing organisms. These can be significantly removed through sedimentation. Sludge contains the major plant nutrients: nitrogen, phosphorus, and potassium. The four alternative methods of sludge disposal were incineration, ocean dumpings, landfill, and land application. Properly operated and designed incinerators were able to meet particulate emission regulations, producing ash in volumes one-tenth that of dry sludge. However, disposal was still required, the removed water was a problem, and the process was expensive. Ocean dumping is to be completely phased out by 1981. Landfilling is an economic alternative and can accommodate concurrent disposal of municipal solid wastes. Pollution of groundwater from leachates and runoff is the most likely problem. Sludge must also be dewatered for this method. The costs to be considered for a land application system are sludge value, handling methods, transport, and distribution. Land acquisition and availability must also be considered. Any program must be prefaced by an understanding of the effects of metal toxicity to plants and the food chain. Several on-going experiments are seeking hard data on the subject. Various means have been suggested to avoid public health hazards. Means of pathogen destruction include long storage times, pasteurization, lime addition to raise pH, chlorination, and other chemical treatment. The final problem concerns the promotion of public acceptance. This should be solicited during developmental stages of a disposal program. (Collins-FIRL)
W77-09882

A NEW RAPID DIGESTION PROCESS FOR SEWAGE SLUDGE UTILIZATION (EINNEUES SCHNELLROTTE-VERFAHREN ALS BEITRAG ZUR WEITERGEHENDEN KLAERSCHLAMM-VERWERTUNG),
For primary bibliographic entry see Field 5D.
W77-09887

ADVANCE SEWER PLANNING FOR RIO DE JANEIRO COASTLINE,
ENCIBRA South America, Rio de Janeiro (Brazil).
For primary bibliographic entry see Field 5D.
W77-09890

WATERTIGHT CASE FOR POND LINERS.
For primary bibliographic entry see Field 5G.
W77-09891

EFFLUENT TREATMENT VERSUS DISPOSAL THROUGH LONG SEA OUTFALLS,
Watson (J. D. and D. M.), High Wycombe (England).
K. D. Staples.
Chemistry and Industry, No. 9, p 333-335, May, 1977.

Descriptors: *Outfalls, Water policy, Planning, *Treatment facilities, Sewage effluents, Oxygen demand, Solid wastes, Engineering, Hydrogen ion concentration, Costs, Physical properties, Chemical properties, *Waste water treatment, *Waste disposal.

Considerations in choosing sewage disposal by long sea outfalls or additional effluent treatment in coastal areas were presented. Environmental and economic concerns were discussed. Policies which attempted to accomplish zero discharge were found very expensive and of doubtful necessity. Limited treatment and longer outfalls were proposed for some areas. Several limitations on marine disposal were listed. Wastes with buoyant, identifiable solids usually require treatment by screening to avoid possible accumulation on shorelines. Heavier solids should be removed when a long outfall is used in areas with high flow variations, to avoid pipeline siltation. Effluents with high oxygen demand, high or low pH, and degradable toxic compounds should only be discharged in long outfalls where high initial dilution is possible. Long outfall engineering involves a high initial cost and low operating costs when compared with land treatment plants. The outfall length would vary with effluent strength and character. Definitive cost evaluation must be made on the basis of individual situations. Cost factors may promote in-house industrial waste treatment with discharge to public sewer facilities for small waste quantities. Outfalls were considered most feasible when large waste quantities were disposed, or when wastes were easily degraded or oxidized at sea. They were also found viable when the waste source was reasonably close to the coast. (Collins-FIRL)
W77-09895

STEROIDS AS SEWAGE SPECIFIC INDICATORS IN NEW YORK BIGHT SEDIMENTS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5A.
W77-09901

CHEMICAL COMPOSITION OF SEWAGE SLUDGES AND ANALYSIS OF THEIR POTENTIAL USE AS FERTILIZERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W77-09904

CHANGES IN INORGANIC NITROGENOUS COMPOUNDS FROM SEPTIC TANK EFFLUENT IN A SOIL WITH A FLUCTUATING WATER TABLE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-09907

A MATHEMATICAL MODEL FOR WATER QUALITY IN A COASTAL REGION IN TERMS OF SEA BOTTOM WASTE DEPOSITS (KAITEI OSENBUSSHITSU NADO NO EIKYO O KORYO SHITA KAIIKI NO SUISHITSU NO YOSOKU-MODERU NO KAIHATSU NI KANSURU KENKYU),
Public Works Research Inst., Tokyo (Japan).
For primary bibliographic entry see Field 5B.
W77-09911

REMOVAL OF NUTRIENTS FROM TREATED MUNICIPAL WASTE WATER BY WETLAND VEGETATION,
Water and Wastewater Technical School, Neosho, Mo.
For primary bibliographic entry see Field 5D.
W77-09916

OPTIONS FOR SLUDGE--TO LAND, SEA OR FIRE,
J. Pullin.
Surveyor, Vol. 149, No. 4423, p 7-9, March, 1977.

Descriptors: *Sludge disposal, *Landfill, *Fertilizers, *Incineration, Pollution abatement, Sewage effluents, Sludge treatment, Nitrogen, Phosphorus, Cadmium, Public health, Trace elements, Waste water treatment, Metals, Economics, Treatment facilities.
Identifiers: *Ocean disposal.

For many years, sludge disposal has been a neglected step in sewage treatment processes. Increased sewage flows and stricter pollution standards have resulted in more efficient treatment methods, and consequently in more sludge. Four basic options for sludge disposal are using the sludge as landfill, using it as fertilizer, disposing of it in oceans, and incinerating it. The type of sludge produced and the geographical characteristics of a given area limit the choices. A 1970 report estimated that England and Wales produced about 1.1 million tons of sludge per year and that nearly 40%

was used as fertilizer. It should be noted that the fertilizing benefits of sludge nitrogen and phosphorus can be offset by the presence of toxic substances, such as heavy metals, which may enter the food chain. Cadmium concentrations in British sewage sludges may be as high as 50 milligrams/kilogram of dry solids. Though ocean disposal has been prominent in the past, incineration has become popular. The use of incineration is basically an economic decision. It was thought that sludge and domestic refuse could be incinerated together, but this was not very successful in Britain. Where sludges are not suitable for land application, incineration has a definite advantage. Land requirements are less, and the ash volume is much lower than the volume of sludge dried on beds. It appears that British practice will be to use incineration and ocean dumping in urban areas, for sludges which contain much industrial waste. Agricultural disposal will be used in areas where land is easily accessible and for sludge which is low in toxic materials. (Collins-FIRL)
W77-09918

AGRICULTURAL WASTES IN FISH FARMING. A COMMERCIAL APPLICATION OF THE CULTURE OF SINGLE-CELLED ORGANISMS FOR PROTEIN PRODUCTION,
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station.
G. Schroeder.
Water Research, Vol. 11, No. 4, p 419-420, 1977. 6 ref.

Descriptors: *Fish farming, *Farm wastes, *Fish food organisms, Pounds of fish per acre, Fish diets, Aquaculture, Bacteria, Protozoa, Productivity, Waste disposal, Recycling, Foreign countries.
Identifiers: *Israel(Fish production).

The use of cow dung and urine to promote bacteria and protozoa growth in Israeli fish farming ponds to enhance economically efficient protein production is described. Fluid animal waste containing both urine and feces has a large amount of suspendable material; approximately 20 to 30% of the dry matter remains in suspension when mixed with water, thus presenting an excellent substrate for the microorganisms. Standing crops of zooplankton and chironomid larvae were some 100-1000 times greater in manured ponds than in nonmanured ponds and produced fish yields greater than 30 kg/ha/day while chemical fertilization rarely produces 10 kg/ha/day. It appears that the organic carbon-based fraction of the dung-urine mixture is the key to the high fish yield. Production of bacteria and some protozoa species is not limited by light penetration; protozoa can feed either directly on dissolved nutrients or on bacteria. The short generation time of these microorganisms produces fish food organisms high in protein content, providing the fish with a diet twice as rich in protein as pelleted feeds conventionally used in Israeli fish culture. The high protein diet produced fish with a low fat content. Oxygen depletion is predicted by measuring the percentage of dry matter allowing additions of the dung-urine mixture at daily rates in excess of 2 tons/ha. (Auen-Wisconsin)
W77-10050

TACONITE TAILINGS DISPOSAL, RESERVE MINING COMPANY, SILVER BAY, MINNESOTA.
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5C.
W77-10062

5F. Water Treatment and Quality Alteration

ATER SYSTEM VIRUS DETECTION,
Organon Diagnostics, El Monte, Calif.
For primary bibliographic entry see Field 5A.
W77-09636

OBSERVATIONS ON THE INTESTINAL PROTOZOA INFECTING MAN IN RHODESIA,
Rhodesia Univ., Salisbury. Dept. of Medical Microbiology.
J. M. Goldsmid, S. Rogers, and K. Mahomed.
South African Medical Journal, Vol. 50, No. 40, p 1547-1550, 1976. 3 fig, 1 tab, 29 ref.

Descriptors: Human diseases, Public health, *Protozoa, Potable water, Water quality.
Identifiers: *Rhodesia, Entamoeba histolytica, Serology, Hookworm, Intestinal infections.

Humans in Rhodesia harbour a wide range of intestinal protozoa. Of the species included, Entamoeba histolytica, Entamoeba coli and Giardia lamblia have previously been recorded. Other species which are either rarely reported or which have previously never been reported from this country, include Trichomonas hominis, Chilomastix mesnili, Enteromonas hominis, Retortamonas intestinalis, Balantidium coli, Entamoeba hartmanni, Entamoeba histolytica Laredo, Endolimax nana, Dientamoeba fragilis and Isospora belli. The importance in Rhodesia of these species, and especially of E. histolytica, is discussed. (So. African Water Info Center)
W77-09691

CHLORINATION REACTIONS OF FULVIC ACIDS IN NATURAL WATERS,
Municipal Water Works of Rotterdam (Netherlands).
J. J. Rook.
Environmental Science and Technology, Vol 11, No 5, p 478-482, May, 1977. 4 fig, 19 ref, 3 tab.

Descriptors: Natural streams, *Fulvic acids, *Chlorination, *Chemical reactions, Water pollution sources, Potable water, Waste water(Pollution), *Organic matter, Surface waters, Groundwater, Color, Halogens, *Chemical degradation.

Chlorination of both drinking waters and waste waters leads to the generation of various chlorinated degradation products of natural fulvic acids. Fulvic acids constitute the bulk of the organic matter in colored surface or groundwaters. Metadihydroxybenzene structures are proposed as main reactive sites of the molecule. Experimental evidence is presented for possible reaction pathways leading to haloforms and other chlorinated by-products. (Witt-IPC)
W77-09741

RESEARCH AND DEVELOPMENT OF AN ELECTROCHEMICAL BIOCIDE, FINAL REPORT,
Life Systems, Inc., Cleveland, Ohio.
For primary bibliographic entry see Field 5D.
W77-09771

WATER PURIFYING SYSTEMS,
J. D. Smith.
U.S. Patent No. 4,002,566, 7 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 954, no 2, p 778, January 11, 1977.

Descriptors: *Patents, *Water purification, *Water treatment, Water quality control, *Aeration, *Biological treatment, *Waste water treatment, Bacteria, Cultures.

The object of the invention is to provide a water purifying system which includes flowing the water through a path supporting a bacteria culture. The water is aerated in the path upstream of the bacteria culture. The bacteria culture constantly and continuously cleans and purifies the water. The invention relates in general to water purification systems but more particularly related to but is not limited to aquariums, swimming pools and other such systems. (Sinha-OEIS)
W77-09808

PHOTODYNAMIC INACTIVATION OF INFECTIOUS AGENTS,
FMC Corp., Santa Clara, Calif. Environmental Engineering Lab.
For primary bibliographic entry see Field 5D.
W77-09883

PROTOZOAN AND HELMINTHIC INFECTIONS OF THE INTESTINES OF HUMANS IN THE INYANGA AREA OF RHODESIA,
Rhodesia Univ., Salisbury. Dept. of Medical Microbiology.
For primary bibliographic entry see Field 5G.
W77-10076

CALCIUM CARBONATE PRECIPITATION KINETICS, PART I, PURE SYSTEM KINETICS,
Cape Town Univ. (South Africa). Dept. of Civil Engineering.
P. L. K. Sturrock, L. Benjamin, R. E. Loewenthal, and G. R. Marais.
Water SA, Vol. 2, No. 3, p 101-109, July 1976. 9 fig, 1 tab, 8 ref.

Descriptors: *Calcium carbonates, *Kinetics, *Chemical precipitation, Supersaturation, Hard water, Water softening, Model studies, Calcite, *Water treatment, Ions.

The kinetics of calcium carbonate precipitation was investigated in seeded batch test experiments at 20C. Two postulates governing precipitation rates were investigated: (1) that rate is a function of seed mass and supersaturation as postulated by Nancoilas and Reddy for CaCO3 precipitation, and (2) that rate is governed by the mass of seed and a charge on the seed surface as postulated by Davies and Jones for AgCl precipitation. (So African Water Info Center)
W77-10087

5G. Water Quality Control

A GUIDE TO AERATION/CIRCULATION TECHNIQUES FOR LAKE MANAGEMENT,
Tetra Tech., Inc., Lafayette, Calif.
M. Lorenzen, and A. Fast.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 126, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/3-77-004, January 1977. 142 p, 51 fig, 5 tab, 93 ref, 4 append. 1BA031, 68-03-2192.

Descriptors: *Specifications, Equipment, *Methodology, *Water treatment, *Aeration, *Water circulation, *Lakes, Destratification, Hypolimnion, Estimated costs, Size, Design, Oxygenation, Oxygen requirements, Mixing, *Circulation.
Identifiers: *Lake rehabilitation, Lake management, Case studies.

In a theoretical and practical review of lake rehabilitation by aeration and circulation application techniques and a discussion of problems amenable to solution or control by these techniques are related to resultant benefits that may be expected, appropriateness of various techniques, and equipment design. Destratification procedures intended to either mix the lake or to provide aeration without maintaining the normal thermal structure are discussed together with systems ranging from high energy mixing devices to low energy aeration procedures (including both mechanical pumps and compressed air). Destratification systems can be used to control excessive algal growth under certain circumstances and an maintain aerobic conditions; however, cold water cannot be maintained

when complete mixing is acheived, and could harm certain fish species. Both air and oxygen systems are available to maintain normal thermal stratification of a lake while adding oxygen to the hypolimnion. Whether to destratify or to maintain stratification depends on water uses and the extent of the problems. Examples of methodologies and devices applied to specific lakes, and methods of estimating costs, are included. (Auen-Wisconsin)
W77-09603

NUTRIENT DIVERSION: RESULTING LAKE TROPHIC STATE AND PHOSPHORUS DYNAMICS,
Washington Univ., Seattle. Dept. of Civil Engineering.
E. B. Welch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 645, Price codes: A05 in paper copy, A01 in microfiche. Ecological Research Series EPA-600/3-77-003, January 1977. 102 p, 27 fig, 16 tab, 27 ref. 1BA031, EPA R-800512.

Descriptors: *Nutrient removal, *Lakes, *Phosphorus, Diversion, *Washington, Sedimentation, Iron, *Cycling nutrients, Mesotrophy, *Trophic level.
Identifiers: *Lake Sammamish(Wash), *Waste water diversion.

About 7000 kg/yr of phosphorus was diverted from Lake Sammamish, Washington, in 1968. But reduced phosphorus loading had no measurable impact on the total phosphorus and cholorophyll-a concentration, water transparency or hypolimnetic oxygen deficit rate, although the cyanophytes declined by over 40%. The lake remains mesotrophic with a mean summer Secchi disc transparency of 3.3 m and a maximum of near 6 m, a state unchanged since early in this century and possibly since the beginning of permanent settlement in the watershed. Maintenance of lake trophic stability is attributed largely to the constancy of the winter phosphorus concentration, which in turn is controlled by high anaerobic release rates from the sediment in summer, but more importantly, high sedimentation rates following autumn turnover. Most of the phosphorus fluctuation was correlated with iron, which controls the anaerobic release and aerobic sedimentation of phosphorus. Although the effect of a one-third reduction or increase, in phosphorus input was not apparent, loading without diversion would well have exceeded the stability mechanisms(s) for water-column phosphorus. A mathematical model simulated phosphorus and chlorophyll-a concentrations reasonably well, but served primarily to study seasonal dynamics of the system. (Auen-Wisconsin)
W77-09604

STUDIES ON THE RECLAMATION OF STONE LAKE, MICHIGAN,
Notre Dame Univ., Ind.
T. L. Theis, and J. V. DePinto.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 198, Price codes: A04 in paper copy, A01 in microfiche. Ecological Research Series EPA-600/3-76-106, November 1976. 94 p, 29 fig, 9 tab, 40 ref, append. 1BA031, EPA R-801245.

Descriptors: *Water pollution treatment, *Eutrophication, *Cycling nutrients, *Lake sediments, *Sealants, Michigan, Clays, Fly ash, Nutrient removal, Chemical precipitation, Phosphorus, Nitrogen, Cost-benefit analysis.
Identifiers: *Lake restoration, *Sedimentary nutrients, Stone Lake(Mich), Nutrient regeneration.

Particulate materials, such as certain types of fly ash or clays, were shown to be potentially effective lake restoration tools for controlling cycling of phosphorus and nitrogen from eutrophic sediments in Stone Lake, Michigan. Usually a 2 to 5 cm layer of material was needed to control phosphate release. Supplemental additions of lime or alum enhanced phosphate removal from the overlying water. Sandy shoreline sediments low in water and organic matter have a low pollution potential and should not usually require covering with a particulate layer. A cost-benefit analysis, using the criteria of ease in handling and application, fishery response to treatment, removal of nutrients, effects on recreation, and aesthetic value compares costs of fly ash, fly ash and lime, clay, dredging, nutrient inactivation combined with aeration, mechanical harvesting with aeration, replacing the lake water, and a soil and plastic barrier. Laboratory data indicate that there may be potentially harmful effects from water soluble extracts of fly ash, particularly sulfur and various heavy metals. Short-term extremes of pH may also affect biota unfavorably. The side-stream method of lake reclamation for removal of phosphorus is also discussed, giving costs and its feasibility. (Auen-Wisconsin)
W77-09605

A METHODOLOGY FOR COMPARATIVE EVALUATION OF WATER QUALITY INDICES,
Worcester Polytechnic Inst., Washington, D. C. Project Center.
For primary bibliographic entry see Field 5A.
W77-09632

THE TUGELA-VAAL STATE WATER SCHEME AS A BILHARZIA RISK (DIE TUGELA-VAAL-STAATSWATERSKEMA AS 'N BILHARZIARISIKO),
South African Medical Research Council, Potchefstroom.
S. J. Pretorius, G. Oberholzer, and J. A. Van Eeden.
South African Medical Journal, Vol. 50, No. 25, p 968-972, 1976. 2 fig, 2 tab, 7 ref.

Descriptors: Inter-basin transfers, *Snails, Intermediate hosts, Africa, *Public health, Surveys, Human diseases.
Identifiers: Sterkfontein Dam, Spioenkop Dam, *Tugela River-Vaal River water scheme(So Afr), Bulinus(Physopsis) africanus, *South Africa, *Bilharziasis, *Schistosomiasis.

The Tugela-Vaal River water scheme constitutes a possible source for the introduction of bilharziasis into an area where the disease is at present not endemic. A survey was made of the snail species in the area encompassed by the scheme. Although Bulinus (Physopsis) africanus (a host of Schistosoma species responsible for urinary bilharzias) was found in the proposed source area of the water scheme, it is not possible at this stage to determine with certainty whether this host will be introduced over the Drakensberg escarpment into the Orange Free State. However, this is a distinct possibility, and it is discussed in relation to ecological factors. (So. African Water Info Center)
W77-09690

OBSERVATIONS ON THE INTESTINAL PROTOZOA INFECTING MAN IN RHODESIA,
Rhodesia Univ., Salisbury. Dept. of Medical Microbiology.
For primary bibliographic entry see Field 5F.
W77-09691

EFFECT OF LEACHING FRACTION ON RIVER SALINITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
D. L. Suarez, and J. D. Rhoades.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 103, No. IR2, Proceedings Paper 13017, p 245-257, June 1977. 7 tab, 9 ref, 2 append.

Descriptors: *Drainage water, *Leaching, *Irrigation engineering, *Salinity, Management, Soil chemical properties, Calcium carbonate, Porosity, Rivers, Water quality, Return flow, Drainage, Root zone, Saline soils, Gypsum, Model studies.
Identifiers: Saturation(Chemical).

The effects of 0.10 and 0.40 irrigation leaching fraction management on amounts of salt precipitated in the soil and river channel and compositions of drainage and river water were calculated for each of the three river types routed through nine successive hypothetical irrigated valleys. The calculations assume dissolution of CaCO3 (in the soil) and return of irrigation drainage waters. Rivers undersaturated with CaCO3 were slightly less saline under low versus high leaching. Rivers saturated with CaCO3 were unaffected by irrigation management. Rivers saturated with CaCO3 and approaching saturation with gypsum experienced substantial reductions in salinity under low leaching compared to high leaching. For CaCO3-saturated rivers, a change from high to low leaching results in a rootzone soil porosity reduction of 0.008% more per year. For rivers that result in the precipitation of gypsum, soil porosity was reduced about 0.08% more per year for low as compared to high leaching. (Visocky-ISWS)
W77-09697

FLUSHING CHARACTERISTICS OF A MISSISSIPPI DEAD-END CANAL SYSTEM,
University of Southern Mississippi, Hattiesburg. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-09721

LOGGING ROADS AND PROTECTION OF WATER QUALITY.
Arnold, Arnold and Associates, Seattle, Wash.; and Dames and Moore, Seattle, Wash.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 703, Price codes: A14 in paper copy, A01 in microfiche. Environmental Protection Agency, Region X, Seattle, Wash., Water Div. Report EPA 910/9-75-007, March, 1975. 312 p, 42 fig, 128 ref, 16 tab.

Descriptors: *Water quality, *Roads, *Lumbering, *Reviews, Forest management, *Road construction, Maintenance, Erosion control, Water pollution sources, Pacific Northwest U.S., Water quality control, Planning, Road design, Chemicals.

This is a state-of-the-art review of methods, procedures, and practices for protecting water quality during the planning, design, construction, reconstruction, use, and maintenance of logging roads. Most of the methodology is also applicable to other forest roads. The report is divided into two parts. The first part provides a general perspective on the physical features and conditions in the Pacific Northwest which are relevant to water quality protection and logging roads. The second part outlines specific methods, procedures, criteria, and alternatives for reducing the degradation of water quality. Topics covered in this part include road planning, design, construction, and maintenance including the use of chemicals on roads. Of all the silvicultural activities, logging roads are the principal source of man-caused sediment. (Witt-IPC)
W77-09725

HOW TO REDUCE WATER AND RAW MATERIAL CONSUMPTION IN PAPERMAKING (COME RIDURRE I CONSUMI D'ACQUA E DI MATERIE PRIME IN CARTIERA),
Cartiere Ambrogio Binda S.p.A., Milan (Italy).
For primary bibliographic entry see Field 3E.
W77-09738

FOREST HARVEST, RESIDUE TREATMENT, REFORESTATION, AND PROTECTION OF WATER QUALITY.
Montgomery (James M.), Inc., Boise, Idaho.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 393, Price codes: A13 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 910/9-76-020, April, 1976. 273 p, 13 fig, 15 tab, 566 ref.

Descriptors: *Water quality, *Lumbering, *Forest management, *Water pollution, *Reviews, *Reforestation, Surface runoff, Soil erosion, Forests, Forest watersheds, Pacific Northwest U.S., Hydrology, Water pollution sources, Wood wastes, Waste disposal, Water quality control, Climates, Geology, Forest soils, Bibliographies.
Identifiers: *Lumbering wastes.

This is a state-of-the-art review of methods, procedures, and practices for protecting water quality during logging, logging residue treatment, and reforestation activities. A description is given of the Pacific Northwest by dividing the region into thirteen subregions based on similar forest species, climate, geology, and soil parent material. This is followed by a discussion of the interaction of water quality problems with forest management, soil erosion, and hydrology. Current forest practices in the Pacific Northwest are described and related to their water quality impacts. The study concludes with a section on the planning and management methods that can be used to reduce and prevent pollution from logging, residue management, and reforestation. (Witt-IPC)
W77-09756

EFFECTS OF LOG HANDLING AND STORAGE ON WATER QUALITY,
Corvallis Environmental Research Lab., Oreg.
For primary bibliographic entry see Field 5C.
W77-09760

A STUDY TO EVALUATE THE INTENSITY OF AN ALTERNATE METHODS FOR NEUTRALIZATION OF DOD AIRCRAFT FUEL SPILLS, PHASE I,
Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Sanitary Sciences Div.
V. J. Ciccone, and A. P. Graves.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-025 937, Price codes: A05 in paper copy, A01 in microfiche. DOD Aircraft Ground Fire Suppression and Rescue Office, Report DOD AGFSRS 76-2, February 1976, 86 p, 18 tab, 27 fig, 5 ref.

Descriptors: *Oil, *Oil spills, *Fuels, Aircraft, *Airports, Industrial wastes, Industrial water, Transportation, Trapping, On-site investigation, Oil-water interfaces, Analytical techniques, *Neutralization, Pollution abatement.
Identifiers: *Fuel spill problem, Fuel volume, Frequency of spills, *Fuel spill neutralization, *Fuel spill collection, Absorbants, Vacuum collection, Wringers, Fuel/water separators, Coalescent filters, Plate separators, Tank separators, Distillation unit, Water booms, Oil skinner.

The magnitude of the fuel spill problem at DOD airfields is described in terms of fuel volume, frequency of occurrence, and specific site of occurrence. In addition, a list of currently available methods for neutralization of fuel spills was prepared, together with a study of the practicality, feasibility and cost effectiveness of methods for collection, treatment, or neutralization of fuel pools resulting from accidental fuel spills at airfields. (Katz)
W77-09774

ESTIMATION OF PERMISSIBLE CONCENTRATIONS OF POLLUTANTS FOR CONTINUOUS EXPOSURE,
Research Triangle Inst., Research Triangle Park, N.C.
For primary bibliographic entry see Field 5A.
W77-09788

APPLICATION OF THE ROTATING FLIGHTED CYLINDER TO LIVESTOCK WASTE MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-09795

WATER TREATMENT SYSTEM WITH PROLONGED AERATION,
A. Wikey.

Descriptors: *Patents, *Water treatment, *Water purification, *Aeration, *Electrolysis, Water quality control, *Water pollution control, Bubbles, Gases, Baffles equipment.

Equipment for and methods of treating, aerating, and purifying water over prolonged periods of time are described. A new and improved water treatment system is provided where the object is to extract greater levels of aeration from oxygen bubbling through the water. One or a vertical series of baffles placed over an electrolyzing unit controls a passage of oxygen out of water and distribute the aerated water within a body of water. Water is drawn into an inlet pipe and broken down into the gaseous oxygen by electrolysis. The resulting oxygen bubbles through and thereby aerates the water. The aerated water is then discharged. (Sinha-OEIS)
W77-09818

AERATING APPARATUS,
J. F. Boward, Jr.
U.S. Patent No. 4,005,015, 5 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 954, no 4, p 1659, January 25, 1977.

Descriptors: *Patents, *Water treatment, *Aeration, *Water pollution treatment, Water quality control, *Water purification, Water circulation, Ponds, Shallow water.

Aeration of stagnant ponds of water is desirable to promote growth of fish and prevent growth of algae and/or fungus. This invention is directed to apparatus for aerating shallow bodies of water and includes a pump having an inlet and an outlet. A first conduit has one end connected to the pump outlet and its other end is connected to a valve for introducing air and/or chemicals into a flowing stream of water moving in a downward direction toward liquid level. The valve is supported at an elevation above the water level. A distribution conduit is connected downstream from the valve and has a greater flow capacity than the first conduit. A submersible distributor head is connected to the distribution conduit. The head has a chamber provided with an inlet and an outlet. The chamber inlet is at an elevation lower than the outlet. The outlet is substantially smaller in size. The apparatus is particularly designed to be portable. (Sinha-OEIS)
W77-09819

WATERTIGHT CASE FOR POND LINERS.
Chemical Week, Vol. 120, No. 23, p 40, June, 1977.

Descriptors: *Linings, *Plastics, Ponds, Landfills, Leachates, Water pollution control, Reservoirs, Construction materials, Costs, Waste storage, Physical properties, Waste disposal.

A progress report was made on the usage of plastic linings in ponds, landfills, and reservoirs. About 110 million square feet was marketed in 1976. The amount could rise to nearly one billion square feet by 1980. Various manufacturers predict annual market growth rates of 15-20%. Groundwater protection regulations were one reason for the emphasis on liners. Stricter regulatory and monitoring requirements have forced a search for means to create leak-secure ponds. This has been especially true for landfill construction and the storage of hazardous materials. Reservoirs would also be covered to prevent vandalism, algal growth, evaporation, and contamination from airborne pollutants. Polyvinyl chloride and polyethylene liners have been the major alternative to traditional liner materials. New materials such as thermoplastics and elastomerics are becoming popular. Greater weatherability and resistance to a wider range of wastes outweigh cost considerations. They also provide simpler and more secure seam sealing methods. Cost comparisons were provided for the traditional and new plastic liner materials. (Collins-FIRL)
W77-09891

SOUTH BEND'S INDUSTRIAL SURVEILLANCE WASTE WATER MONITORING PROGRAM,
South Bend Bureau of Wastewater, Ind.
For primary bibliographic entry see Field 5A.
W77-09919

CONSTRUCTION MANAGEMENT FOR WASTE WATERTREATMENT PLANTS,
CM Associates, Inc., Houston, Tex.
For primary bibliographic entry see Field 5D.
W77-09920

IMPACT OF MUNICIPAL WATER AND SEWAGE CHARGES ON INDUSTRY,
Packard and Anderson Engineers, Auburn, N. Y.
R. J. Schaffer, Jr., and B. L. Pickard.
Water and Sewage Works, Reference Issue, p 107-109, April, 1977. 4 tab.

Descriptors: *Water costs, *Cost allocation, Water policy, *Water rates, Water consumption(Except consumptive use), Water resources, Waste treatment, Industrial water, Industrial wastes, Water users, Municipal water, *Waste water treatment.

The economics of municipal waste water treatment can be staggering. One aspect of the issue is that of charges to industrial users of the systems. Increased costs for power, labor, and chemicals, in addition to federal stipulations for cost appropriation, have increased the financial responsibility of industrial customers. Minimizing such costs would necessitate a detailed analysis of water uses and waste water generation by each facility. Determination of the best means to monitor the strengths and quantity of waste water disposed to municipal systems would follow. Pretreatment of specific wastes of separate waste water treatment facilities may be justified. Alternate solutions include water metering by uses to separate water used and disposed to the system from that used and disposed by other means. The total flow of municipal water used and that of waste water discharged to sewers could be metered. Fixed charges could be negotiated, based on accurate flow data. These choices involve several considerations. The type of metering device chosen would depend on the selected solution. Reduction of municipal water usage and the development of a private additional water source should be investigated. Industries should not overlook the possibility of reducing waste water flow to municipal sewers. A case study proved that even a small plant could benefit from improvements and recover costs. (Collins-FIRL)
W77-09921

CROSS CANADA REPORT,
M. Overment.
Water and Pollution Control, Vol 115, No 3, p 14-19, 21, March, 1977. 2 fig, 1 tab.

Descriptors: *Environmental control, *Pollution abatement, *Water pollution control, *Legislation, Waste treatment, Waste disposal, Costs, *Treatment facilities, Flood control, Economics, Planning, *Waste water treatment.

A review was made of the water and sewage activities in Canada, as well as pollution control efforts. Spending on various programs reached $2.5 billion in 1976 due to an emphasis on cleanup and prevention. Spending for sewage treatment was as high as $1.2 billion. The Fisheries Act and the Canadian Waters Act were the basic enabling legislation for programs in water pollution control. The Ocean Dumping Control Act and the Environmental Contaminants Act, passed in the 1975-76 fiscal year, have affected flood control, sewage treatment, ocean dumping, and pollution control. Various activities in Province were described with a financial breakdown for water and sewage treatment. (Collins-FIRL)
W77-09923

POTENTIAL ENVIRONMENTAL CONSEQUENCES OF TERTIARY OIL RECOVERY,
Energy Resources Co., Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5C.
W77-10023

IDENTIFICATION AND ANALYSIS OF MID-ATLANTIC ONSHORE OCS IMPACTS.
Resource Planning Associates, Cambridge, Mass.
For primary bibliographic entry see Field 5C.
W77-10027

EVALUATION OF UTILITY EQUIPMENT FOR HARBOR OIL SPILL REMOVAL/RECOVERY SYSTEMS,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
S. C. Garg.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 252, Price codes: A06 in paper copy, A01 in microfiche. Technical Note no TN-1443, June 1976. 118 p, 37 fig, 15 ref, 3 append.

Descriptors: *Oil spills, *Harbors, *Estuaries, *Water pollution control, Cleaning, Equipment, Skimming.
Identifiers: *Oil booms, *Oil spill removal equipment, Utility equipment.

The following items of equipment for harbor oil spill cleanup operations were evaluated: a power assistance unit for deploying and retrieving boom, a 20-foot utility boat, a 28-foot flattop boat, three boom mooring systems, a dust abatement attachment for a sorbent distributor, and the associated connectors, shackles, and lines. A description of the test program, the test results, and recommendations for deployment, use, and retrieval of the equipment are presented. Manpower and time measurements for deployment and retrieval were made. Deficiencies in equipment, as observed, and methods to remove the deficiencies are described. (Sinha-OEIS)
W77-10031

OIL AND GAS SEEPS IN ALASKA. ALASKA PENINSULA, WESTERN GULF OF ALASKA,
Bureau of Mines, Anchorage, Alaska. Alaska Field Operation Center.
For primary bibliographic entry see Field 5B.
W77-10033

SIMULATION FACTORS INVOLVED IN OCEAN THERMAL POWER PLANTS,
Naval Academy, Annapolis, Md. Dept. of Naval Systems Engineering.
For primary bibliographic entry see Field 5B.
W77-10034

ANIMAL COLONIZATION OF MAN-INITIATED SALT MARSHES ON DREDGE SPOIL,
North Carolina State Univ., Raleigh. Sea Grant Program.
For primary bibliographic entry see Field 2L.
W77-10035

BOTTOM WITHDRAWAL CAN ENHANCE LAKE WATER QUALITY,
Arkansas Univ., Fayetteville. Dept. of Civil Engineering.
J. W. Moore.
Water and Sewage Works, Vol. 123, No. 11, p. 58-60, 1976. 2 fig., 3 ref.

Descriptors: *Water quality control, *Reservoirs, *Equipment, *Methodology, Hypolimnion, Withdrawal, *Arkansas, Nutrient removal, Algal control, Taste, Odor, Iron, Manganese, Lakes.
Identifiers: *Prairie Grove Lake(Ark).

Substantial bottom concentrations of iron and manganese in Prairie Grove Lake, Arkansas, a 4060 acre-ft water supply reservoir, forced in threatment plant operator to choose between two alternatives: withdrawing water from near the lake surface, with severe taste and odor problems, or withdrawing water from the hypolimnion. An experimental bottom withdrawal system was installed, consisting of shroud with two 48-inch diameter corrugated metal pipes attached to each side of the 'morning glory' tower. Examination of the feed stream phosphorus content showed it to be half that found in the reservoir discharge. Reduction of phosphorus in the lake would reduce nuisance algae growth and taste and odor problems caused by the algae. Preliminary examinations indicated that iron and manganese concentrations in the hypolimnion were lowered. The 'morning glory' tower spillway design, in which spilled water falls about 40 ft then moves through 300 ft of 36-inch concrete pipe prior to discharge, makes it an excellent stripping device for carbon dioxide and hydrogen sulfide. The withdrawal system does not affect chemocline or thermocline stratification, nor does it oxygenate the lower reaches of the reservoir. It was designed only as an aid to maintain water quality and was not intended as a lake restoration method. (Auen-Wisconsin)
W77-10049

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFGYL. PART 1, AVAILABLE PHOSPHORUS IN URBAN RUNOFF AND LAKE ONTARIO TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10052

BAY SPRINGS LAKE WATER-QUALITY STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W77-10055

BUTOXYETHANOL ESTER OF 2,4-D FOR CONTROL OF EURASIAN WATER MILFOIL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W77-10057

DESTRUCTION OF VEGETATION ON DAMS OF THE GORKY HYDROELECTRIC POWER PLANT WITH HERBICIDES,
For primary bibliographic entry see Field 4A.
W77-10059

PROTOZOAN AND HELMINTHIC INFECTIONS OF THE INTESTINES OF HUMANS IN THE INYANGA AREA OF RHODESIA,
Rhodesia Univ., Salisbury. Dept. of Medical Microbiology.
R. J. MacCabe, and J. M. Goldsmid.
South African Medical Journal, Vol 50, No 20, p 779-780, 1976. 1 tab, 17 ref.

Descriptors: *Protozoa, Human parasites, *Public health, Potable water, Water quality, Africa, E coli, *Human diseases.
Identifiers: Entamoeba coli, Inyanga, *Rhodesia, *Helminthic infections, Hookworm.

A survey of the protozoan and helminth species which infest the intestines of the people in the Inyanga area of Rhodesia has revealed a wide range of species. Of the protozoa, Entamoeba coli was by far the commonest species encountered (45,8%), and of the helminths, hookworms (8,2%) were the most common. (So African Water Info Ctr)
W77-10076

CONTROLLING THE ACCESS OF NUTRIENTS FROM POINT AND DIFFUSED SOURCES WITH SPECIAL REFERENCE TO THE PRETORIA/WITWATERSRAND/VEREENIGING REGION,
Johannesburg City Council(South Africa).
Water SA, Vol. 2, No. 4, p 145-149, October 1976. 4 tab, 6 ref.

Descriptors: *Nutrients, *Phosphorus compounds, Costs, Sewage treatment, Biological processes, Eutrophication, Water reuse, Urbanization, Human population, Urban runoff, Africa, Water pollution control, Waste water treatment.
Identifiers: South Africa, Witwatersrand.

The present contribution of phosphorus compounds of effluent origin to rivers and impoundments in the industrialized Pretoria/Witwatersrand/Vereeniging region is estimated on the basis of the size of the contributing population. Demographic projections are used to estimate figures for the year 2000. Costs of alternative wastewater treatment technologies are compared. Priority research areas are identified. (So African Water Info Center)
W77-10082

THE CASE FOR THE EXPANDED STUDY OF FRESHWATER POLLUTION ZOOLOGY,
Zululand Univ., Empangeni (South Africa). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-10086

ENVIRONMENTAL SCIENCES.
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 6G.
W77-10098

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMAL OPERATION OF FLOOD CONTROL SYSTEMS, (FINAL REPORT; V.II),
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering.

For primary bibliographic entry see Field 4A.
W77-09927

6B. Evaluation Process

THE FUNCTIONAL AND AESTHETIC USES OF TWO CACHE VALLEY, UTAH, CANALS,
Utah State Univ., Logan. Dept. of Landscape Architecture and Environmental Planning.
J. S. Culberson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 358, Price codes: A04 in paper copy, A01 in microfiche. Master of Landscape Architecture, 1975. 58 p, 12 fig, 4 tab, 16 ref. OWRT A-017-UTAH(2), 14-31-0001-3845.

Descriptors: *Recreation demand, Recreation facilities, Parks, Canal design, *Utah, *Multiple-purpose projects, Aesthetics, *Irrigation canals.
Identifiers: *Cache Valley(Utah).

This research is a local supplement to a wider-focused report on multiple uses of irrigation canals (see W75-04939), primarily concerned with recreational uses. Increasing magnitude and variety of use generated several use conflicts, and the need for a closer look at canal-oriented activities arose. The intent of the study is to show local residents and planning officials the present physical condition of local canals and canal corridors, their present multiple uses, the importance of Cache Valley irrigation canals as recreation systems, and some possible future canal use alternatives. A proposal to consolidate three local canals into one large concrete highline canal has been made by a few members of irrigation companies. Water loss due to seepage (approximately 30 percent) and increased water pressure in the valley below the canals are the reasons for the proposal. From an engineering point of view this proposal is logically sound. Economically, one must look at the cost of construction of 9.7 miles of concrete canal versus the long term rewards of such construction, especially irrigation efficiencies and water demands of Cache Valley. Water demands have marginally exceeded water supply in only a few drought years, and water excess is common. Average excess was 11,220 acre feet for the upper canal and average deficit was 228 acre feet. Sprinkler irrigation distributes the water more evenly and uses less water; the problem of water deficit could be minimumized by using trickle systems. The 30 percent water loss should not be considered all wasted. Seepage water supports trees and other dense stands of vegetation, which attract birds and other wildlife to the canals. Proper impact evaluation and cost effectiveness should be required before any serious efforts towards construction of highline canal system are made.
W77-09796

ARID LANDS OF SUB-SAHARAN AFRICA.
National Academy of Sciences, Washington, D.C. Commission on International Relations.
For primary bibliographic entry see Field 6E.
W77-09934

WATER RESOURCES ASSESSMENT METHODOLOGY (WRAM)--IMPACT ASSESSMENT AND ALTERNATIVE EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 6G.
W77-09985

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

URBAN RUNOFF POLLUTION CONTROL--TECHNOLOGY OVERVIEW,
Municipal Environmental Research Lab., Cincinnati, Ohio. Wastewater Research Div.
For primary bibliographic entry see Field 5D.
W77-09823

STORM WATER MANAGEMENT MODEL: LEVEL I--COMPARATIVE EVALUATION OF STORAGE-TREATMENT AND OTHER MANAGEMENT PRACTICES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Science.
For primary bibliographic entry see Field 5D.
W77-09824

NATIONWIDE EVALUATION OF COMBINED SEWER OVERFLOWS AND URBAN STORMWATER DISCHARGES. VOLUME II: COST ASSESSMENT AND IMPACTS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W77-09874

IMPACT OF MUNICIPAL WATER AND SEWAGE CHARGES ON INDUSTRY,
Packard and Anderson Engineers, Auburn, N. Y.
For primary bibliographic entry see Field 5G.
W77-09921

TACONITE TAILINGS DISPOSAL, RESERVE MINING COMPANY, SILVER BAY, MINNESOTA.
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5C.
W77-10062

IMPACT OF ECONOMIC RISKS ON BOX CULVERT DESIGNS--AN APPLICATION TO 22 VIRGINIA SITES,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 8B.
W77-10067

6D. Water Demand

AN APPROACH TO REDUCE WATER CONSUMPTION IN NEIGHBORHOODS THROUGH REUSE,
Sir Venkateswara Univ., Tirupati (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-09855

WATER-RESOURCES APPRAISAL OF THE CARSON RIVER BASIN, WESTERN NEVADA,
Geological Survey, Carson City, Nev. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-09992

WATER RESOURCES OF THE UMATILLA INDIAN RESERVATION, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-10011

6E. Water Law and Institutions

CROSS CANADA REPORT,
For primary bibliographic entry see Field 5G.
W77-09923

ARID LANDS OF SUB-SAHARAN AFRICA.
National Academy of Sciences, Washington, D.C. Commission on International Relations.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 594, Price codes: A03 in paper copy, A01 in microfiche. Staff final report, NAS/NRC Advisory Panel of the Board on Science and Technology for International Development, Prepared for the Agency for International Development, 1975. 36 p.

Descriptors: *Arid lands, *Africa, *Droughts, *Long-term planning, *Water resources development, Climatic data, Meteorological data, Food abundance, Productivity, Manpower, Education, Transportation, Communication, Data collections, River basin development, Watersheds(Basins), Public health.
Identifiers: Board of Science and Technology for International Development(BOSTID), *Sahel.

Problems of long-term development of the Sahel are discussed, and conclusions are presented. The current weather pattern in the Sahel suggests severe drought cycles will continue and should be included as a factor in long-range planning. Food security, education in rural areas, and transportation and communication systems must be upgraded. Improvements in the predictive capacity of meteorological services, information on soil and water resource development and food production capacity are also crucial. Development of large-scale water resources projects in the great river basins of the area must not cause neglect of opportunities for small-scale water resource development. Recommendations are outlined as part of a long-term strategy for development. (Jahns-Arizona)
W77-09934

FEDERAL PLAN FOR ACQUISITION OF WATER DATA BY FEDERAL AGENCIES, FISCAL YEAR 1977.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10013

6G. Ecologic Impact Of Water Development

THE ORIGIN AND STRUCTURE OF AMERICAN ARID-ZONE ECOSYSTEMS. THE PRODUCERS: INTERACTIONS BETWEEN ENVIRONMENT, FORM AND FUNCTION,
San Diego Univ., Calif. Dept. of Biology.
For primary bibliographic entry see Field 2A.
W77-09933

WATER RESOURCES ASSESSMENT METHODOLOGY (WRAM)--IMPACT ASSESSMENT AND ALTERNATIVE EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. C. Solomon, W. J. Hansen, L. W. Canter, B. K. Colbert, and S. E. Richardson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 677, Price codes: A08 in paper copy, A01 in microfiche. Technical Report Y-77-1, February 1977. 150 p, 5 fig, 12 tab, 25 ref, 4 append.

Descriptors: *Environmental effects, Environment, Planning, *Water resources, *Evaluation, *Methodology, *Alternative planning, Reviews.
Identifiers: *Environmental impact assessment.

The U.S. Army Corps of Engineers has been directed by various legislation, acts, and regulations to conduct systematic and comprehensive environmental planning for its activities. The thrust of this study has been to pull together the state of the art and to synthesize a water resource assessment methodology (WRAM) for impact assessment and alternative evaluation. A review of 54 impact assessment methodologies revealed that none entirely satisfied the needs or requirements for the Corps' water resources projects and programs. However, salient features contained

several of the methodologies were considered pertinent for inclusion in WRAM. One of the features consisted of weighting impacted variables and scaling the impact of alternatives. The resulting weighted and scaled values are multiplied to obtain final importance values. The weighted rankings technique is the basic weighting and scaling tool used in this methodology. It consists of developing relative importance coefficient values for each variable, assigning alternative choice coefficient values to each alternative in relation to its impact on each variable, and displaying the products in a final coefficient matrix. (WES)
W77-09985

POTENTIAL ENVIRONMENTAL CONSEQUENCES OF TERTIARY OIL RECOVERY,
Energy Resources Co., Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5C.
W77-10023

IDENTIFICATION AND ANALYSIS OF MID-ATLANTIC ONSHORE OCS IMPACTS.
Resource Planning Associates, Cambridge, Mass.
For primary bibliographic entry see Field 5C.
W77-10027

REPORT ON A BIOLOGIC AND SEDIMENTOLOGIC STUDY RELATED TO THE TYBEE ISLAND BEACH NOURISHMENT PROJECT AND THE OFFSHORE AREA FOR DREDGE MATERIAL DISPOSAL,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 2L.
W77-10029

THE CASE FOR THE EXPANDED STUDY OF FRESHWATER POLLUTION ZOOLOGY,
Zululand Univ., Empangeni (South Africa). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-10086

A CHECK LIST AND NOTES ON THE BIRDS OF SANDVIS, SOUTH WEST AFRICA,
South African Div. of Nature Conservation and Tourism, Etosha. Ecological Inst.
For primary bibliographic entry see Field 2L.
W77-10089

ENVIRONMENTAL SCIENCES.
Council for Scientific and Industrial Research, Pretoria (South Africa).
S. Jackson.
Scientiae, Vol. 16, No. 4, p 8-15, August 1975. 12 fig.

Descriptors: *Ecosystems, *Water pollution, Aquatic weeds, *Environmental effects, Management, Climatology, Primary productivity, Air pollution, Reservoir silting, Irrigation, Photosynthesis, Africa, *Ecology.
Identifiers: Nylsvley, Pongola River, Lake Sibaya, Wilderness lakes, South Africa.

The South African National Committee on Environmental Sciences has confined the scope of its activities to man's natural environment. Attention is focussed on the working of the environment considered as a living system in which man finds a place; on problems of its management; on preserving vegetation types; and preventing environmental deterioration. Two ecological systems were chosen for special study because of their applicability to other systems. The first study is of a savanna system in the Nylsvley reserve between Naboomspruit and Potgietersrus, in the Transvaal. A fundamental examination of the savanna region bordering the southern tropic has been undertaken. This involves studying the energy cycle through the system. A multi-disciplinary study has been planned to establish how the ecosystem works and what stresses are imposed by man's presence. Later it is hoped to point out how stress on the system can be avoided by better management, and what the human occupation capacity of the area is. Other projects of the National environmental program include inland waters, coastal lakes, air pollution, inversion climatology, and heat islands over large cities. (So. African Water Info. Center)
W77-10098

LAKE SIBAYA - A LAND-LOCKED ESTUARY,
Rhodes Univ., Grahamstown (South Africa) Inst. of Freshwater Studies.
For primary bibliographic entry see Field 2H.
W77-10099

7. RESOURCES DATA

7A. Network Design

ELEMENTS NEEDED IN DESIGN OF A GROUND-WATER-QUALITY MONITORING NETWORK IN THE HAWAIIAN ISLANDS,
Geological Survey, Honolulu, Hawaii. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-09995

FEDERAL PLAN FOR ACQUISITION OF WATER DATA BY FEDERAL AGENCIES, FISCAL YEAR 1977.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10013

7B. Data Acquisition

AN AUTOMATIC SCANNING APPARATUS FOR GAMMA SPECTROMETRY FOR THE DETERMINATION OF THE MOISTURE CONTENT IN SOIL COLUMNS, (IN DUTCH),
For primary bibliographic entry see Field 2G.
W77-09613

A PRACTICAL APPARATUS FOR QUANTITATIVE SAMPLING OF EPILITHIC PERIPHYTON, (IN FRENCH),
Liege Univ. (Belgium). Dept. of Botany.
J. P. Descy.
Bull Soc R Bot Belg 199(1), p 43-47, 1976.

Descriptors: Sampling, Equipment, Periphyton, Diatoms, Rivers, Instrumentation.
Identifiers: *Belgium, *Epilithic periphyton, River Meuse(Belgium).

An apparatus, derived from the original one of Douglas, was designed for the sampling of epilithic periphyton, without losses, from a known area. A study of the variability of sampling, for diatoms, was made in 1 station of the Belgian part of the river Meuse.--Copyright 1977, Biological Abstracts, Inc.
W77-09623

DETERMINATION OF HYDRAULIC PARAMETERS TO ESTIMATE WATER MOVEMENT AND WATER STORAGE IN UNDISTURBED SOIL: COMPARISON OF FIELD AND LABORATORY METHODS, (IN GERMAN),
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W77-09624

A METHODOLOGY FOR COMPARATIVE EVALUATION OF WATER QUALITY INDICES,
Worcester Polytechnic Inst., Washington, D. C. Project Center.
For primary bibliographic entry see Field 5A.
W77-09632

CLASSIFYING AND MONITORING WATER QUALITY BY USE OF SATELLITE IMAGERY,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W77-09634

CATION-EXCHANGE CAPACITY OF ACID SOILS USING ALUMINUM CHLORIDE AND BARIUM CHLORIDE-TRIETHANOLAMINE,
Klamath National Forest Yreka, Calif.
For primary bibliographic entry see Field 2G.
W77-09652

TEMPORALLY AND AREALLY DISTRIBUTED RAINFALL,
Agricultural Research Service, Athens, Ga. Southeast Watershed Lab.
For primary bibliographic entry see Field 2B.
W77-09696

EXPERIENCES WITH THE USE OF THE AEROLOGICAL METHOD IN EVAPORATION STUDIES IN NORTHWESTERN EUROPE,
Helsinki Univ. (Finland). Dept. of Meteorology.
For primary bibliographic entry see Field 2D.
W77-09710

A MODEL OF TRANSPIRATION AND INTERCEPTION LOSS FROM A SPRUCE FOREST IN PLYNLIMON, CENTRAL WALES,
Institute of Hydrology, Oxon (England).
For primary bibliographic entry see Field 2D.
W77-09711

A LABORATORY MODEL TO INVESTIGATE THE SOIL MOISTURE CONDITIONS ON A DRAINING SLOPE,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2G.
W77-09712

A SIMPLE HAND CORER FOR SHALLOW WATER SAMPLING,
Southwest Research Inst., Houston, Tex.
J. H. Baker, L. A. Pugh, III, and K. T. Kimball.
Chesapeake Science, Vol 18, No 2, p 232-236, June 1977. 3 fig, 2 tab, 15 ref.

Descriptors: *Sampling, *Cores, *Equipment, *Sediments, Shallow water, Estuaries, Benthos, Benthic fauna, Benthic flora, Pesticides, Heavy metals, Oil, Sand, Mud, Silts, Monitoring, Sedimentology.
Identifiers: *Sediment corers.

A simple, inexpensive 2 in Hand Corer was developed for efficiently sampling most types of shallow water sediments. The corer consists of a Lexan plastic core tube, 1-1/2 in -check valve unit, and polyvinyl chloride tube handle. The 2 in Hand Corer consistently collected higher mean densities of organisms than did the Mackin Corer, resulting in more precise estimates of the mean densities of the collected taxa. Undisturbed sediment samples for pesticide, oil and grease, and heavy metals analysis also were collected. (Sims-ISWS)
W77-09715

STANDARDIZATION OF METHYLMERCURY ANALYSIS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5A.

W77-09775

ENVIRONMENTAL APPLICATIONS OF ADVANCED INSTRUMENTAL ANALYSES: ASSISTANCE PROJECTS, FY 75,
Environmental Research Lab., Athens, Ga. Analytical Chemistry Branch.
For primary bibliographic entry see Field 5A.
W77-09782

OCEANOGRAPHIC WATER SAMPLER,
E. Ratigan.
U.S. Patent No. 4,002,066, 6 p, 5 fig, 4 ref; Official Gazette of the

Descriptors: *Patents, Oceanography, *Sampling, *Water sampling, On-site-data collections, On-site tests, Time series analysis.
Identifiers: *Oceanographic water samplers.

In order to solve the difficulty of a relatively long time delay before a test can be made on an oceanographic water sample, this invention permits adding reagents, in situ, at the time and place where the sample is taken before any change in oxygen contents can be made by change of temperature or handling of the sample. A container has a pair of covers which can be closed. Means are provided to add chemicals to the trapped water in the container at the same location where and when the sample is taken. Ampules containing the chemical are mounted in the container and knives are connected to break the ampules at predetermined times. A time delay device is provided so that a first chemical may be added to the trapped water at a certain time, and the second chemical may be added to the trapped water after a predetermined time delay. (Sinha-OEIS)
W77-09799

ACOUSTICAL WAVE FLOWMETER,
Institutes of Medical Sciences, San Francisco, Calif. (Assignee).
E. J. Dewath.
U.S. Patent No. 4,003,252, 9 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 954, no 3, p 1011, January 18, 1977.

Descriptors: *Patents, *Flowmeters, *Instrumentation, Velocity, Flow measurement, Acoustics, Sound waves.
Identifiers: Transducers.

The invention comprises an acoustical wave flowmeter in which the transmitting and receiving transducers are mounted in the fluid flow conduit in such a manner as to provide a smooth walled flow conduit having no substantial protuberances into the fluid flow path or cavities. A housing having rigid walls is provided with an inner liner of acoustic damping material in which four transducers are mounted, the inner surfaces of the transducers having substantially the same shape and dimensions as the inner wall surface of the liner of acoustic damping material. Two transducers are spaced a fixed distance and are operated exclusively in a receive mode; while the two outer transducers are operated exclusively in a transmit mode. In operation, the outer transmit transducers are alternately energized to generate compressional waves which travel from the transmitting transducer to the receiving pair in the upstream and downstream directions, respectively. By measuring the phase difference between waves traveling in the upstream and downstream directions and received by the receiving transducer pair, the velocity of fluid flow in the conduit is readily determined. (Sinha-OEIS)
W77-09809

AN EVALUATION OF TOTAL SOLAR REFLECTANCE AND SPECTRAL BAND RATIOING TECHNIQUES FOR ESTIMATING SOIL WATER CONTENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W77-09957

THE GREAT DISMAL SWAMP: MANAGEMENT OF A HYDROLOGIC RESOURCE WITH THE AID OF REMOTE SENSING,
Geological Survey, Reston, Va. Water Resources Div.; and Great Dismal Swamp National Wildlife Refuge, Suffolk, Va.; and National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2H.
W77-10007

WATER COLOR AND CIRCULATION SOUTHERN CHESAPEAKE BAY. PART I. SOUTHERN CHESAPEAKE BAY WATER COLOR AND CIRCULATION ANALYSIS, PART II. SKYLAB MSS VS. PHOTOGRAPHY FOR ESTUARINE WATER COLOR CLASSIFICATION,
Virginia Inst. of Marine Science, Gloucester Point. Applied Marine Science and Ocean Engineering.
For primary bibliographic entry see Field 2L.
W77-10026

UNDERWATER HABITATS FOR SCIENTIFIC RESEARCH IN THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
L. H. Somers, and R. F. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 662, Price codes: A02 in paper copy, A01 in microfiche. In: Proceedings 13th Conference of Great Lakes Research, p 1041-1049, 1970. 2 fig, 5 ref. (Univ. of Michigan Great Lakes Research Div. Contribution No. 142). NSF GA-4507, GA-352 and SG GH-50.

Descriptors: *Underwater, *Bathymetry, *Caissons, *Watertight, *Equipment, On-site investigations, Anchors, *Great Lakes, Diving, Nutrient requirements, Benthic flora, Spatial distribution, Diurnal.
Identifiers: *Underwater habitats(Sublimnos), *Diving equipment, Underwater mapping.

Description is given of the use of a small, inexpensive shallow-water underwater habitat, Sublimnos, which rests at a depth of 30 ft. in Little Dunks Bay on the Bruce Peninsula in Georgian Bay, Ontario. This habitat, a vertically-oriented cylinder 9 ft. high and 8 ft. in diameter, provides about 350 cu. ft. of living space and is designed to serve as a shallow-water 'explorer's tent' to increase an observer's daily underwater time during the 2 years it is designed to remain in place. The steel personnel chamber is anchored by a lower cylinder which contains about 10 tons of ballast. Underwater operations for which Sublimnos have been used include a nutrient enrichment experiment with phytoplankton populations, in-situ measurements of production rates of benthic algae, a study of the spatial distribution of macrobenthic invertebrates, a time study of the behavior and ecological relationships of certain populations which variations between day and night periods, and an evaluation of two methods of underwater mapping which proved applicable to areas of moderate-to-good subsurface visibility. The Sublimnos habitat, while limited in depth, duration of use and comfort, costs only $10,000-$30,000 to build and can be operated on an annual budget of $40,000-$50,000. (Harris-Wisconsin)
W77-10060

7C. Evaluation, Processing and Publication

A FOOD WEB MODEL FOR LAKE MICHIGAN: PART I-JUSTIFICATION AND DEVELOPMENT OF THE MODEL,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W77-09631

AN ELECTRIC ANALOG AND DIGITAL COMPUTER MODEL OF THE CHIPUXET GROUND WATER AQUIFER, KINGSTON, RHODE ISLAND,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W77-09637

PRECIPITATION TREND AND STORM ANALYSIS IN COLORADO.
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 2C.
W77-09685

SATELLITE-DERIVED GLOBAL OCEANIC RAINFALL ATLAS (1973 AND 1974),
National Aeronautics and Space Administration, Greenbelt. Goddard Space Flight Center.
M. S. V. Rao, W. V. Abbott, III, and J. S. Theon.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Catalog No. C/N NAS1. 21:410. NASA SP-410, June 1976. 181 p, 14 fig, 2 ref, 5 append.

Descriptors: *Atlantic Ocean, *Pacific Ocean, *Rainfall, *Indian Ocean, *Maps, *Data collections, Monthly, Seasonal, Annual, Oceans, Remote sensing, Distribution patterns, Rainfall intensity, Rates, Precipitation(Atmospheric), Spatial distribution, Satellites(Artificial).
Identifiers: *Rainfall maps, Rainfall patterns, *Oceanic rainfall atlas.

Based on the relationship between satellite-borne Electrically Scanning Microwave Radiometer brightness temperatures and rain-rates over oceans, quantitative maps of rainfall were obtained from Nimbus-5 microwave data. Weekly, monthly, seasonally, and annually averaged maps were generated from December 1972 through February 1975. From the maps, analysis was made of the patterns of rainfall in the three major oceanic areas of the world; namely, the Pacific, Atlantic, and Indian Oceans. It was shown that the data permit the monitoring of features such as the movement of the Intertropical Convergence Zone and the advance of the Indian Monsoon. An interesting rainfall pattern in the Pacific, associated with the El Nino phenomenon, was revealed. A possible interpretation of the pattern in terms of local variation of the Hadly cell circulation was discussed. The variations in oceanic rainfall and its latent heat release (which has also been computed) should provide useful inputs to numerical models and to studies of planetary energy and water budgets. (Froehlich-ISWS)
W77-09693

COMPUTER INTERPRETATION OF POLLUTANT MASS SPECTRA,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5A.
W77-09776

COMPUTER APPLICATION IN WATER AND WASTE WATER MANAGEMENT: A PANEL DISCUSSION,
Houston Univ., Tex. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.

W77-09903

WATER SUPPLY FROM SHELBYVILLE AND CARLYLE LAKES AND THEIR OPTIMAL JOINT OPERATION,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-09943

SENSITIVITY ANALYSIS OF THE WATER QUALITY FOR RIVER-RESERVOIR SYSTEMS MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5B.
W77-09981

THE COCKFIELD AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
C. A. Spiers.
Water-Resources Investigations 77-17 (open-file report), April 1977. 3 sheets, 17 fig, 3 tab, 14 ref.

Descriptors: *Groundwater resources, *Mississippi, *Aquifer characteristics, *Water supply, *Water quality, Well data, Water users, Pumping, Water yield, Specific capacity, Drawdown, Water wells, Hydrologic data, Hydrogeology, Mapping.
Identifiers: *Cockfield Formation(Miss), Eocene aquifers, Claiborne Group.

The Cockfield Formation in the upper part of the Claiborne Group of Eocene age is a principal source of water supplies in Mississippi. The Cockfield Formation consists of beds of fine to medium sand, sandy carbonaceous clay, and thin beds of lignite. The largest withdrawal from the aquifer is in the Greenville-Leland area in Washington County where about 7.3 mgd was pumped in 1975. Long-term water-level trends indicate an average decline of about 1.5 ft per year. Specific capacity of wells in the Cockfield ranges from about 1.6 to 4.3 (gal/min)/ft. The dissolved-solids concentration in the water increases downdip to the west and the south. The Cockfield aquifer will continue to be major source of water supply in Mississippi and well fields producing 1 to 3 mgd can be developed in many places. (Woodard-USGS)
W77-09991

COMPUTATION OF UNSTEADY FLOWS IN RIVERS AND ESTUARIES BY THE METHOD OF CHARACTERISTICS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-09993

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1976 WATER YEAR,
Geological Survey, Little Rock, Ark. Water Resources Div.
R. K. Knott.
Open-file report 77-401, May 1977. 16 p, 2 tab.

Descriptors: *Streamflow, *Discharge measurement, *Flow rates, *Arkansas, Water quality, *Data collections, Sites, Basic data collections.

Streamflow data are presented for a network of water-quality monitoring stations operated by the Arkansas Department of Pollution Control and Ecology. Discharge on days of sampling was determined for about 75 of the sites. A summary of those discharges for the water year 1976 is tabulated. Several discharges for miscellaneous dates in the 1974 and 1975 water years are shown also. (Woodard-USGS)
W77-09997

SELECTED WATER-LEVEL RECORDS FOR WESTERN OKLAHOMA, 1975-1976,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
R. L. Goemaat.
Open-file report 77-239, 1977. 50 p, 1 fig, 1 tab.

Descriptors: *Groundwater resources, *Water levels, *Water wells, *Irrigation, *Oklahoma, Basic data collections, Sites, Observation wells, Water level fluctuation, Aquifers.
Identifiers: Western Oklahoma.

Ground-water-level measurements and water level changes are tabulated for about 860 wells in 25 counties of western Oklahoma where ground water is heavily used for irrigation. Measurements were made in major aquifers of the area including the Ogallala Formation, Rush Springs Sandstone, Blaine Gypsum, Cimarron terrace, and Tillman terrace. The data are subdivided by counties. (Woodard-USGS)
W77-09998

GROUND-WATER LEVELS IN OBSERVATION WELLS IN OKLAHOMA, 1975,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
R. L. Goemaat.
Open-file report 77-238, 1977. 35 p, 1 fig, 1 tab.

Descriptors: *Groundwater resources, *Water levels, *Basic data collections, *Oklahoma, Observation wells, Sites, Aquifers, Water level fluctuations, Water supply.

Ground-water-level measurements made in 42 observation wells throughout Oklahoma are tabulated for the calendar year 1975. The data are subdivided by counties. The objectives of the observation-well program are (1) to provide long-term records of water-level fluctuations in representative wells, (2) to facilitate the prediction of water-level trends and indicate the future availability of ground-water supplies, and (3) to provide information for use in basic research. (Woodard-USGS)
W77-09999

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1975--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, Ohio. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 782, Price codes: A24 in paper copy, A01 in microfiche.
Water-Data Report OH-75-1, 1976. 578 p, 1 fig, 4 tab, 33 ref.

Descriptors: *Ohio, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.

Water resources data for the 1975 water year for Ohio consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells. This report contains discharge records for 238 gaging stations; stage and contents for 32 lakes and reservoirs; water quality for 174 gaging stations, and 12 wells; and water levels for 25 observation wells. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Ohio. (Woodard-USGS)
W77-10000

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1975--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey Columbus, Ohio. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 783, Price codes: A11 in paper copy, A01 in microfiche.
Water-Data Report OH-75-2, 1976. 258 p, 1 fig, 4 tab, 33 ref.

Descriptors: *Ohio, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.
Identifiers: *St. Lawrence River basin(Ohio).

Water resources data for the 1975 water year for Ohio consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells. This report for the St. Lawrence River basin, contains discharge records for 59 stations; water quality for 50 stations, and 3 wells; and water levels for 8 observation wells. Additional water data were collected at various sites, not part of the systematic data collection program, and are published in separate tables. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State, Federal, and other governmental agencies in Ohio. (Woodard-USGS)
W77-10001

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1975.
Geological Survey, Cheyenne, Wyo. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 841, Price codes: A99 in paper copy, A01 in microfiche.
Water-Data Report WY-75-1, October 1976. 646 p, 5 fig, 4 tab, 40 ref.

Descriptors: *Wyoming, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.

Water resources data for the 1975 water year for Wyoming consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 215 gaging stations; stage only records for 1 lake; stage and contents for 16 lakes and reservoirs; water quality for 126 gaging stations, 6 partial-record flow stations, 4 lakes, and 188 wells; and water levels for 48 observation wells. Also included are 114 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Wyoming. (Woodard-USGS)
W77-10002

ANNUAL WATER-RESOURCES REVIEW WHITE SANDS MISSILE RANGE, 1976 - A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10005

WATER QUALITY PROGRAM OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-10006

FEDERAL PLAN FOR ACQUISITION OF WATER DATA BY FEDERAL AGENCIES, FISCAL YEAR 1977.
Geological Survey, Reston, Va. Water Resources Div.
Office of Water Data Coordination report, December 1976. 86 p, 2 fig, 8 tab, 3 append.

Descriptors: *Hydrologic data, *Data collections, *Networks, *Projects, *United States, Data storage and retrieval, Federal government, Governmental interrelations, Regional analysis.
Identifiers: *National Water Data Network.

The Federal Plan for the Acquisition of Water Data summarizes the activities planned for fiscal year (FY) 1977 by Federal agencies concerned with the acquisition and use of water data. The Federal Plan is prepared each year by the Geological Survey's Office of Water Data Coordination (OWDC) in compliance with Office of Management and Budget (OMB) Circular A-67 which states: '...the Department of the Interior will prepare and keep a Federal Plan, and the status of its implementation, for the efficient utilization of network and related specialized water-data acquisition activities.' Compilation is based principally on 'Regional Plans' prepared for each of the 21 water resources regions. The scope for reporting on station activities includes long-term (3 or more years of continuous operation) groundwater quality stations and stage, discharge, and water-quality stations on surface water bodies. The practice, which began in the FY 1976 field coordination cycle, of including information on both long-term and short-term (less than 3 years continuous operation) surface-water station activities of the Geological Survey was continued through the FY 1977 cycle, and this information also is included in this report. (Woodard-USGS)
W77-10013

FLUCTUATIONS OF GROUND-WATER LEVELS IN LEE COUNTY, FLORIDA, IN 1975 WATER YEAR,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-10014

1976 WATER-QUALITY DATA IN BEAR CREEK BASIN, MEDFORD, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-10015

A DYNAMIC WATER QUALITY MODEL FOR THE NEUSE ESTUARY, N.C.,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-10037

METHOD OF ANALYZING SOME EXPERIMENTAL DATA ON ZOOPLANKTON, (IN RUSSIAN),
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 2I.
W77-10038

8. ENGINEERING WORKS

8A. Structures

THROUGH THE ANDES.
South African Tunnelling, Vol 1, No 3, p 4-5, 1976.

Descriptors: Irrigation design, *Tunnel construction, *Dam construction, Reservoir construction, *South America, Irrigation engineering, *Irrigation systems, *Tunnel design, Flumes, Diversion structures.
Identifiers: South Africa, *Peru(Majes irrigation scheme), Andes mountains.

Concor Construction has been allocated the task of building eight tunnels totalling 11 km in length as part of the massive Majes irrigation scheme project in Peru. It is working on the project in conjunction with companies from Canada, England, Spain and Sweden. Described are the South African company's share in the project, the design and construction of a factory for the manufacture of precast flumes and the construction of a reservoir and dam at Condoroma which will control the Colca River. (So. African Water Info Center).
W77-09687

TUNNELLING WORK FOR THE RUACANA SCHEME,
E. P. Chunnett.
South African Tunneling, Vol 1, No 4, p 6-13, 1976.

Descriptors: Rock excavation, Tunnel construction, Shafts, Hydroelectric plants, Rock mechanics, Africa.
Identifiers: *Ruacana scheme(SWA), Cunene River, *South West Africa.

Underground excavations totalling nearly 370 000 m3 were needed for the various tunnels, caverns, shafts, special galleries and construction adits for the hydropower station at Ruacana. In addition surface excavations for portals and the large surge headbay amounted to almost 300 000 m3, apart from a further 120 000 m3 involved in foundations for the diversion weir. Other than the lower heading for the tailrace tunnel, all excavations have been completed. Described the scheme being undertaken by the SWA Water and Electricity Corporation with the objective of generating hydropower with an annual output of some 1 200 GWh which will be transmitted into the SWA grid. (So. African Water Info Center).
W77-09688

DURBAN TUNNELS UNDER THE MICROSCOPE,
Durban City Engineers Dept. (South Africa).
D. C. MacLeod.
South African Tunnelling, Vol 1, No 3, p 23-28, 1976. 2 tabs.

Descriptors: Tunnel design, Tunnel construction, Drainage engineering, Sewers, Africa.
Identifiers: Durban(South Africa).

The important role played by tunnels in the past and future development of Durban is underlined in this article written by the City's Engineer. Tunnels will be used to an even greater extent in meeting the anticipated engineering requirements of the city. A description is given of the tunnels that have been constructed and are being planned for the supply of raw water for water purification works as well as for drainage and sewerage purposes. (So. African Water Info Center).
W77-09689

A UNIQUE MEANS OF OBTAINING SEA-WATER,
South West African Consolidated Diamond Mines Ltd., Oranjemund.
For primary bibliographic entry see Field 8E.
W77-09692

PENNSYLVANIA WASTE WATER PROJECT PROGRESSES QUICKLY.
For primary bibliographic entry see Field 5D.
W77-09840

CITY OF MINNETONKA WING LAKE TRUNK SEWER: CITY OF MINNETONKA, MINNESOTA.
For primary bibliographic entry see Field 5D.
W77-09842

NEW SEWER SYSTEM RESISTS INFILTRATION.
For primary bibliographic entry see Field 5D.
W77-09843

SAFFRON WALDEN OPENS ITS LOW PROFILE SEWAGE WORKS,
For primary bibliographic entry see Field 5D.
W77-09872

CONSTRUCTION MANAGEMENT FOR WASTE WATERTREATMENT PLANTS,
CM Associates, Inc., Houston, Tex.
For primary bibliographic entry see Field 5D.
W77-09920

WATER RESOURCES ASSESSMENT METHODOLOGY (WRAM)--IMPACT ASSESSMENT AND ALTERNATIVE EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 6G.
W77-09985

MAKING SURE OF PIPELINE PERFORMANCE,
Construction in Southern Africa, Vol. 21, No. 3, p 53-57, June 1976. Illustrated.

Descriptors: *Pipelines, *Performance, Sewers, Drains, *Instrumentation, Africa.
Identifiers: *South Africa.

In the wake of new recommendations for the air testing of sewers and drains by the Council for Scientific and Industrial Research's National Building Research Institute, a South African company has designed what is claimed to be a reliable and simple unit to carry out these important checks. Due to the unavailability of a versatile and economic method of testing, several municipalities have admitted that their checking methods have not been as comprehensive as they would like. (So. African Water Info Ctr)
W77-10068

THE DAM BUSTERS,
Construction in Southern Africa, Vol. 20, No. 12, p 39-47, March 1976. 4 fig.

Descriptors: Disasters, *Dam failure, Dam sites, Damage control, Damage criteria, Africa, *Foundation failure.
Identifiers: Bouzey Dam, Marshall Creek Dam, Dokan Dam, Dolgarrog Dam, *South Africa.

Most structural failures result in fairly localized damage. The failure of a dam is something else again, for thousands of tons of unrestrained water can leave a wake of destruction that includes farmlands, industries and wholesale loss of life, both human and animal. Some of the world's dam failures are described. (So. African Water Info Ctr)
W77-10070

CAPE TOWN'S STEENBRAS HYDRO-ELECTRIC PUMPED STORAGE SCHEME,
Siemens (Pty) Ltd., Cape Town (South Africa).
G. K. Maier.
Vector, No. 4, p 24-40, April 1976. 3 fig.

Descriptors: Pumped storage, Hydro-electric plants, Dam design, Tunnel design, Hydraulic aspects.
Identifiers: Steenbras dam, South Africa.

The Steenbras hydro-electric pumped storage scheme will utilize cheap off-peak power available at night to pump water from a lower reservoir to an upper mountain reservoir in order to utilize the energy thus stored to generate power to meet the peak demand during day-time hours. Thus, the Cape Town Municipality will have at its doorstep a 180 MW supply plant which should be adequate to cater for the city's requirements for many years to come. Details regarding the dams, machine sites, power house and tunnels are given. (So. African Water Info Ctr)
W77-10071

THE DAY THEY ALMOST ABANDONED THE ORANGE-FISH TUNNEL,
H. Olivier.
Construction in Southern Africa, Vol 20, No 10, p 41-43, January 1976. 2 illus.

Descriptors: *Tunnel construction, Legal aspects, *Costs.
Identifiers: *Orange-Fish Tunnel(South Africa).

So enormous was the cost escalation during the construction of the Orange-Fish tunnel that one of the contractors was forced to issue summons on the South African Minister of Water Affairs while the other consortia involved recommended abandoning the project. These facts are revealed in a book released by the author, who is a former chairman of LTA and probably the world's leading expert on major dam design. (So African Water Info Ctr)
W77-10077

8B. Hydraulics

THROUGH THE ANDES.
For primary bibliographic entry see Field 8A.
W77-09687

BRINK DEPTH METHOD IN RECTANGULAR CHANNEL,
Agricultural Univ., Wageningen (Netherlands). Dept. of Hydrology and Catchment Hydrology.
J. A. Kraijenhoff, and A. Dommerholt.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 103, No. IR2, Proceedings Paper 12971, p 171-177, June 1977. 5 fig, 11 ref, 1 append.

Descriptors: *Critical flow, *Channels, Roughness(Hydraulic), Open channel flow, Open channels, Reynolds number, Mathematical studies, Roughness coefficient slopes, Subcritical flow, Channel flow, Hydraulics.
Identifiers: *Critical depth, Rectangular channels, Brink depth method.

Supplementary experiments for the brink depth method in a rectangular channel were described, including changes of channel slope and channel roughness. The ratio of the end depth and the critical depth as suggested by Rouse, was confirmed for Reynolds numbers ranging from 20,000 to 1,000,000. (Lee-ISWS)
W77-09695

SHALLOW MARINE SAND BAR SEQUENCES: AN EXAMPLE FROM THE LATE PRECAMBRIAN OF NORTH NORWAY,
Oxford Univ. (England). Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2J.
W77-09699

DESIGN AND OPERATION OF RAIN SPILLWAYS AND RAIN OVERFLOW CATCHMENT (ENTWURF AND BETRIEB VON REGENUBERLAUFEN (RU) UND REGENUBERLAUFBECKEN (RUB),
S. Pfeiff.
Berichte der Abwassertechnischen Vereinigung e.V., No. 29, p 127-146, 1976. 11 fig.

Descriptors: *Storm runoff, *Watersheds(Basins), *Spillways, *Design criteria, *Operations, Overflow, Canal construction, Precipitation(Atmospheric), Water storage, Dam construction.

Detailed description is given of the design and operation of rain spillways and rain overflow catchment basins. Feed canals should have triangular or half-cup cross-sections to prevent sludge sedimentation from back-water. The overflow dam should be at least 25 cm above the feed danal sole, and it should be as long as possible. (Takacs-FIRL)
W77-09822

CRITICAL AND BRINK DEPTHS IN ELLIPTICAL SEWERS,
A. S. Paintal.
Water and Sewage Works, Reference Issue, p 172-173, April, 1977. 3 fig.

Descriptors: *Sewers, *Non-uniform flow, *Channel flow, *Flow rates, Subcritical flow, Overfalls, Physical properties, Conveyance structures, Mathematical studies, Equations.
Identifiers: Critical depth, Brink depth, *Elliptical sewers.

A method for the determination of critical depth in elliptical sewers was presented. Flow estimation involved measurement of brink depth. Brink depth was the result of a subcritical sewer flow at a free overfall critical depth upstream of the overfall. The brink depth to critical depth ratio is constant and provides a method for critical depth determination. Basic elliptical geometry was combined with mathematical expressions for the determination of critical depth and brink depth. This resulted in equations which could be used to formulate functional relationships between the two depths. (Collins-FIRL)
W77-09841

BUOYANT SURFACE JETS DISCHARGED INTO A STRONG CROSSFLOW,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-09926

ENTRAINMENT VELOCITY IN NATURAL STRATIFIED VERTICAL SHEAR FLOW,
Copenhagen Univ. (Denmark). Inst. of Physical Oceanography.
For primary bibliographic entry see Field 2L.
W77-09946

SENSITIVITY ANALYSIS OF THE WATER QUALITY FOR RIVER-RESERVOIR SYSTEMS MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5B.
W77-09981

HYDRAULICS AND DYNAMICS OF NEW CORPUS CHRISTI PASS, TEXAS: A CASE HISTORY, 1973-75,
Texas Univ. at Austin. Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 2L.
W77-09982

STABILITY OF RUBBLE-MOUND BREAKWATER JUBAIL HARBOR, SAUDI ARABIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. D. Carver, and D. D. Davidson.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A034 815, Price codes: A04 in paper copy, A01 in microfiche. Technical Report H-76-20, December 1976. 71 p, 4 fig, 1 tab, 6 ref, 41 photo, 9 pl.

Descriptors: *Hydraulic models, *Breakwaters, *Harbors, Model studies, Asia.
Identifiers: *Jubail Harbor(Saudi Arabia), *Rubble-mound breakwaters.

An undistorted-scale hydraulic model study was conducted to investigate the adequacy of seven breakwater cross sections considered for use at Jubail Harbor, Saudi Arabia. Tests conducted in evaluating the various plans consisted of (1) two-dimensional stability tests (Plans 1, 2, 2A, 3, 4, and 5), (2) two-dimensional transmission tests (Plans 1, 2, 3, and 5), and (3) three-dimensional stability tests (Plan 6). Test results indicate that for the selected design conditions 5.0-metric-ton dolos armor will be of adequate size for use on all portions of the Jubail breakwater system. (WES)
W77-09984

SEASONAL VARIATIONS IN GREAT LAKES DESIGN WAVE HEIGHTS: LAKE ERIE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. T. Resio, R. M. Brooks, and C. L. Vincent.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 153, Price codes: A05 in paper copy, A01 in microfiche. Miscellaneous Paper H-76-21, March 1977. 82 p, 8 fig, 1 tab, 12 ref, 4 append.

Descriptors: *Great Lakes, *Lake Erie, *Waves(Water), *Seasonal, Methodology, Climatology.
Identifiers: *Design wave heights.

Tables of 5-day extremal parameters are presented, along with a methodology for the calculation of design wave heights for variable intervals of time during the year. A brief description of the Great Lakes climatology is included to provide a meteorological context for the wave height variations throughout the year. (WES)
W77-09986

DICKEY-LINCOLN SCHOOL LAKES HYDROTHERMAL MODEL STUDY; HYDRAULIC LABORATORY INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
M. S. Dortch, B. Loftis, D. G. Fontane, and S. C. Wilhelms.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 538, Price codes: A05 in paper copy, A01 in microfiche. Technical Report H-76-22, December 1976. 72 p, 14 fig, 1 tab, 14 ref, 2 append, 15 pl.

Descriptors: *Hydraulic models, *Mathematic models, *Pumped storage, *Reservoirs, *Stratified flow, *Thermal stratification, *Water temperature, *Maine, Lakes.
Identifiers: *Dickey-Lincoln School Lakes(Me).

A one-dimensional, vertically stratified thermal simulation model was developed for prediction of

temperature within and downstream from Dickey-Lincoln School Lakes. Two physical hydraulic models were used to obtain an improved understanding and description of the hydrodynamic response of the lakes to pumped-storage hydropower. An undistorted, 1:200-scale model of the Dickey Lake intake structures and local topography was used to determine the steady-state selective withdrawal and pumpback flow characteristics for various conditions. A highly distorted-scale model (1:3600 horizontal, 1:180 vertical) was used to simulate the entire dual reservoir system and to determine the response to dynamic, unsteady-state, density stratified flow. Information from the two physical models was used to modify existing algorithms and to develop new algorithms for the mathematical model. The mathematical model allows simulation of the hydrodynamic and heat exchange characteristics so that the thermal regimes within and downstream from the two lakes can be determined for various hydrologic and meteorologic conditions and various pumped-storage hydropower operations. (WES)
W77-09987

LAKE DARDANELLE, ARKANSAS RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. E. Foster, and J. J. Franco.
Technical Report H-77-4, March 1977. 50 p, 2 fig, 24 pl.

Descriptors: *Hydraulic models, *Channel improvement, Channels, *Arkansas, Model studies, Lakes, Reservoirs, *Navigation, *Navigable rivers, Hydraulic structures.
Identifiers: *Arkansas River, *Lake Dardanelle(Ark), *Navigation channels.

Lake Dardanelle is a 51-mile-long reservoir formed by Dardanelle Lock and Dam which is located at mile 205.5 on the Arkansas River. This study, using a movable-bed model, was conducted to determine the type and location of training and stabilization structures needed to develop a satisfactory navigation channel downstream of mile 238.4 and to provide a satisfactory channel approaching the navigation span of the proposed highway bridge at mile 234.9. Results of this investigation indicated that: A plan could be developed that would provide a satisfactory crossing toward the left bank and in the approaches to the proposed bridge. Navigation gaps could be used in the two closure dikes across the channel along the right bank during construction and development of the crossing. Some shoaling could be expected in the upstream approaches to the gaps and some scouring could be expected just downstream of the gaps. Development of a channel along the left bank upstream of the proposed bridge would reduce the tendency for erosion of the left bank in the upper portion of the band downstream of the bridge. (WES)
W77-09988

DESIGN FOR SMALL-BOAT HARBOR IMPROVEMENTS, PORT WASHINGTON HARBOR, WISCONSIN; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. R. Bottin, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 088, Price codes: A09 in paper copy, A01 in microfiche. Technical Report H-77-1, February 1977. 172 p, 5 fig, 19 tab, 47 photo, 13 ref, 2 append, 62 pl.

Descriptors: *Hydraulic models, *Harbors, Waves(Water), *Wisconsin, Design, Lake Michigan, Model studies.
Identifiers: *Port Washington Harbor(Wisc), *Channel deepening, Rubble-mound breakwaters, *Small boat basins(Design).

A 1:75-scale undistorted hydraulic model reproducing Port Washington Harbor, approximately 2600 ft of shoreline on each side of the harbor, and sufficient offshore area in Lake Michigan to permit generation of the required test waves was used to investigate the design of certain proposed improvements with respect to wave action. The proposed improvement plan consisted of (1) new rubble-mound breakwaters within the existing harbor aggregating about 1330 ft in length and arranged to form a protected harbor of approximately 13.5 acres; (2) a 10-ft-deep, 150-ft-wide entrance channel; (3) a 10-ft-deep anchorage-maneuvering area about 3.5 acres in extent; (4) an 8-ft-deep, 72-ft-wide launching ramp channel extending from the anchorage-maneuvering area to a launching ramp; (5) a 500-ft-long wave absorber adjacent to the existing north breakwater; and (6) safety railings on the new breakwaters. A 50-ft-long generator, a centrifugal pump and flow meter, and an Automated Data Acquisition and Control System were utilized in model operation. (WES)
W77-09989

IGLOO WAVE ABSORBER TESTS FOR PORT WASHINGTON HARBOR, WISCONSIN; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. R. Bottin, Jr.
Available from the National Technical Information Service, Springfield, VA. 22161. Miscellaneous Paper H-76-22, November 1976. 25 p, 1 fig, 2 tab, 4 ref, 5 pl.

Descriptors: *Hydraulic models, *Harbors, *Breakwaters, Standing waves, Waves(Water), *Wisconsin, Model studies, Lake Michigan, Testing procedures.
Identifiers: *Port Washington Harbor(Wisc), *Igloo absorber tests.

Port Washington Harbor is exposed to waves generated by storms from northeast to south-southeast. Storm waves from these directions have caused damage to harbor facilities and boats and difficulties to ships and craft navigating the harbor entrance. Standing waves in the slip areas have reached heights of 12 ft. Anchorage in the outer harbor is not safe for small boats due to lack of adequate wave protection. Hence, the harbor is unsafe as a harbor-of-refuge. Hydraulic model tests were conducted to determine the effects of installation of Igloo wave absorber units in the harbor. Conclusions drawn from the results of these tests were that (a) Igloo wave absorber units placed in and around the slip areas will significantly reduce wave heights in the slips; (b) east and west breakwaters constructed of Igloo units without backing will not be stable; (c) a 500-ft-long Igloo structure adjacent to the north breakwater as an alternative to the east breakwater will not meet established wave-height criteria; and (d) a 200-ft-long Igloo east breakwater (with backing) will meet the established wave-height criteria. (WES)
W77-09990

COMPUTATION OF RECORDS OF STREAMFLOW AT CONTROL STRUCTURES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-10003

VARIATION OF WIDTH AND DISCHARGE FOR NATURAL HIGH-GRADIENT STREAM CHANNELS,
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-10009

LOS ANGELES AND LONG BEACH HARBORS MODEL STUDY; REPORT 4, MODEL DESIGN,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. G. Outlaw, D. L. Durham, C. E. Chatham, and R. W. Whalin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A012 069, Price codes: A02 in paper copy, A01 in microfiche. Technical Report H-75-4, February 1977 (Report 4 of a series). 109 p, 31 fig, 4 tab, 25 pl, 32 ref, append.

Descriptors: *Harbors, *Hydraulic models, *California, Model studies.
Identifiers: *Harbor oscillations, *Long Beach Harbor(Cal).

Described is the design of the Los Angeles and Long Beach Harbors hydraulic model for investigation of harbor oscillation characteristics of the existing harbor and for evaluation of various proposed harbor modifications. The effects of wave refraction, diffraction, viscous friction, wave reflection, wave transmission through the harbor breakwaters, wave filters, and wave absorbers were considered. Wave generator design, automated model data acquisition and control, and model data analyses are also described. The model reproduces approximately 253 square miles of prototype area. Model wave record analyses include the capacity for determination of: (a) average, root mean square, and significant wave height and (b) average period. Procedures for Fourier analysis and least-squares harmonic analysis of the wave record are also available. The hydraulic model can be used in a predictive mode to evaluate various proposed modifications to optimize the modifications from both a cost and functional standpoint. (See also W77-02955 and W75-10664 and W76-11751) (WES)
W77-10016

NORTH FORK LAKE SPILLWAY SAN GABRIEL RIVER, TEXAS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. D. Rothwell.
Technical Report H-76-10, October 1976. 64 p, 9 fig, 8 tab, 11 photo, 13 pl.

Descriptors: *Hydraulic models, *Weirs, *Spillways, *Outlet works, *Texas, Model studies, Hydraulic structures.
Identifiers: *North Fork Lake Dam(Tex), *San Gabriel River(Tex).

The spillway for North Fork Lake Dam will consist of a 1000-ft-wide uncontrolled broad-crested weir excavated in limestone located in the right abutment of the dam. An outlet works consisting of two flood-control and four low-flow inlets will discharge into a hydraulic-jump-type stilling basin and exit channel located on the downstream side of the earth-filled dam. Model investigations were conducted using a 1:80-scale model to develop a design that would eliminate the destructive currents along the toe of the earthfill dam embankment and in the vicinity of the outlet works stilling basin and spillway discharge channel. The model was also used to measure valocities, surging, and flow patterns for several discharges in the approach and discharge channels and to determine the design of a rockfill dike at the upstream left abutment of the spillway. Tests indicated that a 100-ft-long elliptical-shaped dike would be required in the vicinity of the upstream left abutment to provide protection for the dam embankment and retaining wall. The minimum stone size (d50 = 16 in.) required for stability of the upstream rockfill dike was determined from the model. The hydraulic performance of the spillway crest design was satisfactory for a range of anticipated discharges. (WES)
W77-10017

OLD RIVER EXISTING LOW-SILL CONTROL STRUCTURE, LOUISIANA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. D. Rothwell, and J. L. Grace, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 996, Price codes: A08 in paper copy, A01 in microfiche. Technical Report H-77-2, February 1977. 147 p, 10 fig, 27 tab, 12 photo, 71 pl.

Descriptors: *Hydraulic models, *Control structures, *Open channel flow, *Stilling basins, *Louisiana, Hydraulic structures, Model studies.
Identifiers: *Old River Control Structure(La).

The Old River Existing Low-Sill Control Structure consists of eleven 44-ft-wide gate bays separated by piers. Model investigations were conducted using two 1:36-scale section models and a 1:150-scale section model to evaluate and develop a satisfactory means of regulating the existing structure to achieve the desired flow objectives without creating adverse hydraulic flow characteristics for uncontrolled- and controlled-flow operations, measure the dynamic loads induced in the cables and supporting devices during placement of the vertical-lift gates, pressures along the structure and velocities in the approach, stilling basin, and exit channel and to determine by observation the relative degree of turbulence in the stilling basin and exit channel. Model tests indicated that partial closure of the gate bays from the top of the structure would be the most effective method of regulating the structure and maintaining satisfactory stilling basin performance and is therefore the recommended plan of regulating the existing structure. (WES)
W77-10018

HARLESTON HARBOR NAVIGATION TUDY, SOUTH CAROLINA, VERIFICATION ESTS; HYDRAULIC MODEL INVESTIGA-ION,
rmy Engineer Waterways Experiment Station, icksburg, Miss.
. A. Benson.
liscellaneous Paper H-77-4, May 1977. 119 p, 4 g, 30 tab, 68 pl.

escriptors: *Hydraulic models, *Prototype tests, Salinity, *South Carolina, Navigation, Channels, odel studies, Tides, Tidal water, Estuaries.
entifiers: *Charleston Harbor(SC), *Navigation annels.

he Charleston Harbor model reproduced the en-e tidal portions of the Ashley, Cooper, and ando Rivers and a portion of the Atlantic Ocean. he model was of fixed-bed construction and was uipped with all the necessary appurtenances for curate reproduction and measurement of tides, al currents, salinity intrusion, and other signifi-nt phenomena of the prototype. This report is ncerned with the hydraulic and salinity verifica-n of the model, and contains complete data owing the degree of accuracy attained with spect to duplication in the model of previous del report and prototype data. The results of verification tests indicate that the model draulic and salinity regimens were in satisfacto-agreement with the previous comparable condi-ns. It therefore can be assumed that the model y be depended on to provide quantitative an-ers concerning the effects of proposed plans on hydraulic and salinity regimens of the estuary. ES)
7-10019

ONVEX CHUTES IN CONVERGING SUPER-ITICAL FLOW,
ny Engineer Waterways Experiment Station, cksburg, Miss.
M. Neilson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-033 733, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper H-76-19, September 1976. 35 p, 14 fig, 32 ref, append, 6 pl.

Descriptors: *Chutes, *Supercritical flow, Flow, Computer models, Flow characteristics, Surfaces.

This study contains a brief literature survey and limited experimental data regarding the water-surface contours for supercritical flow in a steep converging chute. Items relevant to design of the chute sidewalls are described, and the development of a computer model for chute design is suggested. Also, it is suggested that a horizontal transverse water surface cannot be obtained unless parallel sidewalls are used and that for a converging chute, the designer will probably have to evaluate and accept some level of nonuniformity in the flow. (WES)
W77-10020

LONG BEACH HARBOR NUMERICAL ANALYSIS OF HARBOR OSCILLATIONS; REPORT 2, ALTERNATE PLANS FOR PIER J COMPLETION AND TANKER TERMINAL PROJECT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. R. Houston.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 066, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper H-76-20, September 1976 (Report 2 of a series). 40 p, 28 pl, 1 append.

Descriptors: *Numerical analysis, *Harbors, *Piers, *California, Model studies, *Finite element analysis, Alternate planning.
Identifiers: *Harbor oscillations, *Tanker terminals, *Long Beach harbor(Calif).

A hybrid finite element numerical model was used to calculate harbor resonance for three alternate plans for the Pier J completion and tanker terminal project of Long Beach Harbor. The numerical model calculates harbor oscillation for harbors of arbitrary shape and variable depth. Three finite element grids which covered areas only in the immediate vicinity of breakwater-protected tanker terminal area were used to calculate the response of this area to incident waves with periods from 30 sec to approximately 6 min. (See also W77-10041) (WES)
W77-10040

LONG BEACH HARBOR NUMERICAL ANALYSIS OF HARBOR OSCILLATIONS; REPORT 4, ALTERNATE PLANS FOR PIER J COMPLETION AND TANKER TERMINAL PROJECT (NO LANDFILL),
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Wanstrath.
Miscellaneous Paper H-76-20, February 1977 (Report 4 of a series). 32 p, 3 fig, 15 pl, 1 append.

Descriptors: *Numerical analysis, *Harbors, *Piers, *California, Model studies, *Finite element analysis, Alternate planning.
Identifiers: *Long Beach Harbor(Cal), *Harbor oscillations.

A hybrid finite element numerical model was used to calculate harbor resonance for the Pier J completion and tanker project of Long Beach Harbor with no landfill. The numerical model calculates harbor oscillation for harbors of arbitrary shape and variable depth. A finite element grid which covered the immediate vicinity of the breakwater-protected tanker terminal area was used to calculate the response of this area to incident waves with periods from 30 sec to approximately 6 min. (See also W77-10040) (WES)
W77-10041

LOS ANGELES HARBOR NUMERICAL ANALYSIS OF HARBOR OSCILLATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. R. Houston.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 155, Price codes: A11 in paper copy, A01 in microfiche. Miscellaneous Paper H-77-2, February 1977. 228 p, 1 fig, 2 tab, 198 pl, 11 ref, append.

Descriptors: *Harbors, *Numerical analysis, *California, Model studies, *Finite element analysis.
Identifiers: *Harbor oscillations, *Los Angeles Harbor(CaL), *Harbor improvements.

A hybrid finite element numerical model was used to calculate harbor resonance for existing conditions and proposed improvements of Los Angeles and Long Beach Harbors. The numerical model calculates harbor oscillation for harbors of arbitrary shape and variable depth. Ten finite element numerical grids were used to calculate the response of the harbors complex for incident waves with periods from 1 to 10 min. Calculations of the model for existing conditions of the harbors were shown to be in good agreement with prototype measurements. The numerical model calculations indicate that resonant oscillations in existing harbor facilities will not be greatly altered by the proposed modifications of the harbors complex. The largest oscillation in the proposed Liquified Natural Gas slip and general cargo terminal created by the Terminal Island landfill occurred at a wave period of 258 sec. The seaward side of the Terminal Island landfill did not exhibit significant resonant oscillations for incident waves with periods from 1 to 10 min. (See also W77-02950 and W77-02951) (WES)
W77-10042

FLOW CONDITIONS AT PUMPING STATIONS, CAIRO, ILLINOIS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher, and J. L. Grace, Jr.
Available from the National Technical Information Service Springfield, VA 22161 as AD-A038 051, Price codes: A04 in paper copy, A01 in microfiche. Technical Report H-77-3, March 1977. 62 p, 8 fig, 1 tab, 25 photo, 12 pl.

Descriptors: *Hydraulic models, *Flow, Pumps, *Pumping, Model studies, *Flow characteristics, *Illinois.
Identifiers: *Cairo(Ill).

A model study was conducted to evaluate the characteristics of inflow to the original design sump and to develop modifications required for improving the distribution of flow to the pump intakes. The study indicated the need for certain minor modifications to improve flow characteristics in the forebay and ensure satisfactory flow characteristics and pressures near the pump intakes. The major problems encountered were generated by the concentrated, submerged jet entering and passing through the forebay. The concentrated jet emerging from the approach conduit into the forebay produced adverse currents and turbulence near the pump intakes. Satisfactory approach flows were obtained by installing 6-ft-high baffles in the forebay and rounded pier noses at the entrance to the individual pump bays. The baffles were effective in dispersing the jet entering the forebay and the rounded pier noses eliminated the instability and separation of flow at the entrance to the pump bays. The improved flow distribution eliminated the vapor cavity and certain potential for cavitation damage in the pump intakes. The recommended design provided satisfactory flow performance with all combinations of pump operation and anticipated sump elevations. (WES)
W77-10043

CENTER SLUICE INVESTIGATION, LIBBY DAM KOOTENAI RIVER, MONTANA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
M. S. Dortch.
Technical Report H-76-21, December 1976. 58 p, 5 fig, 19 tab, 2 photo, 14 pl.

Descriptors: *Sluices, Dams, *Cavitation, *Hydraulic models, Model studies, *Montana, Conduits, Hydraulic structures.
Identifiers: *Libby Dam(Mont), *Kootenai River(Mont), *Center sluice investigations.

The model study of the center sluice, Libby Dam, was conducted to determine the causes of and to develop means for preventing the cavitation damage experienced in the sluices. The study was conducted in a 1:20-scale model of the center sluice which reproduced the 'as-built' geometry of the bell-mounted intake, emergency gate slot, regulating gate and gate well, and parabolic trajectory of the sluiceway. The model helped to define undesirable hydraulic conditions that have caused cavitation damage in the prototype structure. Through the use of the model, an aeration device was developed to ventilate the jet and prevent cavitation damage. The recommended aeratory (type 7) provided a high degree of aeration without adversely altering flow conditions in the sluice. A certain roof modification was suggested to prevent unstable flow and cavitation damage in the sluice intake. (See also W77-10045) (WES)
W77-10044

SLUICE PRESSURES, GATE VIBRATIONS AND STILLING BASIN WALL PRESSURES LIBBY DAM, KOOTENAI RIVER, MONTANA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. D. Hart, and A. R. Tool.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 665, Price codes: A04 in paper copy, A01 in microfiche. Technical Report H-76-17, October 1976. 59 p, 10 fig, 5 tab, 22 pl, 9 ref.

Descriptors: *Sluice gates, *Sluices, *Gates, Dams, *Stilling basins, Cavitation, Pressure, *Montana, Conduits, Hydraulic structures.
Identifiers: *Gate vibration, *Libby Dam(Mont), *Kootenai River(Mont).

Two of the three Libby Dam sluices suffered cavitation damage after a short period of operation. During this period of operation, extreme noise was heard and structural movement suspected. Prototype studies were conducted to monitor the sluice pressure fluctuation amplitudes and frequencies as well as sluice gate and structural vibrations. In addition, stilling basin wall pressures were measured during spillway releases. The sluice pressure measurements indicated that negative pressure fluctuation occurred at all points of measurement along the invert (at all gate openings) and that vapor pressure was approached or occurred at three of these locations during certain gate openings. Structural vibrations were generally insignificant whereas the sluice gate was subjected to significant vibrations in all three directions. The mean pressures measured on the stilling basin wall were lower in the upstream, lower portion of the wall and vapor pressure was approached in the upstream lower corner. (See also W77-10044) (WES)
W77-10045

DIVIDE CUT DRAINAGE STRUCTURES TENNESSEE-TOMBIGBEE WATERWAY MISSISSIPPI AND ALABAMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. H. Ables, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 666, Price codes: A05 in paper copy, A01 in microfiche. Technical Report H-76-18, October 1976. 66 p, 6 fig, 1 tab, 15 photo, 23 pl.

Descriptors: *Hydraulic models, *Drainage systems, *Alabama, *Mississippi, Model studies, Design, Channel improvement, Canals.
Identifiers: *Tennessee-Tombigbee Waterway.

Standardized designs for drainage structures in the Divide Cut Section of the Tennessee-Tombigbee Waterway were developed in model tests conducted on the US Bureau of Reclamation type VI impact basin at a scale of 1:4, on the minor drainage chutes and energy dissipators at a scale of 1:10, and on the major drainage structures at a scale of 1:25. Test results indicate that the type VI impact basin performs satisfactorily below rectangular channels for all discharges tested and critical dimensions are tabulated for discharges expected at drainage structures where the type VI basin will be installed. Generalized information was developed to permit satisfactory design of minor drainage chutes and energy dissipators emptying into the canal. A satisfactory baffled chute spillway was developed for the largest of the drainage structures. Model test results will permit design of the other three major structures based on a unit discharge of 60 cfs common to the five structures for 100-year frequency flows. (WES)
W77-10046

ENTRANCE TO UPSTREAM APPROACH CANAL, GAINESVILLE LOCK, TOMBIGBEE RIVER, MISSISSIPPI AND ALABAMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. J. Shows, and J. J. Franco.
Available from National Technical Information Service, Springfield, VA 22161 as AD-A033 539, Price codes: A04 in paper copy, A01 in microfiche. Technical Report H-76-19, November 1976. 64 p, 12 fig, 6 tab, 22 pl.

Descriptors: *Hydraulic models, *Locks, *Alabama, Model studies, Canals, Mississippi, *Navigation, *Canals, Hydraulic structures, *Channel improvement.
Identifiers: *Tennessee-Tombigbee Waterway, *Gainesville Lock and Dam(Ala), Navigation conditions, *Tombigbee River.

As part of the program for the development of navigation on the Tennessee-Tombigbee Waterway, the Gainesville Lock and Dam will be the first navigation structure proposed for the development of the waterway. A fixed-bed model reproduced about 2.6 miles of the Tombigbee River channel, about 3000 ft of the upstream end of the navigation canal. The model investigation was concerned with the development of good navigation conditons at the entrance to the approach canal and in the two bends just upstream of the entrance to the canal, and in the distribution of flow through the gated spillway. Results of investigation revealed the following: (a) Satisfactory navigation could be developed at the entrance to the lock approach canal by modification of the excavation along the left bank and in the bend adjacent to the canal. (b) Satisfactory navigation conditions for two-way traffic through the reach could be provided under most conditions by the excavation mentioned in (a) above, by increasing channel width, and by improving the curvature of the second bend upstream of the canal. (c) Improving the distribution of flow through the gated spillway with a training wall would have little effect on water-surface elevations upstream. (WES)
W77-10047

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 17-4, NUMERICAL MODEL FEASIBILITY STUDY,
Army Engineer Waterway Experiment Station, Vicksburg, Miss.
D. C. Raney, D. L. Durham, and H. L. Butler.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 972, Price codes: A08 in paper copy, A01 in microfiche. Technical Report H-74-6, April 1977 (Report 4 of a series). 151 p, 36 fig, 2 tab, 35 ref, append.

Descriptors: *Lake Erie, *Airports, *Waves(Water), Shore protection, Shores, *Feasibility studies, *Model studies, *Ohio.
Identifiers: *Longshore waves, *Wave heights, Cleveland area(Ohio).

An integral part of the feasibility assessment of a proposed offshore jetport site near Cleveland, Ohio, is the investigation of the hydrodynamics of Lake Erie to aid in determining the effects of the structure on such phenomena as seiching, storm surge, and lake circulation. To assist in determining these effects, the feasibility of using numerical modeling techniques was investigated. Numerical models that appeared capable of predicting the extent and magnitude of hydrodynamic changes produced by the proposed jetport were reviewed. A determination was made of the feasibility of applying numerical models to the problems of seiching, storm surge, and lake circulation in Lake Erie. The numerical model feasibility study was restricted to the consideration of existing state-of-the-art models. No extensive model development was undertaken in this feasibility study; however, areas where additional numerical development is required were identified. The theoretical limitations, verification, resolution cabilities, and accuracy of the model as well as the cost of application of the model were considered. (See also W77-10670 and W77-07286) (WES)
W77-10048

IMPACT OF ECONOMIC RISKS ON BOX CULVERT DESIGNS--AN APPLICATION TO 22 VIRGINIA SITES,
Water Resources Engineers, Inc., Springfield, Va.
G. K. Young, and M. R. Childrey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 10
Price codes: A04 in paper copy, A01 in microfiche. Report No FHWA-RD-75-49, August 1974. 52 p, 13 fig, 5 tab, 32 ref. DOT-FH-11-7669.

Descriptors: *Highways, *Culverts, *Economic efficiency, *Design criteria, *Flood damage, Engineering structures, *Risks, Construction costs, Estimating equations, Damages, Flow characteristics, Flow around objects, Excavation, Embankments, Flood routing, Streamflow forecasting, *Virginia.
Identifiers: Box culverts.

Optimal culvert designs for rural four-lane highways, based on economic criteria and data from 22 cases studied in Virginia, seemed to yield smaller cross-section areas than designs based on the conventional 50-year flood criteria. The smaller culverts are about 15% less in cost than culverts designed to the 50-year criteria. The findings summarize a preliminary effort to incorporate economic risks into culvert design and relate the design to conventional engineering design practices for the 22 culvert sites. Economic design is defined as the minimum annual construction costs plus expected flood-related loss or risk. Each design is evaluated according to a five-step procedure: (1) calculation of annual construction costs, including the cost of the structural excavation, the culvert, embankment and roadway; (2) performing of dynamic flow routings for a set of flood hydrographs (in place of steady-state flood peak discharge in this case, as dynamic routing gives the duration of overtopping which in turn determines the amount of embankment durability and the duration of traffic interruption); (3) e

mation of embankment erosion; (4) calculation of losses from damage to the site, traffic-related damage and upstream property damage; (5) weighing of losses with flood probabilities to derive risks. (Harris-Wisconsin)
W77-10067

PROPOSED PIPELINE SYSTEM WILL LINK WATER SCHEMES DWA'S R24 MILLION BALANCING ACT.
Construction in Southern Africa, Vol 21, No 2, p 49-52, May 1976.

Descriptors: *Pipelines, Inter-basin transfers, Water requirements, Thermal powerplants, Water resources, Distribution systems, Africa.
Identifiers: *Transvaal, *South Africa, Komati River, Usutu River, Escom.

The Department of Water Affairs has recently proposed a R24 million system of pipelines to link the Komati and Usutu Government water schemes. The project will allow shortages in one system to be relieved by using surpluses in the other and will enable the Department to meet the projected water requirements of the Electricity Supply Commission's (Escom) power stations in the Eastern Transvaal. It is envisaged that the scheme could be completed by the mid-1980's. (So African Water Info Ctr)
W77-10069

8C. Hydraulic Machinery

MOTOR POWERED BY WAVE ACTION,
R. M. Axford.
U. S. Patent No. 4,002,416, 5 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 954, no 2, p 731, January 11, 1977.

Descriptors: *Patents, *Waves(Water), Ocean waves, Surf, Pumps, Energy conversion, Energy transfer, Equipment.

A motor, in the form of a pump, is primarily designed to be activated by the oscillating motion of waves and has a paddle placed to oscillate about a stationary horizontal axis located in the plane of the paddle. The paddle is placed in the surf and positioned where the wave action is greatest so that the force of the waves can act on the paddle to cause it to oscillate back and forth, one cycle with each wave. The paddle is on a stationary axis. The oscillating motion of the paddle is coupled to a suitable pump which pumps sea water. The pump has a cylindrical housing concentric with the stationary axis. A radial vane is fixed to a shaft within the housing while the paddle is fixed to the shaft outside the housing. Suitable valves are provided in the housing to allow sea water to enter and exit under action of the oscillating vane. (Sinha - OEIS)
W77-09803

GEAR MOTOR SOLVES PLANT'S NOISE PROBLEM.
Water and Sewage Works, Vol 124, No 5, p 59, May, 1977.

Descriptors: *Gears, *Pumps, *Treatment facilities, Performance, *Aeration, Oxygen demand, Equipment, Microorganisms, Activated sludge, *Waste water treatment.
Identifiers: Noise problem(Treatment facilities).

Noise problems of secondary tank aerators were resolved during an expansion and modernization program at a Mecca, California, treatment plant. Noise from the gearbox drives was negated when a new aeration tank at the secondary stage was constructed. The mechanical aerator installed produced very little vibration, torquing, or tilting of a nearby catwalk. Tolerances of .0025 inches were maintained on drive train units. There was no oil spill or leakage and the unit ran cool to the touch. A 'superfine' sparger supplied air through peripheral holes at 20 psi and about 100,000 cu ft/day. Aerator blades forced rising bubbles back down through the waste. Bubbles were also forced outward to the tank sides. This provided the oxygen demand needed by microorganisms. Around-the-clock operation has required little maintenance and noise complaints have dropped to zero. Constant density changes in the tank results from the highly efficient air mixing; this is related to shock load to the aerator and to the gear drive. (Collins-FIRL)
W77-09827

DEMONSTRATING THE FEASIBILITY OF VACUUM AND PRESSURE SEWERS,
C and G Engineering, Salem, Oreg.
For primary bibliographic entry see Field 5D.
W77-09834

DESIGN PROPOSALS FOR SUBMERSIBLE SEWAGE LIFT STATIONS,
H. G. Kelly.
Water and Sewage Works, Reference Issue, p 76-78, 80-84, 86, 88-90, April, 1977. 12 fig, 2 tab, 18 ref.

Descriptors: *Hydraulic design, *Hydraulic structures, *Pumps, *Sewers, Construction materials, Performance, Design criteria, Operation and maintenance, Flow rates, Costs, Control systems.
Identifiers: Submersible lift stations(Sewage).

Designs were presented for submersible sewage lift stations. Submersible lift stations are economical alternatives to larger dry well/wet well stations. They can also be used to handle fows until increased flows require larger facilities. Design factors considered were construction materials, sizing, pump types, power and controls, hydraulic conditions, operation and maintenance needs, and costs. Practical design can be achieved for flows less than 1500 gpm. Centrifugal pumps are generally used, but progressive cavity pumps and pneumatic ejectors have been used in low flow-high head applications. Concrete, fiberglass, or a protected metal are the usual construction materials, depending upon specific site, design, and construction considerations. Sizing and pump selection should be based on accurate design inflow estimations. Pumps should also perform reliably and have a good service record, as well as conform to head requirements. A friction loss equation should be derived before the selection of system components, and the system head curve should reflect its optimum solution. System hardware should be selected for ease of installation, operation, maintenance, cleaning, and repair. The well must be large enough to provide pump operation times which would prevent material accumulation and septicity. The range of liquid level controls includes float and pneumatic bubbler controls, ultrasonic echo controls, and pressure sensng tubes with time delays. Pump motors should be installed with non-overloading features. Horsepower should run out a certain percentage of the pump characteristic curve past the intended operation point. Grinder pumps provided alternatives for low flow applications. They were economical and simple, and could be used for individual homes or in a station for several homes or sources. Installation and material costs can determine the type of station constructed. Individual preference may overrule cost comparison in this selection. Operation and maintenance costs should be considered, as well as the costs of downtime. (Collins-FIRL)
W77-09839

SEWAGE EJECTORS AVOID MANUAL UNBLOCKING OF PIPES.
Process Engineering, p 11, March, 1977.

Descriptors: *Hydraulic machinery, *Sewage treatment, Screens, Pumps, Pipes, Liquid wastes, Solid wastes, Maintenance, Performance, Equipment, Waste water treatment.
Identifiers: *Sewage ejectors(Hydraulic).

An East Anglian, England, hospital replaced sewage handling centrifugal pumps with gravity filled electromatic sewage ejectors. This immediately reduced the maintenance problems encountered through pipe blockage by cloth, toys, and other solid materials. A roller screen on skids prevented passage of such solid materials into the mechanism. The ejectors, with 30 hp compressors, were able to handle up to 12 liters/second. The ejectors have proven themselves most reliable and were considered more effective than rotary valve or electrode control units. There were no floats or electrodes in the sewage flow. (Collins-FIRL)
W77-09856

ANALYSIS OF ECONOMIC SEWAGE LIFT STATION DESIGN,
Stanley Associates Engineering, Ltd., Edmonton (Alberta).
O. Smolik.
Water and Sewage Works, Reference Issue, p 58-62, April, 1977. 8 fig.

Descriptors: *Pumping plants, *Design, Inflow, Hydraulic engineering, Hydraulic machinery, *Sewage, Conveyance structures, Analytical techniques, Pumps, Performance, Equipment, Economics.
Identifiers: *Lift stations(Sewage).

A procedure for the economical design of a sewage lift station was presented. The objective was to determine a standard type or size of station and a standard control for specific magnitudes of inflow. Design problems included wet well size and the capacity and number of pumps for a given sewage inflow. Equations were included which could aid the determination of relationships between well size, pump efficiency, and sewage inflow. Other equations were designed to specify inflow at a station with no flowmeter. Use of these steps was expected to reduce costs at the design stage and to increase efficiency of the system. (Collins-FIRL)
W77-09906

FLOW CONDITIONS AT PUMPING STATIONS, CAIRO, ILLINOIS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-10043

HYDRO-ELECTRIC DEVELOPMENT OF THE TUGELA RIVER,
Department of Water Affairs, Pretoria (South Africa).
T. P. Van Robbroeck, and B. W. Graber.
Energy, Vol 2, No 3, p 10-19, June 1976. 6 fig, 1 tab, 5 ref.

Descriptors: *Hydroelectric plants, *Pumped storage, Rockfill dams, Dam design, Hydrologic data, Africa.
Identifiers: *Tugela River(Natal), *South Africa, Buffalo River, Kotongweni Dam, Ntulwana Dam, Mvumase Dam.

A scheme is proposed as the first step for the hydro-electric development of the Tugela River, consisting of two large dams and one small dam to support a total installed capacity of 5 200 MW, comprising 3 700 MW of conventional hydro plant and 1 500 MW of pumped storage plant. In addition to supplying cheap peaking power to the interconnected system network of Escom, the hydro-electric development of the Tugela River would offer numerous benefits such as irrigation, water supply, flood control, recreation facilities, fishing, saving of foreign currency, prestige value, etc. (So African Water Infor Ctr)
W77-10073

8D. Soil Mechanics

STATIC CALCULATION OF DRAINAGE CHANNELS AND PIPES (DIE STATISCHE BERECHNUNG VON ENTWASSERUNG-SKANALEN UND-LEITUNGEN),
For primary bibliographic entry see Field 8G.
W77-09833

SEEPAGE FROM SMALL EARTH DAMS,
Western Australia Dept. of Agriculture, South Perth.
R. G. Pepper.
Australian Journal of Soil Research, Vol 15, p 39-50, 1976. 2 fig, 3 tab, 42 ref, 1 append.

Descriptors: *Seepage, *Soil mechanics, *Soil sealants, *Earth dams, *Hydraulic conductivity, Australia, On-site investigations, Water balance, Soil water movement, Soil chemical properties, Soil investigations, Soil profiles, Tensiometers, Permeameters, Laterites.

Seepage from small earth dams (excavated tanks) studied in the Badgingarra area of Western Australia was governed by a 0.2 m thick sealing layer of soil bounding the excavation, with hydraulic conductivity about one-tenth that of soil deeper in the profile. The hydraulic properties of this layer were determined for dams in the area using tensiometers and samples from permeameters. Results from water balance studies on several earth tanks indicated that hydraulic conductivity variations were attributable to sand content, exchangeable magnesium and sodium percentages, and dithionite extractable iron and aluminum in the soil. Disturbing lateritic soils disrupts the in situ structure so that laboratory results on hydraulic conductivity are not applicable to the field situation. Details of the experimental techniques and soil studies are presented, along with equations to be used in such studies. (Jahns-Arizona)
W77-09932

HYDRO-ELECTRIC DEVELOPMENT OF THE TUGELA RIVER,
Department of Water Affairs, Pretoria (South Africa).
For primary bibliographic entry see Field 8C.
W77-10073

8E. Rock Mechanics and Geology

TUNNELLING WORK FOR THE RUACANA SCHEME,
For primary bibliographic entry see Field 8A.
W77-09688

DURBAN TUNNELS UNDER THE MICROSCOPE,
Durban City Engineers Dept. (South Africa).
For primary bibliographic entry see Field 8A.
W77-09689

A UNIQUE MEANS OF OBTAINING SEA-WATER,
South West African Consolidated Diamond Mines Ltd., Oranjemund.
G. R. Walker.
Journal of the South African Institute of Mining and Metallurgy, Vol. 76, No. 10, p 412-422, May 1976. 8 fig, 1 ref.

Descriptors: *Sea water, Water requirements, *Tunnelling, Mining engineering, Mineral industry, Rock excavation, *Water supply, *Industrial water, Tunnel construction, Tunnel design.
Identifiers: South West Africa, Southern Africa, Atlantic Ocean.

Although the mining and treatment operations at The Consolidated Diamond Mines of South West Africa, Limited, are located within an average distance of 1 km from the Atlantic Ocean, the supply of clear sea-water in large and continuous quantities for use in treatment plants is made difficult by siltation of water-holes and the amount of sand in suspension in the sea itself. The need for sixty million litres of sea-water per day at the new No. 2 treatment plant necessitated the construction of a system that would ensure a continuous and reliable supply. Several sea-water intake schemes were proposed. The need for an improved means of obtaining water is discussed and the construction of the scheme eventually chosen - a tunnel driven through bedrock for over 400 m beneath the Atlantic Ocean is described. At the end of the tunnel, two large chambers were excavated from which vertical holes were drilled to intersect the sea-bed. (So. African Water Info Center)
W77-09692

CHICAGO PLAN DESIGNED FOR POLLUTION AND FLOOD CONTROL.
For primary bibliographic entry see Field 4A.
W77-09838

EFFECT OF SOURCE ORIENTATION AND LOCATION IN THE PERU-CHILE TRENCH ON TSUNAMI AMPLITUDE ALONG THE PACIFIC COAST OF THE CONTINENTAL UNITED STATES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2L.
W77-09983

8F. Concrete

CORROSION AVOIDANCE IN WATER AND SEWAGE PIPELINES,
T. R. Smith.
Water Services, Vol. 82, No. 973, p 143, 145, 146, March, 1977.

Descriptors: *Corrosion control, *Sewers, *Piping, *Linings, Iron, Concrete, Plastics, Costs, Maintenance costs, Construction materials, Evaluation, Prestressed concrete.
Identifiers: Ductile iron, Polyethylene, Glass reinforced plastics, Reinforced plastic mortar.

Current economic conditions dictate that water and sewage pipelines be chosen for the lowest overall costs. These costs not only include the pipe cost, but installation and maintenance costs. The latter depends greatly on pipe life-aging and breakage. Corrosion, which contributes greatly to aging and breakage, should be minimized. Ductile iron is generally coated with a tar or bitumen-based substance which enhances its metal corrosion resistance, and especially its oxide skin. Great reliance is placed on cement mortor linings. Sulfate resisting cement is often specified for ductile iron linings. Other lining materials include epoxy resin systems and loose polyethylene film. Better application methods are being developed for polyethylene to provide resistance to extremely corrosive environments. Prestressed concrete pipes can be used under conditions of sulfate levels exceeding 5000 ppm when a proprietary wrapping tape system is used or when the pipes are installed in limestone surroundings. The very dense structure of concrete gives it an improved corrosion resistance similar to that of prestressed concrete. When sulfates are present in soils, a sulfate resistant cement should be specified. Corrosion resistance can be improved by using a hard calcareous aggregate such as dolomite. Glass reinforced plastics (GRP) or reinforced plastic mortar (rpm) pipes provide corrosion resistance at a reasonable cost. Proper installation of this pipe is necessary for obtaining the full benefits of its resistance properties. Soil analyses can aid in determining the pipe composition and the means of protection needed. (Collins-FIRL)
W77-09832

PVC LINING--THE ANSWER TO CORROSIVE ATTACK BY H2S IN CONCRETE SEWERS AND STRUCTURES.
For primary bibliographic entry see Field 8G.
W77-09835

SYNTHETIC AGGREGATES MADE FROM SEWAGE PLANT SLUDGE.
Engineering News-Record, Vol 199, No 18, p 13, May, 1977.

Descriptors: *Aggregates, *Concrete technology, Sludge disposal, Incineration, Particle size, Construction materials, Shales, Physical properties, Specific gravity, Waste disposal, Recycling, *Water treatment.

A method was devised to produce lightweight synthetic aggregates from sewage sludge for use in concrete. Ash of incinerated sludge was mixed with crushed shale, water, and binding materials. This mixture was heated to 2,200 F and molded into 0.4-inch diameter balls having a porous interior and a nonporous, compact surface layer. Their specific gravity was 1.2 compared to an average of 1.5 for other synthtic aggregates. Only laboratory production has been successful, but the size and shape of the balls could be adjusted for commercial usage. (Collins-FIRL)
W77-09924

8G. Materials

STATIC CALCULATION OF DRAINAGE CHANNELS AND PIPES (DIE STATISCHE BERECHNUNG VON ENTWASSERUNG-SKANALEN UND-LEITUNGEN),
W. Zaschke.
Berichte der Abwassertechnischen Vereinigung e.V., No 29, p 107-122, 1976. 12 fig, 17 ref.

Descriptors: *Sewers, Analytical techniques, *Loads(Forces), Viscous flow, Specific gravity, Friction, Mechanical properties, Physical properties, Conduits, Soil mechanics, Stress analysis, Drainage, *Drainage, *Pipes.
Identifiers: *Static calculations.

The static calculation of statically stiff and soft pipes is presented. The basic soil mechanics parameters necessary to load calculation are specific gravity, viscous flow, and modulus of deformation. The earth load is reduced by the friction forces of the wall. The traffic load is calculated on the basis of Boussinesq's theory. Various formulas for the determination of the stress concentration in stiff pipes, and the Iowa formula for statically soft pipes, are presented. The live load is nearly independent of the pipe-laying condition; it can be assumed to be rectangular. While statically stiff pipes should be chosen on the basis of stess or load-bearing capacity calculations, the long-term and short-term deformations, and possibly the stresses, should be calculated for statically soft pipes. The maximal permissible relative change in the vertical diameter of soft pipes is 6%. (Takacs-FIRL)
W77-09833

PVC LINING--THE ANSWER TO CORROSIVE ATTACK BY H2S IN CONCRETE SEWERS AND STRUCTURES.
Water Services, Vol. 82, No. 973, p 161-16
March, 1977.

Descriptors: *Linings, *Plastics, *Corrosion control, *Concrete structures, Hydrogen sulfide, Physical properties, Chemical properties, Sewer

Sulfur compounds, Aerobic conditions, Design criteria.
Identifiers: Polyvinyl chloride(PVC).

Polyvinyl chloride (PVC) linings were studied in Australia as a preventive measure for hydrogen sulfide corrosion in concrete sewers and structures. Factors involved in this type of corrosion are temperature, sewer design, and degree of turbulence. High temperature increases the rate of corrosive attack. Hydrogen sulfide corrosion can be broken down to four stages: sulfur compounds natural to sewage or formed by bacterial activity in anaerobic conditions provide a sulfide content; H2S gas is released into the sewer atmosphere depending on the relative humidity, the degree of turbulence, and the pH in the sewer flow; H2S is oxidized by bacteria, reducing the pH and forming sulfuric acid on the concrete; and the sulfuric acid reacts with lime and hydrated calcium silicates in cement to destroy its structure and reduce it to a putty-like paste. Any protective lining should be resistant to waste constituents and sulfuric acid. It should be suitable for sewer use, remain in place, be unaffected by bacterial actions, be formed as a continuous coating throughout the entire system, and be easily identifiable and reparable in case of accidental damage. A patented process was developed to embed PVC sheets in concrete pipes. They are placed to avoid moisture buildup between the PVC sheets and the concrete, and methods were developed to join sheets between successive pipes after laying them. A lining testing method was also developed to ensure the lining's integrity. (Collins-FIRL)
W77-09835

WATERTIGHT CASE FOR POND LINERS.
For primary bibliographic entry see Field 5G.
W77-09891

IGLOO WAVE ABSORBER TESTS FOR PORT WASHINGTON HARBOR, WISCONSIN; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W77-09990

MAKING SURE OF PIPELINE PERFORMANCE,
For primary bibliographic entry see Field 8A.
W77-10068

SEWER-MAINTENANCE PRACTICE AND EQUIPMENT,
Durban City Engineers Dept. (South Africa).
D. C. MacLeod.
Municipal Engineer, Vol 7, No 1, p 43-51, 1976. 6 fig, 2 tab, 4 ref.

Descriptors: Sewerage, Operation and maintenance, Equipment, Design, Cleaning, Safety aspects, Construction materials, Africa.
Identifiers: Durban(South Africa).

Reviews are presented of sewer-maintenance practice and equipment against the background of experience and practice in the Durban municipal area. Reference is made to design practices, construction materials, sewer cleaning equipment, closed-circuit TV inspection of sewers, manhole spacing practice, waste-food disposal units, and the safety and public health aspects of sewer maintenance. (So African Water Info Center)
W77-10078

8I. Fisheries Engineering

HOW A HEAT PUMP IMPROVED WATER CONDITIONS AT A FISH HATCHERY,
Cornell Univ., Ithaca, N.Y. Dept. of Thermal Engineering.
For primary bibliographic entry see Field 05C.
W77-09791

PRODUCTIVITY OF CLARIAS BATRACHUS IN THE SEWAGE FERTILIZED FISH PONDS,
National Environmental Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 05C.
W77-09922

THE DARWENDALE RESERVOIR AS A FISHERY,
Rhodes Univ. (Salisbury). Dept. of Zoology.
For primary bibliographic entry see Field 02H.
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INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: KETONIC SOLVENTS,
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British Columbia Water Resources Service, Victoria.
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Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 05D.
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THE GEORGIA COASTAL ENVIRONMENT. A COMPILATION OF RESOURCE MATERIALS COVERING THE COASTAL PLAIN, ESTUARIES AND OFFSHORE WATERS.
Army Engineer District, Wilmington, N.C.
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Illinois State Water Survey, Hydrology	W77-09693--09723 09943--09958	47
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W77-09724--09729 09731--09742 09744--09760	35
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Ocean Engineering Information Service (Outer Continental Shelf)	W77-10022--10027 10029--10037 10039	16
U. S. Geological Survey	W77-09991--10009 10011--10015	24

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
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VOLUME 10, NUMBER 19
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 19
OCTOBER 1, 1977

W77-09101 -- W77-09600

Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication mats. The contents of these documents cover the water-ated aspects of the life, physical, and social sciences as l as related engineering and legal aspects of the charac-stics, conservation, control, use, or management of water. ch abstract includes a full bibliographical citation and a set descriptors or identifiers which are listed in the **Water sources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-arch categories established by the Committee on Water sources Research of the Federal Council for Science and chnology.

SIC IS NOT PRESENTLY IN A POSITION TO PROVIDE PIES OF DOCUMENTS ABSTRACTED IN THIS JOUR-L. Sufficient bibliographic information is given to enable ders to order the desired documents from local libraries ther sources.

ected Water Resources Abstracts is designed to serve scientific and technical information needs of scientists, gineers, and managers as one of several planned services he Water Resources Scientific Information Center RSIC). The Center was established by the Secretary of the erior and has been designated by the Federal Council for ence and Technology to serve the water resources com-nity by improving the communication of water-related earch results. The Center is pursuing this objective by co-inating and supplementing the existing scientific and tech-al information activities associated with active research l investigation program in water resources.

provide WRSIC with input, selected organizations with ve water resources research programs are supported as nters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

. WATER CYCLE

A. General

N OPERATIONAL APPROACH TO PRESERV-IG SKEW IN HYDROLOGIC MODELS OF ONG-TERM PERSISTENCE,
ashington Univ., Seattle. Dept. of Civil En-neering.
P. Lettenmaier, and S. J. Burges.
ater Resources Research, Vol 13, No 2, p 281-0, April 1977. 8 fig, 5 tab, 20 ref. NSF DEB74-744/A01.

escriptors: *Hydrologic systems, *Monte Carlo ethod, *Model studies, Hydrology, Probability, arkov processes, Simulation analysis, Paramet- hydrology, Hydraulic models.
entifiers: *Skewed distributions, Gaussian ise, Long-term persistence, Log normal dis-bution, Nonlinearity, Distortion, Coefficient of riation, Gamma distribution.

rmulation of two models of long-term per-tence, fast fractional Gaussian noise (ffGn), and e first-order autoregressive-first-order moving erage process for a three-parameter log normal d three-parameter gamma distribution were ven. For the three-parameter log normal distribu-n, the marginal probability distribution was nerated exactly for both models, but the desired tocorrelation functions were distorted. Because the nonlinearity of the three-parameter log nor-l transformation, sequences with slightly higher g-term persistence had to be generated in the garithmic domain to achieve the desired model operties in the skewed domain. For the gamma stribution, the autocorrelation function was eserved exactly, but the desired marginal proba-ity distribution was distorted. Monte Carlo tests owed that the distortion was evidenced primari-in the loss of the theoretical lower bound of the mma distribution. The distortion was most ex-me for time series having high long-term per-tence and large coefficients of variation. For erational applications, there appeared to be no ar advantage to use of either of the skewed dis-butions. (Robert-ISWS)
77-09127

IE OPERATIONAL WATER QUANTITY ODEL,
ntral and Southern Florida Flood Control Dis-ct, West Palm Beach. Resource Planning Dept.
r primary bibliographic entry see Field 4A.
77-09204

DROLOGY OF TWO SMALL WETLAND SINS IN EASTERN MASSACHUSETTS,
well Univ., Mass. Dept. of Earth Sciences.
L. O'Brien.
ater Resources Bulletin, Vol. 13, No. 2, p 325-0, April 1977. 10 fig, 3 tab, 11 ref.

scriptors: *Wetlands, *Hydrologic budget, assachusetts, Groundwater movement, apotranspiration, Swamps, Peat, Muck soils, infall, Precipitation(Atmospheric), Runoff, se flow, Streamflow, Instrumentation, Obser-ion wells, Geology, Hydrogeology, Permeabili- Hydrographs, Watersheds(Basins), On-site in-stigations, Groundwater, Hydrology.

ydrologic budget was prepared for two geologi-ly different wetland basins in eastern Mas-husetts for the 1971 water year. Water table nditions prevailed at one wetland underlain by t, while an artesian system functioned at the er wetland which was underlain by muck. drologic responses generally were similar at h wetlands, although each functioned dif-ently in detail. Both wetlands exhibited high ing discharges and depressions of low flow. Groundwater accounted for an estimated 93% of the total annual discharge from both wetlands; in late summer, the peat deposit recharged the regional groundwater body. Evapotranspiration in the spring was retarded in probable consequence of the extreme wetness of the wetland soils. (Sims-ISWS)
W77-09336

SENSITIVITY OF SOME RUNOFF MODELS TO ERRORS IN RAINFALL EXCESS,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Journal of Hydrology, Vol. 33, No. 3/4, p 301-318, 1977. 15 fig, 2 tab, 28 ref.

Descriptors: *Rainfall-runoff relationships, *Runoff, *Model studies, Watersheds(Basins), Hydrology, Mathematical models, Peak discharge, *Precipitation excess, Equations.
Identifiers: *Sensitivity analyses, Runoff models, Surface runoff hydrograph, Linear models, Non-linear models.

Mathematical models describing the surface runoff hydrograph from a watershed can be classified as either linear or nonlinear. Linear models are used routinely because of their mathematical tractability, although it is recognized generally that watersheds are inherently nonlinear. This paper examined the sensitivity of predictions of runoff peak and its time by five linear and nonlinear surface runoff models to errors in rainfall excess. It was shown that if rainfall excess errors are sufficiently large, a perfectly identified nonlinear model does not perform always as well as an optimally identified linear model in predicting runoff peak, according to an objective function based upon fitting of runoff peaks. Thus, if one is not very confident in estimates of watershed infiltration, then in some circumstances linear models may have an advantage over nonlinear models in runoff peak predictions because they do not amplify the input errors. (Lee-ISWS)
W77-09339

FINITE-ELEMENT ANALYSIS OF GROUNDWATER FLOW IN MULTI-AQUIFER SYSTEMS, II. A QUASI THREE-DIMENSIONAL FLOW MODEL,
Kyoto Univ. (Japan). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W77-09362

TIDE-INDUCED RESIDUAL CURRENT-VERIFICATION OF A NUMERICAL MODEL,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-0959

2B. Precipitation

THEORETICAL PROBABILITY DISTRIBUTION OF CRITICAL HYDROLOGIC EVENTS BY THE PARTIAL-DURATION SERIES METHOD,
Rome Univ. (Italy). Istituto di Costruzioni Idrauliche.
G. Calenda, A. Petaccia, and A. Togna.
Journal of Hydrology, Vol. 33, No. 3/4, p 233-245, 1977. 5 fig, 2 tab, 15 ref, 2 append.

Descriptors: *Precipitation(Atmospheric), *Flood peak, *Model studies, *Probability, Mathematical models, Mathematics, Stochastic processes, Statistical methods, Rainfall, Precipitation excess, Probable maximum precipitation, Equations, Rivers, Streamflow, Frequency curves, Hydrology.
Identifiers: *Partial-duration series methods, Polya stochastic process, Binomial distributions.

Precipitation or flood-peak exceedances usually are considered to occur in a Poisson stochastic process. The assumption is not always consistent with observed data, especially at high-exceedance probabilities. A better fitting model is the Polya stochastic process, which implies that each occurrence probability depends on previous events. The model yields a negative binomial distribution of the number of exceedances in a time interval. (Sims-ISWS)
W77-09109

THE FREEZING BEHAVIOUR OF SUPERCOOLED WATER DROPS,
University of Manchester Inst. of Science and Technology (England). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W77-09118

THE EFFECT OF RAINFALL INTENSITY ON STORM FLOW AND PEAK DISCHARGE FROM FOREST LAND,
Georgia Univ., Athens. School of Forest Resources.
J. D. Hewlett, J. C. Fortson, and G. B. Cunningham.
Water Resources Research, Vol 13, No 2, p 259-266, April 1977. 4 fig, 5 tab, 11 ref.

Descriptors: *Appalachian Mountain Region, *Rainfall intensity, *Peak discharge, Storm runoff, Rainfall, Forests, Forest watersheds, Precipitation intensity, Storms, Winter, Summer, Storm water.
Identifiers: *Forest land, Intensity variables, Storm rainfall classes, Storm magnitude.

Analysis of a 30-year record of rainfall and storm flow from a forested watershed in the southern Appalachians was made to determine whether rainfall intensity influenced storm flow volume or peak discharge per unit area. Hourly and minutely rainfall intensities during storms had no effect on storm flow volumes delivered by the basin. Storm rainfall P, antecedent flow I, season (winter or summer), and duration of the rainstorm D accounted for 86.4% of the total variation in the log of storm flow. Addition of maximum 60-, 30-, 15-, and 5-min intensities raised the variation to 86.7% but reduced the standard error by less than 1/2%. The same four variables (P,I,S, and D) accounted for 72% of the variation in the log of peak flow. Addition of the intensity variables raised the variation to 76.7%. Thus, only 4.7% of the total variation in the log of peak flow was attributable to intensity. Intensity played a much smaller role in peak discharge generation on the studied basin than was expected. The hypothesis was offered that rainfall intensity variation is not a dominant variable controlling flood generation in humid region, wild land watersheds. (Roberts-ISWS)
W77-09125

AN ASSESSMENT OF WATERSPOUT FREQUENCIES ALONG THE U.S. EAST AND GULF COASTS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
J. H. Golden.
Journal of Applied Meteorology, Vol 16, No 3, p 231-236, March 1977. 4 fig, 1 tab, 12 ref. NRC AT (49-25)-1004.

Descriptors: *Storms, *Tornadoes, *Coasts, *Southeast US, *Florida, Weather, Damages, Winds, Frequency analysis, Frequency, Spatial distribution, Statistics, Weather patterns, Meteorology, Florida.
Identifiers: *Waterspouts, Florida Keys, Tampa Bay(Fla).

Ship reports dating back to the 1880's and 'Storm Data' reports for the period 1959-1973 were used to assess the threat posed by waterspouts to existing and proposed floating offshore nuclear power plants along the U.S. East and Gulf Coasts. In particular, it was found that the primary warm axis of th Gulf Stream and large coastal bays and inland waterways are favored regions of waterspout occurrence. A list of the ten most active coastal regions, in terms of reported waterspouts per unit area, was synthesized. It was shown th]t]wtv900003648 Florida Keys, the most prolific waterspout region is the entire southeast Florida Coast (Stuart to Homestead). Tampa Bay has had the greatest number of damaging waterspouts. (Sims-ISWS)
W77-09130

PORTABLE AUTOMATED MESONET IN OPERATION,
National Center for Atmospheric Research, Boulder, Colo.
F. V. Brock, and P. K. Govind.
Journal of Applied Meteorology, Vol 16, No 3, p 299-310, March 1977. 11 fig, 5 tab, 2 ref.

Descriptors: *Meteorological data, *Instrumentation, *Equipment, On-site investigations, Weather, Temperature, Humidity, Winds, Pressure, Rainfall, Measurement, Data transmission, Weather data, Radio communication systems, Sampling, Surveys, Meteorology.
Identifiers: *Data collecting systems.

'Design highlights, system performance, and operational use of the Portable Automated Mesonet (PAM) were featured. PAM consists of a trailer-mounted base station and a network of remote sampling stations for surface mesoscale research. PAM differs from unautomated systems in that the data are sampled synchronously, averaged locally, and transmitted digitally via a telemetry link to the base station where real-time data from the entire network are displayed. The base station uses minicomputer control for polling remotes, logging data, checking data quality, and displaying data. Displays include tabular listings, time plots, vector wind plots, and contours. Remote stations measure pressure, temperature, humidity, rain, wind speed, and wind direction, and include flexibility for future expansion. A programmable microprocessor at each remote station controls communications, data sampling, and data averaging. Averaged data are reported to the base station when the base station interrogates the remote station (typically once a minute). System performance was evaluated in a group intercomparison experiment prior to field operation in support of the National Hail Research Experiment (NHRE '76). Real-time display of PAM was used to identify surface mesoscale circulations influencing thunderstorm development during NRE '76. (Sims-ISWS)
W77-09131

EROSION CAUSED BY INTENSE RAINFALL IN A SMALL CATCHMENT IN NEW YORK STATE,
Clark Univ., Worcester, Mass. Graduate school of Geography.
For primary bibliographic entry see Field 2J.
W77-09134

AEROSOL OVER THE HIGH PLAINS OF THE UNITED STATES,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5A.
W77-09225

LIFE AT THE DESERT'S EDGE.
For primary bibliographic entry see Field 4C.
W77-09305

COMMENTS ON THE MECHANISM OF SOIL DETACHMENT BY RAINFALL,
Hebrew Univ., Jerusalem (Israel). Dept. of Geology.
For primary bibliographic entry see Field 2G.
W77-09313

LABORATORY INVESTIGATION OF RAINFALL RETENTION AND TRANSMISSION IN FRESH SNOW,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
W. P. Ebaugh, and D. R. DeWalle.
Technical Completion Report to National Weather Service, March 1977. 177 p, 15 fig, 11 tab, 6 ref. 4-36722.

Descriptors: *Rain, *Snow, Hydrology, Testing, Model studies, *Rainfall, *Retention, Water storage.
Identifiers: *Experimental data(Rainfall).

Hydrologic simululation models for routing liquid water through snow generally provide for both storage and routing of water within the snowpack. To provide data for such models, rain-on-snow experiments were conducted utilizing fresh snow samples in plexiglass cylinders. Measurements of rainfall quanitity, rainfall temperature, snow depth, snow temperature, initial and final snow density, and snowpack out-flow were made during 44 rain-on-snow events conducted in a controlled temperature environmental chamber. Data collected for fresh snow were used to determine outflow lag times, liquid-water-holding capacities, and routing coefficients. Results show outflow lag time to be a function of snow water equivalent and, to a lesser degree, initial snowpack temperature. Liquid-water-holding capacities were very low, ranging from zero to 5% by volume with an average value of 1%. Liquid-water-holding capacity was most highly correlated with initial snowpack density. Routing coeffiecients, defined as the fraction of water in transit released from a snowpack per time interval, decreased linearly in magnitude with liquid water content during the drainage portion of each run. Average routing coefficients for each rain-on-snow experiment varied from 0.0037 min-1 to 0.152 min-1 with an average value of 0.035 min-1. (NOAA).
W77-09322

PRECIPITABLE WATER VAPOR IN ATMOSPHERES CHARACTERIZED BY TEMPERATURE INVERSIONS,
Consiglio Nazionale della Ricerche, Bologna (Italy). Sezione Microfisica dell Atmosfera.
C. Tomasi.
Journal of Applied Meteorology, Vol. 16, No. 3, p 237-243, March 1977. 8 fig, 1 tab, 14 ref.

Descriptors: *Precipitation(Atmospheric), *Water vapor, *Air temperature, *Model studies, Mathematical models, Equations, Correlation analysis, Atmosphere, Humidity, Dew point, Temperature, Rainfall, Meteorology.

The total atmospheric precipitable water W was measured with an infrared hygrometer for different atmospheric conditions and for various seasons. Related to the simultaneous dew-point temperature T sub d at the surface, the data indicated that correct estimates of W can be given by the relationship lnW = a + b T sub d (first proposed by Reitan) only if properly chosen values for the intercept parameter a are used corresponding to the various periods of each day. The examination of both spectral hygrometer and radiosonde data taken in atmospheres characterized by marked temperature inversions showed that the parameter a is related closely to the ratio beta between the surface absolute humidity and W. On the other hand, the ratio appears to depend substantially on the general form of the vertical moisture profile of the low atmosphere. Thus, empirical relationships were proposed which give the possibility of inferring from empirical values of beta estimates of the partial precipitable water content within low atmospheric layers and of the absolute humidity at some standard levels, when radiosonde data are not available. (Sims-ISWS)
W77-09330

A SIMULATION OF SMOOTH-VARIABLE INTENSITY RAINFALL PATTERNS,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
J. F. Alfaro, and A. Y. Hachum.
Water Resources Bulletin, Vol. 13, No. 2, Paper No. 76101, p 349-364, April 1977. 8 fig, 11 ref.

Descriptors: *Rainfall simulators, *Simulated rainfall, *Artificial precipitation, Infiltration, Runoff, Laboratory tests, Temporal distribution, Equipment, Laboratory equipment, Rainfall, Rainfall intensity, Erosion, Simulation analysis, Precipitation(Atmospheric), Sprinkling.
Identifiers: *Application patterns, Smooth variation, Watershed simulation.

Continuous rainfall patterns currently are simulated by approximating the patterns by stair-stepped (piece-wise) patterns. The effects of the approximation on infiltration and runoff processes are not well known. A new technique for simulating smooth-variable intensity rainfall patterns was presented. The technique is based on the fundamental principles of a moving water head in a container. The proposed technique is general and capable of simulating any rainfall pattern. However, as the rainfall pattern gets more complicated the equipment required for simulation becomes more involved. The proposed technique was tested experimentally. A close agreement was found between the theoretical and experimental simulations. It was concluded that the proposed technique might be very useful in studying the infiltration and runoff processes under variable intensity rainfall, especially for simple convex patterns. (Sims-ISWS)
W77-09337

PRECIPITATION LOADING OF ACID AND HEAVY METALS TO A SMALL ACID LAKE NEAR SUDBURY (ONTARIO),
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
For primary bibliographic entry see Field 5A.
W77-09353

ON THE CAUSES OF LOCAL CLIMATIC ANOMALIES, WITH SPECIAL REFERENCE TO PRECIPITATION IN WASHINGTON STATE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
A. B. Pittock.
Journal of Applied Meteorology, Vol. 16, No. 3, p 223-230, March 1977. 5 fig, 2 tab, 44 ref.

Descriptors: *Precipitation(Atmospheric), *Topography, *Washington, *Australia, Climates, Climatology, Rainfall, Mountains, Lakes, Correlation analysis, Weather, Winds, Air circulation, Weather patterns, Air pollution, Fluctuations, Spatial distribution.

Topographic effects on climate, and particularly on precipitation, are well known in the literature. Nevertheless, the separation on the mesoscale of topographic effects from possible anthropogenic effects has proved difficult. A method based on patterns of correlation between local climate elements and indices of the general circulation, which was developed in a study of Australian rainfall, was applied to precipitation in the State of Washington and surrounding areas where relief is much greater. Patterns were found which account for the major part of some climatic anomalies discussed in the literature and which have prev

usly been ascribed to anthropogenic effects. The vider implications for the study of urban and other nthropogenic effects was discussed with eference to the La Porte anomaly and METROMEX. (Sims-ISWS)
W77-09355

. SIMPLE CONTINUOUS ICE CRYSTAL EPLICATOR FOR USE IN LABORATORY LOUD CHAMBERS,
ommonwealth Scientific and Industrial Research rganization, Sydney (Australia). Div. of Cloud hysics.
. R. Wishart.
ournal of Applied Meteorology, Vol. 16, No. 3, p 17-318, March 1977. 2 fig, 10 ref.

escriptors: *Cloud physics, *Instrumentation, Sampling, Ice, Crystals, Laboratory tests, Equipent, Precipitation(Atmospheric), Meteorology.
dentifiers: *Cloud chambers, *Ice crystal replicars, Samplers.

y means of the Schaefer 'wet slide' method, apied to a standard 7.5 cm x 2.5 cm glass slide, an expensive, continuous ice crystal replicator was eveloped, which produces replicas of good quali for sampling times of up to 3 min, with a time solution approaching + or - 5 s. (Sims-ISWS)
77-09360

SUGGESTED TECHNIQUE FOR THE ANALSIS OF AIRBORNE CONTINUOUS ICE UCLEUS DATA,
ontana State Univ., Bozeman. Dept. of Earth iences.
or primary bibliographic entry see Field 3B.
77-09361

PORTABLE RAINFALL SIMULATOR FOR RODIBILITY AND INFILTRATION MEAUREMENTS ON RUGGED TERRAIN,
lamath National Forest, Yreka, Calif.
or primary bibliographic entry see Field 2J.
77-09441

C. Snow, Ice, and Frost

LEISTOCENE ICE AT THE BASE OF THE ARNES ICE CAP, BAFFIN ISLAND, N.W.T., ANADA,
innesota Univ., Minneapolis. Dept. of Geology d Geophysics.
. LeB. Hooke.
urnal of Glaciology, Vol 17, No 75, p 49-59, 76. 6 fig, 2 tab, 18 ref. NSF GA-19310, GA-728.

escriptors: *Canada, *Glaciation, *Ice, leistocene epoch, Glaciology, On-site investigaons, *Isotope studies, Oxygen isotopes, aciers, Movement, Mathematical models, alytical techniques, Analysis, On-site data colctions, Evaluation, Ablation, Velocity, Temrature.
entifiers: *Baffin Island(Canada), *Barnes Ice p(Canada), Ice Cap.

ygen-isotope ratios indicate that a distinctive nd of white ice along the margin of the Barnes Cap is of Pleistocene age. It was estimated m a flow model that beneath the center of the cap the thickness of the band should be about times its thickness at the margin, or about 8 m. owever, an independent estimate, based on calated vertical strain-rates and explicitly assumno basal melting, predicts a thickness of about m beneath the center of the ice cap. The discrecy between the two thickness estimates was inpreted as indicating that basal melting has ocred. Calculated basal temperatures support the nclusion. (Humphreys-ISWS)
7-09116

ICE AND OCEAN TILT MEASUREMENTS IN THE BEAUFORT SEA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch.
J. R. Weber, and M. Erdelyi.
Journal of Glaciology, Vol 17, No 75, p 61-71, 1976. 6 fig, 12 ref, 1 append.

Descriptors: *Sea ice, *Slopes, *Sea levels, *Oceans, *Measurement, On-site investigations, On-site tests, On-site data collections, Instrumentation, Water levels, Floating, Hydraulics, Evaluation, Analysis, Theoretical analysis, Ice.
Identifiers: *Beaufort Sea, *Ice tilt measurement.

During the AIDJEX pilot study of 1972 in the Beaufort Sea, the tilt changes of the fluid ocean surface and of the sea ice were measured with a hysrostatic level. Preliminary results indicated a tilt range of + or - 5 microradians for the water surface and of + or - 30 microradians for the sea ice. The tilt change of the sea ice appears to be directly proportional to the component of the velocity change of the ice drift parallel to the hydrostatic level. It was concluded that the ice tilt is wind induced, and that the ice sheet tilts downward in the drift direction as a result of the moment exerted on it by wind and water drag. It was postulated that the tilt causes the ice to break at right angles to the drift direction. The tilt is a function of the length of an ice floe (or of the unbroken distance between two cracks), of the average ice thickness, of the average drag coefficients, and of wind and current velocities. Calculation of the ice tile using a simple model of a floating, rigid ice slab gives values which are very much smaller than the observed tilts. If the discrepancy between theory and observation can be resolved, or if an empirical formula between wind velocity and tilt angle can be deduced from continuous tilt observations which will be carried out during the AIDJEX main experiment, it will be possible, for a given wind, to estimate the maximum length of an unbroken ice sheet from its estimated thickness, its drag coefficients, and its tensile strength. It should also be possible to calculate the average drag coefficients of a free-floating ice pan, or of an ice island, from tilt, wind, and current measurements. The curious relationship between tilt angle and atmospheric pressure gradient that Browne and Crary observed on the ice island T-3 in 1952 was explained as being the wind-induced tilt of the ice island rather than that of the fluid ocean surface. (Humphreys-ISWS)
W77-09117

THE FREEZING BEHAVIOUR OF SUPERCOOLED WATER DROPS,
University of Manchester Inst. of Science and Technology (England). Dept. of Physics.
M. J. Gay, and J. Latham.
Journal of Glaciology, Vol 17, No 75, p 99-109, 1976. 5 fig, 1 tab, 12 ref. NERC GR3/2425.

Descriptors: *Freezing, *Cloud physics, *Drops(Fluids), *Laboratory tests, Precipitation(Atmospheric), Nucleation, Ice, Glaciation, Equipment, Data collections, Evaluation, Supercooling, Supersaturation.

An electrodynamic containment system was used to study the freezing behavior of supercooled water drops, of radius range 25 to 90 micrometer. The drops were frozen at temperatures between 0 and 29 C in an environment whose relative humidity was approximately 90% with respect to ice. Freezing events were observed visually and photographically, and measurements were made of the accompanying fractional mass loss. The most common mode of freezing (70% of the drops studied) resulted in an apparently spherical ice particle. However, 18% exhibited spikes or other protuberances, and the freezing of 3% was accompanied by the ejection of numerous ice particles. In each situation, values of fractional mass loss ranged from about 5 to 15%. A further 9% of the drops exhibited one or more secondary mass-loss events, occurring several seconds after the freezing process was complete, which is indicative of the ejection of ice particles. Almost all of the values of fractional mass loss were significantly in excess of those predicted on the basis of evaporation during freezing, suggesting that an additional mechanism of mass loss also was present. The measured freezing times were considerably shorter than the classical values-at least, for the larger drops freezing at warmer temperatures. (Humphreys-ISWS)
W77-09118

THE FREEZING OF SMALL TYNDALL FIGURES IN ICE,
Nagoya Univ. (Japan). Water Research Inst.
S. Mae.
Journal of Glaciology, Vol 17, No 75, p 111-116, 1976. 6 fig, 4 ref.

Descriptors: *Crystal growth, *Ice, *Crystallography, *Laboratory tests, *Freezing, Crystals, Melting, Testing procedures, Anisotropy, Measurement, Evaluation.
Identifiers: *Tyndall figures(Ice).

Tyndall figures, small thin discs of liquid water containing a vapor cavity, were formed in the centers of grains of pure, polycrystalline ice and were observed while freezing and growing. The freezing experiments showed, that the rate of decrease in the radius of a Tyndall figure does not depend upon the radius of the figure but does depend upon the thickness, h. Below a transition thickness of 12 micrometers, the rate of decrease of the radius varied inversely with h squared; above the transition thickness, the radius rate of decrease varied with 1/h. For growing figures, the transition thickness was approximately 10 micrometers and was defined in such a way that for h greater than the transition thickness, perturbations with wavelengths greater than 100 micrometers formed on the side faces of the Tyndall figures. (Humphreys-ISWS)
W77-09119

RIDGES ON ANTARCTIC ICE RISES,
British Antarctic Survey, Cambridge (England).
P. J. Martin.
Journal of Glaciology, Vol. 17, No. 75, p 141-144, 1976. 4 fig, 7 ref.

Descriptors: *Ice, *Antarctic, *Topography, *Model studies, Glaciology, Flow, Deformation, *Remote sensing, On-site investigations.
Identifiers: *Larsen ice shelf, *Spaatz Island, Ice rise, Sand model.

Satellite pictures have revealed the presence of ridges on the summits of ice rises in Antarctica. Because ice does not exhibit a critical stress, it was concluded that the ridges must be produced by a snow accumulation process rather than by ice deformation. A sand-model analog was used to simulate this behavior. The existence of a ridge on an ice rise will produce an increase in the shear stress below it, which in turn will tend to flatten the surface profile. Thus, unlike the sand model, the normal flow behavior of the ice will tend to spread the surface ridge, so producing the very shallow slopes observed. (Humphreys-ISWS)
W77-09120

EXTRACTION OF TRACE COMPONETS FROM LARGE QUANTITIES OF ICE IN BORE HOLES,
Bern Univ. (Switzerland). Physikalisches Institut.
H. Oeschger, B. Stauffer, P. Bucher, and M. Moell.
Journal of Glaciology, Vol. 17, No. 75, p 117-128, 1976. 4 fig, 1 tab, 11 ref.

Descriptors: *Ice, *Borehole geophysics, Dating, *Sampling, Polar regions, *Boreholes, Instrumentation, *Radioactive dating, Drill holes, Core

drilling, Testing procedures, Melting, On-site investigations, Equipment, Heating, Separation techniques, *Isotope studies.

A melting probe system was developed which can be lowered down to 400 m in an ice borehole of 135-165 mm diameter. At the desired depth, a section of the borehole is isolated and evacuated. Afterwards, several tons of ice are melted under vacuum with an electrical heater. The inclusions, which are principally gaseous, may be collected both during or after the melting procedure. The application of this system is mainly in the field of dating polar ice by radio-active isotope analysis. The devices used for sampling included a melting probe, a balloon probe, submersible pump, cable hose and auxilary hoses, winches for cable hose and auxiliary hoses, gas control system, and the electrical power system. Each device was described. (Humphreys-ISWS)
W77-09121

A METHOD OF CONCENTRATING THE MAJOR IMPURITIES CONTAINED IN ICE BY ION EXCHANGE,
Grenoble-1 Univ. (France). Institut de Geographie Alpine.
M. Ricq-de Bouard.
Journal of Glaciology, Vol. 17, No. 75, p 129-133, 1976. 1 fig, 1 tab, 9 ref.

Descriptors: *Ice, Sampling, Testing procedures, *Analytical techniques, Snow, Glaciers, *Ion exchange, *Sodium, *Potassium, *Calcium, *Magnesium, Analysis, Laboratory tests, Cations, *Flame photometry, Methodology, Pollutant identification.
Identifiers: Atomic absorption.

This note described a method for concentrating Na, K, Ca, and Mg impurities in samples of snow and ice for analysis by atomic absorption in flame photometry. The cations are fixed on a Dowex 50 ion-exchange resin and then selectively released and separately analyzed by atomic absorption. The described method allows the simultaneous treatment of a large number of specimens with concentration factors which can reach 60 to 75 and with very low risk of contamination or loss of the specimens. (Humphreys-ISWS)
W77-09122

ON THE USE OF TENSIOMETERS IN SNOW HYDROLOGY,
Cold Regions Research and Engineering Lab., Hanover, N. H.
S. C. Colbeck.
Journal of Glaciology, Vol. 17, No. 75, p 135-140, 1976. 4 fig, 11 ref. Army 4A161102B52E/02/011.

Descriptors: *Tensiometers, *Snow, *Ice, *Water pressure, *Arctic, Hydrology, Snowpacks, Glaciers, Moisture tension, Tension, Instrumentation, Measurement, Equipment, Mechanical properties, Water, On-site tests, Percolating water.

The construction and use of snow water tensiometers were described. Water pressure at the base of a shallow, Arctic snowpack was measured to illustrate the response of the basal layer to water percolation. Water tension above an ice layer and water flux through the ice layer were measured in glacial snow. The gravity flow theory was used to explain the close agreement between the parameters. The theory suggests that the ice layer has little effect on the flow field and that gravity (rather than tension gradients) controls the flow. Further work on water tensions is needed to identify the role of tension gradients in ripening and shallow snow covers. (Humphreys-ISWS)
W77-09123

PLEISTOCENE GLACIATION IN ETHIOPIA: NEW EVIDENCE,
Oregon State Univ., Corvallis. Dept. of Geology.
E. C. Potter.
Journal of Glaciology, Vol. 17, No. 75, p 148-150, 1976. 1 fig, 8 ref.

Descriptors: *Glaciation, *Africa, *Glacial drift, Pleistocene epoch, Geomorphology, Mountains, Valleys, Foreign countries.
Identifiers: *Ethopia, *Mount Badda(Ethiopia).

Geomorphological evidence indicates that Mount Badda, Ethiopia, had a Pleistocene ice cap of at least 140 sq km. Altitude of the snow line was probably about 4000 m, only 350 m below the summit, suggesting that glaciation occurred during the Wurm glacial maximum. (Humphreys-ISWS)
W77-09124

RESEARCH PROJECTS IN GLACIOLOGY - 1976.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
Report Series No 49, 1977. 136 p, 168 ref, 9 photos.

Descriptors: *Research and development, *Glaciers, Erosion, Instrumentation, Remote sensing, Ice, Climatology, Oil, Pipelines, Watersheds(Basins), Snowpacks, Satellites, Melt water, Oil pollution, *Canada, *Surveys, *Bibliographies.
Identifiers: Project catalogue, *Arctic hydrology, *Ice properties, *Avalanche research, *Glacier mapping, Baffin Island, Mackenzie Basin, Northwest Territories, Mass balance, Dendroclimatology.

The principal objective of the Glaciology Division, Environment Canada, is to maintain withing Canada a center of expertise in snow and ice, particularly in relation to inland water resources. This includes the establishment of an inventory of the perennial snow and ice masses and their changes from year to year; studies of Arctic hydrology; studies of lake and river ice; of the role of snow and ice in hydrology; of the fundamental properties of these materials and of avalanche problems. Increased attention is being given to applied studies, the results of which can be used operationally in water management projects or in the Environmental Review and Assessment process. The structure and organization of the Glaciology Division are described and the general objectives and responsibilities of each of its components are presented. The catalog section provides details of work done on projects since publication of the 1974 report. Projects which have been terminated, transferred, suspended or absorbed into other studies are listed separately. A bibliography of 168 published material not contained in previous reports is included. (WATDOC)
W77-09220

CANADIAN GLACIERS IN THE INTERNATIONAL HYDROLOGICAL DECADE PROGRAM, 1965 - 1974, NO. 1. SENTINEL GLACIER, BRITISH COLUMBIA - SUMMARY OF MEASUREMENTS,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
O. Mokievsky-Zubok, and A. D. Stanley.
Scientific Series No. 68, 1976. 75 p., 1 fig., 1 tab, 47 ref, 29 maps.

Descriptors: *Glaciers, *Glaciology, Hydrology, Hydrography, *Measurement, Geology, Meteorology, Mass, Rating curves, Parametric hydrology, Surface drainage, Elevation, Mountains, Melt water, *Data collections, *Canada.
Identifiers: *Sentinel Glacier, *British Columbia, Net mass balance, Winter balance, Summer balance.

Sentinel Glacier, located in the Coast Mountain Range of British Columbia, is one of five glaciers studied in Western Canada as part of the Canadian contribution to the International Hydrological Decade (IHD). Studies began in 1966. The report describes the main parameters of the glacier, the geology of the basin and gives summaries of glaciological, meteorolgical and hydrological data collected until the end of 1974 field season, together with a bibliography and references to special studies of the glacier. (WATDOC)
W77-09222

PREDICTING SNOW DEPTHS ON A MOUNTAIN WATERSHED,
Colorado State Univ., Fort Collins. Dept. of Fishing and Wildlife Biology.
L. H. Stelter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 363, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, Spring 1975. 50 p, 12 fig, 2 tab, 65 ref. OWRT A-019COLO(1). 14-31-0001-5006.

Descriptors: Snow, Forecasting, Depth, Watershed management, Data collections, *Colorado, Measurement, Model studies, Regression analysis, Snowmelt.
Identifiers: *Snow depth prediction, Mountain watersheds(Colo), *Missionary Ridge watershed(Colo).

The Missionary Ridge watershed on the western slope in southwestern Colorado was studied to determine if accurate predictions of snow depth with respect to elevation could be made, using wide ranges of the variables aspect, percent slope, and vegetative type to classify snow measurement sites. Data were collected for the winters of 1971-72, 1972-73, and 1973-74, using a total of 19 snow stake stations over an elevational range of 2300-3500 meters (7500-11,500 ft). The stations were placed in one of two groups; the groups were separated by differences in aspect, vegetative type, and ranges in percent slope. A simple linear regression model was used to try to explain the changes in snow depth with changes in elevation through the snow period for each of the two groups of stations. Predictions were fairly accurate each time the snow depths were measured, but the slopes of the regression lines were rather drastically different when the snow depth at a particular snow station was the same both between years and at different times of the same year. It was concluded that the major variables affecting snow accumulation and melt were too generally accounted for in this study to be of use in predicting snow depth over the entire watershed.
W77-09257

LACUSTRINE SEDIMENTS IN THE ALLEGHENY PLATEAU OF ERIE COUNTY, NEW YORK: THEIR CHARACTERISTICS, DISTRIBUTION, AND LAND USE PROBLEMS,
Cornell Univ., Ithaca, N.Y. Agricultural Experiment Station.
For primary bibliographic entry see Field 2J.
W77-09357

THE WINTER DARK SURVIVAL OF AN ALGAL FLAGELLATE--CRYPTOMONAS EROSA (SKUJA),
For primary bibliographic entry see Field 5C.
W77-09482

EFFECT OF CRUDE OIL ON POPULATIONS OF BACTERIA AND ALGAE IN ARTIFICIAL PONDS SUBJECT TO WINTER WEATHER AND ICE FORMATION.
For primary bibliographic entry see Field 5C.
W77-09526

2D. Evaporation and Transpiration

AUGMENTING SUMMER STREAMFLOW BY USE OF A SILICONE ANTITRANSPIRANT,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.

For primary bibliographic entry see Field 3B.
W77-09126

EVAPORATION AND EVAPOTRANSPIRATION N NIGERIA,
. O. Ayoade.
ournal of Tropical Geography, Vol. 43, p 9-19, December, 1976, 10 fig, 3 tab, 19 ref.

Descriptors: *Evaporation, *Evapotranspiration, *Evaporimeters, *Africa, *Meteorological data, *Moisture availability, *Measurement, Hydrology, Climatology, Soil moisture, Evaporation control, Rainfall, Evaporation pans, Correlation analysis, Precipitation(Atmospheric), Meteorology.
Identifiers: *Potential evapotranspiration, *Nigeria.

Evaporation and evapotranspiration are difficult to measure. In Nigeria routine measurements of evaporation did not begin in most parts of the country until the late 1950s. An overview is given of the various methods used to measure evaporation and some of the problems encountered. An attempt has een made using correlation analysis to assess the relative influence of some meteorological factors on measured evaporation in Nigeria. Due to the high costs associated with measuring evapotranspiration in the field, it is sometimes estimated indirectly from meteorological data. This is discussed; the formulae designed to estimate evapotranspiration can also be used to estimate potential evapotranspiration. The effectiveness of using the Thornthwaite or the Penman formula or estimating potential evapotranspiration is also discussed. (Jamail-Arizona)
W77-09299

ESTIMATED EVAPOTRANSPIRATION AND IRRIGATION REQUIREMENTS FOR CITRUS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Science.
J. S. Rogers, and J. F. Bartholic.
Soil and Crop Science Society of Florida Proceedings, Vol 35, p 112-117, Nov 1975. 2 fig, 4 tab, 2 ref. OWRT A-031-FLA(1). 14-34-0001-6010.

Descriptors: *Evapotranspiration, *Evaporation, Lake evaporation, Water management(Applied), Bowen ratio, Turbulent flux, Water balance, Rainfall, Soil water, Holding capacity, *Irrigation practices, *Water requirements, Crop production, Forecasting, Estimating, *Citrus.

Research data for water requirements of crops in Florida are limited. With the advent of water use permitting, it is imperative that techniques be available to reliably predict water requirements of crops. In this study a modified Blaney-Criddle procedure for estimating evapotranspiration (ET) for citrus was compared with research data of Robert Koo. The Blaney-Criddle technique gave the same ET values as the research data. Net irrigation requirement was calculated by a procedure developed by the Soil Conservation Service and compared with a daily water balance. Again comparable results were obtained. The ET estimates for citrus vary little within the state. Thus irrigation requirements depend upon amount of rainfall, rainfall distribution, and soil storage. Less rainfall usually results in higher irrigation requirements, but even in a high rainfall year considerable irrigation may be needed because of poor rainfall distribution. As soil storage decreases, larger amounts of irrigation are needed. Also as the crop ET increases, irrigation requirements will increase. (Morgan-Fla)
W77-09406

THE AQUATIC THERMAL CAPSULE,
Southern Illinois Univ. at Carbondale. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-09486

ELEVATED SUCTION TENSIONS AND MORPHOLOGICAL ALTERATIONS CAUSED BY TRANSVERSE CUTS IN A TAXUS STEM, (IN GERMAN),
Hochschule fuer Bodenkultur, Vienna (Austria). Botanisches Institut.
For primary bibliographic entry see Field 2I.
W77-09530

2E. Streamflow and Runoff

THEORETICAL PROBABILITY DISTRIBUTION OF CRITICAL HYDROLOGIC EVENTS BY THE PARTIAL-DURATION SERIES METHOD,
Rome Univ. (Italy). Istituto di Costruzioni Idrauliche.
For primary bibliographic entry see Field 2B.
W77-09109

CRITERION TO CHOOSE STEP LENGTH FOR SOME NUMERICAL METHODS USED IN HYDROLOGY,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Journal of Hydrology, Vol. 33, No. 3/4, p 287-299, 1977. 3 fig, 4 ref.

Descriptors: *Model studies, *Numerical analysis, *Analytical techniques, *Hydrology, Mathematics, Mathematical models, Equations, Diffusion, Rainfall, Runoff, Rainfall-runoff relationships, Finite element analysis.
Identifiers: *Step errors, Numerical methods, Differential equations.

An analytical treatment was given for the step error of some numerical methods frequently used in hydrology. Such a treatment is then utilized to formulate a criterion to choose the step length a priori that will guarantee convergence, stability, and minimum error production for the numerical method. (Sims-ISWS)
W77-09110

OPTIMAL FILTERING TECHNIQUES FOR HYDROLOGICAL FORECASTING,
Public Power Corp., Athens (Greece).
A. H. Maissis.
Journal of Hydrology, Vol 33, No 3/4, p 319-330, 1977. 3 fig, 14 ref.

Descriptors: *Inflow, *Reservoirs, *Forecasting, *Model studies, Mathematical models, Time series analysis, Analytical techniques, Regression analysis, Mathematics, Runoff, Streamflow, Hydrology.
Identifiers: *Inflow forecasting, Antoregressive models.

Two important aspects of linear prediction theory were outlined: time series forecasting and dynamic system identification. In both cases, the estimation of a parametric model is involved. The model parameters were computed by an iterative method based on Kalman's optimal filtering technique. Using Kalman's method, a model was fitted to the time series representing the monthly water inflows to a reservoir of the Greek hydroelectric system. Short-and medium-term forecasts of good accuracy then were computed. The confidence limits of the forecasts were determined by combining the results of the presented method and those obtained by pure statistical analysis of the data. (Sims-ISWS)
W77-09111

THE CALIBRATION OF SHARP CRESTED WEIRS BY THE PONDAGE DRAWDOWN METHOD,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 8C.
W77-09113

THE EFFECT OF RAINFALL INTENSITY ON STORM FLOW AND PEAK DISCHARGE FROM FOREST LAND,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 2B.
W77-09125

AN OPERATIONAL APPROACH TO PRESERVING SKEW IN HYDROLOGIC MODELS OF LONG-TERM PERSISTENCE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-09127

DEVELOPMENT OF THE SPRING CREEK DATA ACQUISITION SYSTEM,
Montana State Univ., Bozeman. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7A.
W77-09258

PREDICTING STORMFLOW AND PEAKFLOW FROM SMALL BASINS IN HUMID AREAS BY THE R-INDEX METHOD,
Georgia Univ., Athens, School of Forest Resources.
For primary bibliographic entry see Field 4A.
W77-09334

SENSITIVITY OF SOME RUNOFF MODELS TO ERRORS IN RAINFALL EXCESS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W77-09339

BAYESIAN GENERATION OF SYNTHETIC STREAMFLOWS, 2. THE MULTIVARIATE CASE,
Simon Bolivar Univ., Caracas (Venezuela).
J. B. Valdes, I. Rodriguez-Iturbe, and G. J. Vicens.
Water Resources Research, Vol. 13, No. 2, p 291-295, April 1977. 3 tab, 9 ref, 1 append. NSF GK-41643X.

Descriptors: *Streamflow, *Synthetic hydrology, *Regression analyses, *Stochastic processes, *Analytical techniques, *New Hampshire, Statistics, Risks, Probability, Hydrologic data, Computers, Methodology, Model studies.
Identifiers: *Bayesian method, *Prior distribution, Multivariate model.

Presented herein was a multivariate extension of the model for generating annual flows with the use of Bayesian methods to account for the parameter uncertainties due to short hydrologic records. The Bayesian multivariate regression model uses informative prior probability distribution function to include additional information about the unknown parameters of the stochastic streamflow process. The methodology was applied to three watersheds in New Hampshire. The results showed that the proposed method produces synthetic traces with higher standard deviations than the historical sample when the historical record is very short, which accounts for the uncertainty about the time value of the parameters and allows the planner to evaluate alternative projects in view of the mentioned uncertainty. (See also W76-05271) (Singh-ISWS)
W77-09349

THE USE OF THE PEARSON TYPE 3 AND LOG PEARSON TYPE 3 DISTRIBUTIONS REVISITED,
National Inst. of Scientific Research, Quebec.
B. B. Bobee, and R. Robitaille.

Water Resources Research, Vol. 13, No. 2, p 427-443, April 1977. 1 fig, 19 tab, 15 ref.

Descriptors: *Flood frequency, *Probability, *Analytical techniques, *Distribution, *Methodology, Hydrologic data, Annual flood, Gaging stations, Drainage area, Equations.
Identifiers: *Pearson type 3 distribution, *Method of maximum likelihood, Homogeneity tests, Method of moments.

Different methods of fitting the Pearson type 3 and log Pearson type 3 distributions were applied to several long-term records of annual flood flow after testing for independence and homogeneity. With the exception of one drainage basin, the test drainage areas ranged from 17 to 578,000 sq km. The method of maximum likelihood was shown to lead to generally poor results for small samples as used in hydrology. The Pearson type 3 distribution was shown to fit the annual flood data more adequately than the log Pearson type 3 distribution for the drainage areas tested. The bias of the coefficient of skewness computed by the method of moments was necessary. (Singh-ISWS)
W77-09352

2F. Groundwater

GROUNDWATER RESOURCES OF AUSTRALIA.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 4B.
W77-09103

THE AGE OF GROUNDWATER IN THE LINCOLNSHIRE LIMESTONE, ENGLAND AND ITS RELEVANCE TO THE FLOW MECHANISM,
Department of the Environment, Reading (England). Central Water Planning Unit.
R. A. Downing, D. B. Smith, F. J. Pearson, R. A. Monkhouse, and R. L. Otlet.
Journal of Hydrology, Vol. 33, No. 3/4, p 201-216, 1977. 3 fig, 2 tab, 14 ref.

Descriptors: *Groundwater, *Age, *Chemical properties, Groundwater movement, Limestones, Isotope studies, Carbon, Oxygen, Tritium, Deuterium, Sulphates, Nitrates, Bicarbonates, Calcium carbonate, Radiochemical analysis, Geology, Hydrogeology.
Identifiers: *England, *Groundwater age.

Groundwater samples from the Lincolnshire Limestone were analyzed for tritium, radiocarbon, and the stable-isotope ratios 13C/12C, 180/160 and D/H. The age of the water increases in a downgradient direction below overlying confining deposits and reaches a maximum age greater than 25,000 years within 15 km of the out-crop. The delta 13C ratio ultimately attains the unusually low negative values of -2 parts per thousand in a downgradient direction; this is approaching that of the aquifer matrix which is +2.35 parts per thousand. The reason is believed to be exchange of carbon between the groundwater and the matrix by a continuous process of precipitation and further solution of calcium carbonate. The delta 180 and delta D ratios imply that recharge of the aquifer during the late Pleistocene took place in the spring and autumn rather than the winter as at present. The data were interpreted by assuming that movement of water through the saturated zone is a combination of flow in fissures and 'piston flow' through the micro-fissures and pores of the rock. The mechanism of water movement in the saturated zone is dominated by relatively rapid flow in fissures, but the fissure flow includes a contribution of much older water from 'intergranular' storage which enters the fissures from the rock matrix by pressure differentials in the fissure distribution system and by diffusion. The distribution of water of different ages in the aquifer is related closely to recent groundwater abstraction patterns. (Sims-ISWS)
W77-09107

RECHARGE TO BUNTER SANDSTONE DETERMINED FROM LYSIMETERS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
R. Kitching, T. R. Shearer, and S. L. Shedlock.
Journal of Hydrology, Vol. 33, No. 3/4, p 217-232, 1977. 5 fig, 4 tab, 13 ref.

Descriptors: *Groundwater, *Groundwater recharge, *Lysimeters, *Sandstones, Measurement, Precipitation(Atmospheric), Rainfall, Evaporation, On-site investigations, Equations, Infiltration, Groundwater movement, Moisture content, Vegetation, Vegetation effects, Hydrogeology.
Identifiers: *England.

The results of three years operation of two large natural grassed lysimeters on Bunter Sandstone were described. Recharge measured each year by both of the lysimeters was greater than that calculated using rainfall, evaporation estimates, and a root constant of 75 mm. The mean measured recharge indicated that the calculated 'actual evaporation' may be 13% too high. A value of root constant of 35-50 mm seems appropriate for short grass in this area. The results highlighted the inadequacy of the 'rainfall less evaporation' calculation as a means of determining recharge within reasonable limits in areas where rainfall and evaporation are of the same order such as in the groundwater areas of the U. K. or semi-arid areas of the world. (Sims-ISWS)
W77-09108

VALIDATION OF AN AXISYMMETRIC PSEUDO-UNCONFINED TIME-VARIANT DIGITAL MODEL,
Birmingham Univ. (England). Dept. of Mechanical Engineering.
Y. K. Chan.
Journal of Hydrology, Vol 33, No 3/4, p 331-340, 1977. 1 fig, 4 tab, 18 ref.

Descriptors: *Aquifers, *Groundwater, *Pumping, *Model studies, Mathematical models, *Computer models, Groundwater movement, Water levels, Drawdown, Wells, Water wells, Analytical techniques, Hydrology.
Identifiers: Time-variant models.

The use of an axisymmetric pseudo-unconfined pumping-test digital model to simulate intergranular flow in an unconfined aquifer, due to a single-well pumping at a constant rate, was justified theoretically. The digital model was further validated by comparison with known steady-state case studies and a time-variant analytical solution. The computational effort required for the digital model was small. (Sims-ISWS)
W77-09112

NON-PENETRATING WELL IN A SEMI-INFINITE MEDIUM WITH NON-LINEAR FLOW,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak.
Journal of Hydrology, Vol 33, No 3/4, p 375-382, 1977. 4 fig, 2 tab, 17 ref.

Descriptors: *Penetration, *Water wells, *Steady flow, Mathematical models, Equations, Darcys law, Aquifers, Groundwater movement, Velocity, Reynolds number, Turbulent flow, Coarse sediments, Hydraulic gradient, Viscosity, Potentiometric level, Well spacing, Discharge.
Identifiers: *Non-penetrating wells, Non-linear flow, Inertial forces, Analytical solutions.

A steady-state analytical solution for the case of a non-penetrating well in a semi-infinite medium incorporating Forchheimer's non-linear velocity-gradient response was presented. The solution was compared with the available solution for Darcian linear flow. The effect of non-linearity in the flow response on the discharge characteristics and piezometric pressure distribution in relation to the corresponding linear case was brought out. (Visocky-ISWS)
W77-09114

PROFILE DESATURATION DURING SEDIMENT DEPOSITION IN A GROUNDWATER RECHARGE TRENCH,
Mississippi Agricultural and Forestry Experiment Station, Mississippi State. Dept. of Agronomy.
For primary bibliographic entry see Field 4B.
W77-09115

DECLINING POTENTIOMETRIC LEVELS IN FORT WALTON BEACH AREA, FLORIDA,
Northwest Florida Water Management District, Tallahassee.
For primary bibliographic entry see Field 4B.
W77-09132

TRANSFORM APPROACH TO SOLUTION OF GROUNDWATER FLOW EQUATIONS,
Nevada Univ., Reno. Water Resources Center and Nevada Univ., Reno. Desert Research Inst.
C. M. Case, and M. K. Peck.
Journal of Hydrology, Vol. 32, No. 3/4, p 305-320, February 1977. 6 tab, 12 ref. OWRT A-059-NEV(3).

Descriptors: *Numerical analysis, *Mathematical models, *Potential flow, *Analytical techniques, Groundwater, Equations, Aquifers, Porous media, Hydrodynamics, Computer models.
Identifiers: *Fourier transforms, Partial differential equations, Integral equations.

A method of obtaining approximate integral transforms of second-order partial differential equations with non-constant coefficients was discussed. The inverses of these transforms may be found by using the appropriate standard inversion techniques. Finite and infinite fourier transforms were discussed as particular cases. The application of these transforms to groundwater flow equations was discussed briefly via two examples. The potential advantages of this technique for application to numerical solution of flow equations and diffusion-dipersion equations are: (1) for each independent variable that can be transformed, a dimension that would otherwise need to be considered numerically is eliminated, thus making larger problems accessible to computer analysis; and (2) the solution can be generated at the spatial and temporal locations of interest only, thus effecting further efficiencies in modeling a given aquifer system. (Adams - ISWS)
W77-09318

HYDROLOGY OF TWO SMALL WETLAND BASINS IN EASTERN MASSACHUSETTS,
Lowell Univ., Mass. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2A.
W77-09336

TYPE CURVES FOR RECOVERY OF DISCHARGING WELL WITH STORAGE,
Nevada Univ. System, Reno. Water Resources Center.
P. R. Fenske.
Journal of Hydrology, Vol. 33, No. 3/4, p 341-34
1977. 3 fig, 7 ref.

Descriptors: *Wells, *Georgia, *Groundwate Groundwater movement, Theis equatio Hydrology, Transmissivity, Discharge(Wate Analysis, Equations, Mathematical studies, O site investigations.
Identifiers: *Type curves, Recovery type curves.

The analysis of water level recovery data usual is carried out using the straight line or late ti solution. Recently, Case et al presented a meth based upon the reversion of the series representi

e exponential integral whereby recovery data uld be analyzed if only two points were known the recovery curve. The analysis was based on the Theis equation and, consequently, was bject to all of the assumptions to the Theis equaon. The most important of these assumptions is e lack of storage in the discharging well. padopulos and Cooper solved the problem and esented appropriate type curves for well covery after instantaneous charge of water when e well contained storage. Fenske presented an tension of the Theis equation which considers th discharging and observation well storage. The mpler mathematics makes the derivation of type covery curves for radial flow systems with scharging well storage readily feasible. It was und that as pumping time becomes very short lative to recovery time, the type recovery curves proach as a limit the curves of Cooper, et al for covery after instantaneous drawdown. Recovery ta from a test at Dawsonville, Georgia, were ed as an example. (Lee-ISWS)
77-09340

HE SPACIAL DISTRIBUTION OF GROUND-ATER DISCHARGE INTO THE LITTORAL ONE OF A NEW ZEALAND LAKE,
epartment of Scientific and Industrial Research, aupo (New Zealand). Freshwater Section.
H. John, and M. A. Lock.
ournal of Hydrology, Vol. 33, No. 3/4, p 391-395, 977. 1 fig, 1 tab, 6 ref.

escriptors: *Groundwater movement, *Base ow, *Lakes, Spatial distribution, Sediments, ischarge(Water), Flow, Measurement, Foreign ountries, On-site investigations, Water sources, oreign research, Water supply.
dentifiers: *New Zealand, *Lake Rotorua(New ealand), Littoral zones.

he spacial distribution of groundwater discharge to the littoral zone of Lake Rotorua (New Zeand) was determined by direct measurement. ischarges at two stations on the eastern shore ere found to be 2.8 and 5.0 times greater than the ischarge at any of the other five stations gauged. n transects at right angles to the shoreline, flow te varied inversely with depth and distance from ore. The maximum discharge recorded was 27.5 liters per sq m per day, and the minimum was 7 liters per sq m per day. It was concluded that e technique employed could be an extremely seful tool when investigating groundwater ischarge into lakes. (Sims-ISWS)
77-09341

INITE-ELEMENT ANALYSIS OF GROUND-VATER FLOW IN MULTI-AQUIFER YSTEMS, II. A QUASI THREE-DIMENSIONAL LOW MODEL,
Kyoto Univ. (Japan). Dept. of Agricultural Engineering.
. Fujinawa.
ournal of Hydrology, Vol. 33, No. 3/4, p 349-362, 977. 7 fig, 1 tab, 13 ref.

escriptors: *Finite element analysis, Groundwater movement, *Aquifer systems, Numerical analysis, Mathematical models, Equaons, Computer models, Theoretical analysis, eakage, Aquitards, Aquifer characteristics, ransmissivity, Storage coefficient, Theis equaon, Artesian heads.
dentifiers: *Multiple-aquifer systems, Threeimensional flow, Galerkin method, Analytical olutions.

n integrated model with a one-dimensional finitelement analysis for solving the vertical flow equaons in aquitards and a two-dimensional finite-elent analysis for solving the horizontal flow equaons in aquifers was developed to analyze quasi hree-dimensional groundwater flow. The numerial results were compared to the analytical solu-on obtained by Neuman and Witherspoon. Except at small values of the dimensionless time, good agreement with the analytical solution was obtained. The advantage of the method lies in the simplification of the calculation procedure and in the reduction of computing time and storage. (See also W77-07148) (Visocky-ISWS)
W77-09362

THE RELEASE OF METAL IONS TO GROUND WATER BY SOILS,
Tuskegee Inst., Ala. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5B.
W77-09405

MULTIPHASE FLUID FLOW THROUGH POROUS MEDIA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W77-09408

2G. Water In Soils

PERSISTENCE OF PROPANIL, DCA, AND TCAB IN SOIL AND WATER UNDER FLOODED RICE CULTURE,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 5B.
W77-09128

THE CHEMICAL COMPOSITION OF THE LYSIMETRIC WATER FROM SANDY PODZOLIC SOIL AND CHANGES AFFECTED BY FERTILIZERS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2K.
W77-09277

INFLUENCE OF CROP MANAGEMENT PRACTICES ON NUTRIENT MOVEMENT BELOW THE ROOT ZONE IN NEBRASKA SOILS,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
J. Muir, J. S. Boyce, E. C. Seim, P. N. Mosher, and E. J. Deibert.
Journal of Environmental Quality, Vol. 5, No. 3, p 255-259, July-September 1976. 9 fig, 12 ref.

Descriptors: *Nitrogen, *Potassium, *Root zone, *Leaching, Irrigation effects, *Nebraska, Soil investigations, Alfalfa, Corn, Nutrients, Path of pollutants.

Deep profile sampling under different water and crop management systems revealed limited movement of N and none of P from the rooting profile of nonirrigated Nebraska soils. Leaching of N to the water table was apparent in most irrigated soils located on valley positions and in sandy soils of the uplands. Alfalfa with its deep rooting system was an effective scavenger of inorganic N that may have accumulated under crops. (Skogerboe-Colorado State)
W77-09279

EFFECT OF PH AND COMPLEX FORMATION ON MERCURY (II) ADSORPTION BY BENTONITE,
Kansas State Univ., Manhattan. Dept. of Agronomy.
D. W. Newton, R. Ellis, Jr., and G. M. Paulsen.
Journal of Environmental Quality, Vol 5, No 3, p 251-254, July-September 1976. 3 fig, 3 tab, 14 ref.

Descriptors: *Heavy metals, *Clays, *Chlorides, *Salts, *Mercury, Aquatic environment, Aquatic population, Adsorption, Bentonite, Soil analysis.
Identifiers: *Desorption, *Aquatic ecosystems.

Reactions of Hg with bentonite clay were studied to determine behavior of the metal in aquatic ecosystems. Mercury (II) adsorption by bentonite as a funciton of pH and comples formation was investigated using a radioisotopic technique. Maximum Hg (II) adsorption in 0.01M Ca (NO3)2 systems occurred in the pH range 4.5-5.5. Varying the Ca(NO3)2 concentration only slightly influenced adsorption or the pH of maximum adsorption. Chloride ions sharply reduced Hg(II) adsorption, especially at low pH's. At pH 6 or lower, increasing CaC12 concentration from 0.00001 to 0.0001M depressed adsorption; higher CaC12 levels were required to decrease adsorption at pH 7. At a given C1(-) concentration, maximum observed Hg(II) adsorption occurred near the calculated pH where HgC10H occurred as a transition complex between HgC12 and Hg(OH)2. Chloride salts were more effective desorbers of Hg(II) than was 0.01M Ca(N03)2 or various 0.01N acids. HCL (0.01N) removed the most adsorbed Hg(II). (Skogerboe-Colorado State)
W77-09281

BEHAVIOR OF CHROMIUM IN SOILS: II. HEXAVALENT FORMS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
R. J. Bartlett, and J. M. Kimble.
Journal of Environmental Quality, Vol 5, No 4, p 383-386, October-December 1976. 2 fig, 4 tab, 7 ref.

Descriptors: *Chromium, *Adsorption, Organic matter, Soils, Soil investigations, Farm wastes, Aluminum, Phosphorus, Pollutant identification, Soil analysis, Soil chemistry.

Adsoption and reduction of added Cr(VI) were characterized in soils with contrasting pH's organic matter contents, and chemical and mineralogical properties. Presence of soil organic matter brought about spontaneous reduction of Cr(VI) to Cr(III), even at pH's above neutrality. Reduction did not occur in soils very low in organic matter unless an energy source was added. Cow manure added to practically organic-free Cecil B2 reduced Cr(IV) only after the pH had been lowered below 3 with HC1. The solubility of Cr(VI) in the presences of excess A1 changed in a pattern remindful of orthophosphate. all of the soils, except of pH 7.8 Cca horizon material, adsorbed Cr(VI). Presence of orthophosphate prevented the adsorption of Cr(VI), presumably by competition for the adsorption sites. Consistent with this finding, KH2P04 was found to be the best extracting agent for Cr(VI) is quickly reduced by soil organic matter. Thus, Cr(VI) added to a soil will remain mobile only if its concentration exceeds both the adsorbing and the reducing capacities of the soil. (Skogerboe-Colorado State)
W77-09283

NITROGEN BALANCE IN THE SOUTHERN SAN JOAQUIN VALLEY,
California Univ., Davis. Water Science and Engineering Section.
For primary bibliographic entry see Field 5B.
W77-09284

EFFECT OF MICROORGANISMS ON THE SORPTION AND FATE OF SULFUR DIOXIDE AND NITROGEN DIOXIDE IN SOIL,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-09285

EFFECT OF DISSOLVED OXYGEN ON REDOX POTENTIAL AND NITRATE REMOVAL IN FLOODED SWAMP,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W77-09286

SPLASH EROSION OF PRIMARY PARTICLES AND AGGREGATES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
For primary bibliographic entry see Field 2J.
W77-09288

THE EFFECT OF TEMPERATURE AND SOIL WATER ON CONVERSION OF DDT TO DDE IN SOIL,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 5B.
W77-09289

POTASSIUM STATUS OF SOME ALLUVIAL SOILS IN KENTUCKY,
Kentucky Univ., Lexington. Dept. of Agronomy.
M. Rasnake, and G. W. Thomas.
Soil Science Society of America Journal, Vol. 40, No. 6, p 883-886, November-December 1976. 7 fig, 3 tab, 21 ref.

Descriptors: *Kentucky, *Potassium, *Bermudagrass, Soil chemistry, Soil chemical properties, Soils, Soil investigations, Pollutant identification.

Six alluvial soils from Kentucky were intensively cropped to 'Midland' bermudagrass to determine K availability in each soil. Potassium removal by the bermudagrass was compared to exchangeable K, to labile K estimated from Beckett quantity/intensity plots and to Gapon coefficients before and after cropping. Exchangeable K was not a good measure of uptake ($r = 0.61$ not significant), but labile K determined on soils before cropping and the Gapon coefficient after cropping gave highly significant linear correlations with K removed by bermudagrass. Exchangeable K after cropping changed an average of only 23 ppm K in the soils, but availability of K to plants was lowered drastically in all soils. This study shows that exchangeable K is an insensitive measurement of K availability to plants. Exchangeable K is a useable measurement only because wide ranges are used in determining classes of availability in soil testing. (Skogerboe-Colorado State)
W77-09290

CALCIUM RETENTION IN RESPONSE TO PHOSPHATE SORPTION BY SOILS,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
J. C. Ryden, and J. K. Syers.
Soil Science Society of America Journal, Vol. 40, No. 6, p 845-846, November-December 1976. 1 tab, 8 ref.

Descriptors: *Sorption, Desorption, Precipitation(Atmospheric), Calcium, Potassium, Soil chemistry, Soil investigations.
Identifiers: *Calcium retention(Soils), *Phosphate sorption(Soils).

Retention of Ca increased in response to P sorption by soils, but was independent of the amounts of added Ca. Rather constant values were obtained for the molar ratio of Ca/P retained (0.19 to 0.34). Retained Ca was essentially recovered in 1M KCl washings in contrast to the fractional recovery of sorbed P. The retention of Ca in response to P sorption by soils is interpreted as arising from a sorption rather than a precipitation reaction, and results from the increase in negative charge induced by P sorption. (Skogerboe-Colorado State)
W77-09291

CORRECTION OF 'TUBE CONTRIBUTION' INTERFERENCE IN THE DETERMINATION OF HEAVY METALS BY X-RAY SPECTROSCOPY USING THE 'ADDITIONS TECHNIQUE',
Maryland Agricultural Experiment Station, College Park. Dept. of Soil Science.
For primary bibliographic entry see Field 5A.
W77-09292

SOIL AIR PRESSURE EFFECTS ON ROUTE AND RATE OF INFILTRATION,
Agricultural Research Service, St. Paul, Minn.
D. R. Linden, and R. M. Dixon.
Soil Science Society of America Journal, Vol. 40, No. 6, p 963-965, November-December 1976. 3 fig, 7 ref.

Descriptors: *Infiltration, *Soil water, *Soil moisture, Soil properties, Soil investigations, Soils.
Identifiers: *Soil air pressure.

One centimeter of 0.1% methylene blue solution was infiltrated into soil with various constant soil air pressures beneath the wetting surface to measure flow into and through soil macropores. Flow was increasingly impeded as soil air pressure increased from 0 to 5 mbars. Infiltration rates during the first 3 min of wetting were decreased by an order of magnitude with 5 mbars of air-back pressure. (Skogerboe-Colorado State)
W77-09293

A SEMIAUTOMATED PROCEDURE FOR TOTAL NITROGEN IN PLANT AND SOIL SAMPLES,
Florida Univ., Gainesville. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W77-09294

AN IMPROVED TECHNIQUE FOR MEASURING SOIL PH,
Montana Agricultural Experiment Station, Bozeman.
A. Mubarak, and R. A. Olsen.
Soil Science Society of America Journal, Vol. 40, No. 6, p 880-882, November-December 1976. 2 fig, 3 tab, 17 ref.

Descriptors: *Soil properties, Soil investigations, Soil chemistry, Soil chemical properties, Laboratory tests, *Hydroglen ion concentration, *Analytical techniques, Measurement, *Soil analysis.
Identifiers: Immiscible displacement, *Soil pH.

Soil solution is obtained by immiscible displacement using centrifugation in the presence of an excess of carbon tetrachloride. A combination glass electrode is then introduced into the soil solution which is floating on top of the carbon tetrachloride. By keeping the system closed, changes in pH induced by loss or gain of carbon dioxide are avoided. No water need be added to a naturally occurring soil so changes in pH induced by the dilution effect and/or the salt effect are obviated. There is no contact between reference electrode and soil particles so there is considered to be no junction error involved in the measurement. The technique is simple and reasonably convenient; the readings are stable and apparently reliable. (Skogerboe-Colorado State)
W77-09295

USE OF UNDISTURBED CORES OF SURFACE SOIL FOR INVESTIGATING LEACHING LOSSES OF SULPHUR AND PHOSPHORUS,
Victoria Dept. of Agriculture, Melbourne (Australia). Div. of Agricultural Chemistry.
K. I. Peverill, and L. A. Douglas.
Geoderma, Vol. 16, p 193-199, October, 1976, 3 fig, 2 tab, 18 ref.

Descriptors: *Cores, *Core drilling, *Leaching, *Soil surfaces, *Sulfur, *Phosphorus, Sands, Fertilizers, Nutrients, Sampling, Drilling samples, Percolation, Topsoil, Water pollution sources.

Leaching of applied phosphorus and sulfur from soil has been extensively studied in the field. In the laboratory, many leaching studies have been undertaken but have involved the use of packed soil columns. In this study undisturbed soil cores ten centimeters long were collected using a precisely constructed 8.5 centimeter diameter soil sampler. To study the loss of sulphur and phosphorus from these cores due to leaching, a technique was developed for encasing the walls of the cores in a micro-crystalline wax. Distilled water was applied to the surface of the cores and sulphur and phosphorus loss determined. Results show that the use of undisturbed soil cores should not lead to exaggerated losses of sulphur and phosphorus from the soil as occurs when packed soil columns are employed, and a constant rate of percolation through the soil can be maintained, thus preventing the occurrence of conditions associated with water-logging. (Jamail-Arizona)
W77-09309

COMMENTS ON THE MECHANISM OF SOIL DETACHMENT BY RAINFALL,
Hebrew Univ., Jerusalem (Israel). Dept. of Geology.
S. Yariv.
Geoderma, Vol. 15, p 393-400, June, 1976, 15 ref.

Descriptors: *Soil mechanics, *Rainfall, *Soil erosion, *Soil water movement, *Soil moisture, Rain, Precipitation(Atmospheric), Soil density, Particle size, Soil water, Moisture, Soil physics, Rainfall runoff-relationships, Rainfall intensity, Precipitation intensity, Erosion, Moisture content, Hydration, Mathematical models, *Impact(Rainfall).

The effect of rain in detaching and dislodging some of the soil particles upon which it falls is well known. However, not all particle sizes are equally susceptible to detachment. Because of their physical mass, gravel and very coarse sand may be very resistant to dtachment. Coarse and medium size particles detach quite readily under raindrop impact. From the coarse sand sizes through silt sizes resistance to detachment decreases. The object of this study is to propose an alternative to explanations already offered for the decrease in the relative detachability of small soil particles. This explanation is based on the fact that most minerals in the small size fraction have high hydration energies. The model used to describe the mechanism of detachment deals with three extreme stages: (1)dry soil; (2) soil water mixture (fluid soil), and (3) soil and overland flow. It is shown that in all three stages the decrease in relative detachability is governed in part by the two factors of particle size and hydration. A mathematical model is presented to describe the probability of detachment of soil particles during all three stages. (Jamail-Arizona)
W77-09313

SATELLITE MICROWAVE OBSERVATION OF SOIL MOISTURE VARIATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
T. J. Schmugge, J. M. Meneely, A. Rango, and R. Neff.
Water Resources Bulletin, Vol. 13, No. 2, p 265-281, April 1977. 11 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, *Soil moisture, *Central U.S., Soils, Vegetation, Vegetation effects, Satellites(Artificial), Aircraft, Microwave, Rainfall, Antecedent precipitation, Precipitation(Atmospheric), Soil water, Crops, Soil moisture meters, Measurement, Monitoring, Water resources, Agriculture.
Identifiers: *Microwave radiometers.

Results from studies in the Illinois-Indiana and Texas-Oklahoma areas indicated that satellite microwave observations at the 1.55 cm wavelength are responsive to relative moisture variations in the near surface layer of the soil. Because significant vegetation cover absorbs the 1.55 cm microwave emission from the soil, the target area must be predominately bare soil or low density vegetation cover for meaningful measurements to result. The 25 km resolution of the satellite sensor limits application of the microwave techniques

e areas such as watersheds or agricultural dis-
s rather than individual fields. In general, at
cm, there is an inverse relationship between
rowave brightness temperature and changes in
moisture levels (as indicated by antecedent
fall) in agricultural regions before planting of
)s or during the early growing season when
etation cover is sparse. Even early season ob-
ations should be of great value in deciding on
time and type of crop planting and for initial ir-
tion scheduling when the root zone is still in
e proximity to the surface. (Sims-ISWS)
7-09335

DROLOGY OF TWO SMALL WETLAND
SINS IN EASTERN MASSACHUSETTS,
vell Univ., Mass. Dept. of Earth Sciences.
primary bibliographic entry see Field 2A.
7-09336

ALING FIELD-MEASURED SOIL HYDRAU-
PROPERTIES USING A SIMILAR MEDIA
NCEPT,
zona Univ., Tucson. Dept. of Soils, Water, and
ineering.
V. Warrick, G. J. Mullen, and D. R. Nielsen.
ter Resources Research, Vol. 13, No. 2, p 355-
, April 1977. 2 fig, 1 tab, 12 ref.

scriptors: *Hydraulic properties, *Soils,
aling, Soil water movement, *Hydraulic con-
tivity, Unsaturated flow, Hydrology, Soil
sics, Flow, On-site investigations, *Soil physi-
properties.
ntifiers: Unsaturated hydraulic conductivity,
ilar media concept.

ld data for soil water characteristic relation-
)s and unsaturated hydraulic conductivity were
led by using the concept of similar media in
er to study water flow in spatially varying soils.
a observed by different investigators at three
graphic areas were used. The soil water charac-
stic data consisted of 840, 900, and 512 obser-
ions, while data for the unsaturated hydraulic
nductivity (available from only one of the three
rces) consisted of 2,640 observations. In the
cess of scaling the data, a best fit for the scaled
a was defined in terms of a sum of squares
ut an 'average' curve, using one value for the
ling parameter for each sampling location.
mparisons made between curves fitting the data
l curves fitting the scaled data showed that scal-
reduces the sums of squares by amounts vary-
from 34 to over 90%. For similar media, the
ling parameter determined at a given sampling
ation for the soil water characteristic relation-
p (a sub r from h(S)) should be identical to the
ling parameter for the unsaturated hydraulic
nductivity (a sub r from K(S)). Although the
rameters were highly correlated (r = 0.91) for
only set of data available, a sub r from h(S)
ues were shown to be more effective in scaling
unsaturated hydraulic conductivity data than
re a sub r from K(S) values in scaling soil water
aracteristic data. (Roberts-ISWS)
7-09350

RTICAL INFILTRATION IN DRY SOIL,
rnell Univ., Ithaca, N.Y. School of Civil and
vironmental Engineering.
Brutsaert.
ter Resources Research, Vol. 13, No. 2, p 363-
, April 1977. 26 ref.

scriptors: *Infiltration, *Soils, *Vertical migra-
n, Dry beds, Sorption, *Infiltration rates, Soil
ter movement, Capillary conductivity, Equa-
ns, Mathematical studies.
ntifiers: *Vertical infiltration, Differential
uations, Water content profile, Quasi-steady-
te method, Soil water diffusivity, Infiltration
uation.

An approximate method was proposed to integrate the ordinary differential equations governing the terms in Philip's series formulation of the water content profile. The method is related to the weighing solution used earlier for the sorption problem, and it is intermediate between the quasi-steady state method and the sharp front method. In a comparison with an available exact solution, it was shown that the derived solution is usually accurate to within less 1%. The water content profile and the infiltration rate can be expresed concisely in terms of soil physical parameters by making use of suitable expressions for the soil water diffusivity and for the capillary conductivity. As an illustration, the infiltration rate was calculated for the Averjanov-Irmay capillary conductivity and for the author's three-parameter power function diffusivity. Inspection of two extreme cases in the calculation finally lead to a new infiltration equation in closed form which is valid for short and for large times of infiltration. (Roberts-ISWS)
W77-09351

THE RELEASE OF METAL IONS TO GROUND WATER BY SOILS,
Tuskegee Inst., Ala. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5B.
W77-09405

MULTIPHASE FLUID FLOW THROUGH POROUS MEDIA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. A. Wooding, and H. J. Morel-Seytoux.
Annual Review of Fluid Mechanics, Vol 8, 1976, p 233-274. 15 fig, 196 ref. OWRT B-144-COLO(2). 14-34-0001-6064.

Descriptors: *Porous media, *Flow, *Reviews, *Bibliographies, Fluid mechanics, *Infiltration, Model studies, *Flow characteristics, *Capillary action, Capillary water.
Identifiers: *Multiphase fluid flow, Two-phase flow.

Research is reviewed on isothermal flow of immiscible phases in rigid porous media, with emphasis on two-phase flow. Particular attention is given to mechanisms of immiscible displacement, and theories of wetting of solids which relate to the motion of solid-liquid-fluid contact lines in displacement flows. Flow in packed towers is reviewed from the macroscopic aspect, and simple kinematic-wave models are observed to be useful for high Reynolds number flows, including the prediction of 'flooding'. Green-Ampt theory is still considered a successful macroscopic model of capillary uptake by, or infiltration into, porous media; later theories of infiltration are also reviewed. Capillary hysteresis during cycles of wetting and drying is still difficult to incorporate into hydrologic infiltration models. Infiltration can be better treated as a two-phase problem, using Buckley-Leverett theory, with capillarity specially treated at moisture 'fronts'. In some cases, however, such fronts are macroscopically unstable and fingering may occur. Multiphase flow under cold conditions, with possible ice formation and soil heaving, is also reviewed briefly.
W77-09408

NITRATE-NITROGEN MOVEMENT THROUGH SOIL AS AFFECTED BY SOIL PROFILE CHARACTERISTICS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-09427

NITRATE LEAKAGE FROM SOILS DIFFERING IN TEXTURE AND NITROGEN LOAD,
Technion - Israel Inst. of Tech., Haifa. Lab. of Soil Science.
Y. Avnimelech, and J. Raveh.
Journal of Environmental Quality, Vol. 5, No. 1, p 79-82, January-March 1976. 1 fig, 1 tab, 10 ref.

Descriptors: *Nitrogen, *Nitrates, *Chlorides, Soil profiles, *Soil texture, Clay soils, Leaching, Denitrification, Soil investigations, Soils, Distribution, Path of pollutants.
Identifiers: *Nitrogen load(Soils).

Nitrogen and chloride distribution in soil profiles underlying plots differing in the nitrogen load and soil type were studied in the coastal plain of Israel. Nitrate leakage was defined as the product of the average nitrate concentration in subsoil solution times the annual water recharge. A large portion of the excessive nitrogen (nitroglen load minus nitrogen uptake by the removal crop) was not recovered. This portion is high for clay soils and for plots receiving high nitrogen dressings. Changes in the NO3/Cl ratio along the soil profile coincided with nitrate removal. The data support the hypothesis that nitrate removal is mainly due to denitrification in the top layer of the soil. (Skogerboe-Colorado State)
W77-09428

SOIL NITRATES FOLLOWING FOUR YEARS CONTINUOUS CORN AND AS SURVEYED IN IRRIGATED FARM FIELDS OF CENTRAL AND EASTERN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-09429

USE OF THE GREEN-AMPT EQUATION WITH VARIABLE CONDUCTIVITY,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
L. R. Ahuja, and G. Y. Tsuji.
Soil Science Society of America Journal, Vol. 40, No. 4, p 619-622, July-August 1976. 2 fig, 13 ref.

Descriptors: *Infiltration, *Hydraulic conductivity, Soil water, *Soil water movement, *Hawaii, Equations.
Identifiers: *Green-Ampt equation, Sorptivity.

A comparison with Philip's two-term equation, derived from a series solution involving t(1/2), indicates that the hydraulic conductivity in the Green-Ampt equation of vertical infiltration varies with time when the soil water content of the transmission zone is assumed to be constant. Use of the Green-Ampt equation with a continuously variable conductivity or a piecewise application of the equation as an extension of Philip's two-term equation resulted in improved prediction of infiltration in two Hawaii soils. Both these forms of application require three parameters, hydraulic conductivity, sorptivity, and constant A, which well-established physical meaning. (Skogerboe-Colorado State
W77-09430

BEHAVIOR OF CHROMIUM IN SOILS: I. TRIVALENT FORMS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
R. J. Bartlett, and J. M. Kimble.
Journal of Environmental Quality, Vol. 5, No. 4, p 379-383, October-December 1976. 2 fig, 4 tab, 9 ref.

Descriptors: *Aluminum, *Chromium, Field capacity, Soils, Soil investigations, Adsorption, Phosphorus, Chemical reactions, Soil chemistry.
Identifiers: Sodium pryrophosphate.

Chemical behavior of Cr(III) was studied in solutions, soil suspensions, and in soils of contrasting characteristics incubated at field capacity moisture. Sodium pyrophosphate, pH 4.8 NH40Ac, and 0.1 M NaF appeared to extract organically bound Cr(III), whereas 1M HCl removed

inorganic Cr hydroxides and phosphates along with some organic Cr. Pyrophosphate and HCl extracts represented quantities of Cr(III) removed; NH40Ac and NaF extracts appeared to characterize small readily removed fractions, that is, intensity factors. Soil organic complexes of Cr(III) formed at low pH and appeared to remain stable and soluble even when soil pH's were raised to levels where the Cr would be expected to precipitate. Adsorption and solubility behavior of Cr(III) as it varied with pH and P treatments was similar to that of Al. Oxidation of Cr(III) to Cr(VI) was not demonstrated at all, even under conditions of maximum aeration and high pH. (Skogerboe-Colorado State)
W77-09432

COMPARISON OF FIELD-MEASURED AND CALCULATED SOIL-HEAT FLUXES,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
B. A. Kimball, R. D. Jackson, F. S. Reginato, F. S. Nakayama, and S. B. Idso.
Soil Science Society of America Journal, Vol. 40, No. 1, p 18-25, January-February 1976. 5 fig, 1 tab, 32 ref.

Descriptors: *Soil temperature, *Thermal conductivity, *Heat flow, Soils, Soil investigations, Water vapor, Temperature, Soil water movement.
Identifiers: Soil-heat fluxes.

Soil-heat fluxes calculated using DeVries' theory (1958,1963) were compared with those experimentally determined in a field of Avondale loam at Phoenix, Arizona, on 6 days representing different seasons of the year. A fair agreement between measured and computed fluxes as obtained only after modifying the air shape factor curve and ignoring heat transfer due to water vapor movement. The omission of the latter implied that heat transfer by pure conduction was most important and that thermal and isothermal vapor fluxes exactly cancelled during the day and were insignificant at night. 'Measured' thermal conductivities were also determined from the ratio of the measured heat fluxes to the corresponding temperature gradient for those times when it was unlikely that isothermal vapor movement was significant. The lack of a temperature dependence in these data, as well as the flux comparisons, strongly indicate that the theory over estimated thermal vapor movement. These data plus others in the literature indicate that an individual 'calibration' of the theory for a particular soil is required before reliable predictions of soil-heat flux can be obtained. (Skogerboe-Colorado State)
W77-09433

SOIL-HEAT FLUX DETERMINATION: TEMPERATURE GRADIENT METHOD WITH COMPUTED THERMAL CONDUCTIVITIES,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
B. A. Kimball, R. D. Jackson, F. S. Nakayama, S. B. Idso, and R. J. Reginato.
Soil Science Society of America Journal, Vol. 40, No. 1, p 25-28, January-February 1976. 1 fig, 2 tab, 13 ref.

Descriptors: *Thermal conductivity, *Heat flow, Soils, Soil investigations, Soil properties, Methodology.
Identifiers: Temperature gradient, Calorimetry, *Soil-heat fluxes.

Surface soil-heat fluxes were determined for 6 days in a field of Avondale loam using the null-alignment method, the combination method, and four variations of the temperature gradient method with thermal conductivities computed from the DeVries' theory for particular reference depths. For all methods, calorimetry was used to obtain the surface flux from the flux determined for the reference depth. There was 10% or less difference between the null-alignment, combination, and temperature gradient methods for a 20-cm reference depth. However, the difference with respect to the null-alignment method increased to 35% for a 5-cm reference depth when DeVries' theory was closely followed. This difference was reduced to 3% when a modified air shape factor was used in the computations and all vapor movement was ignored. The temperature gradient method with conductivities computed from DeVries' theory can be reliably used with a 20-cm reference depth, but a 'calibration' of the theory for a particular soil should be obtained before the method is used with a 5-cm reference depth. (Skogerboe-Colorado State)
W77-09434

THE INFLUENCE OF APPLIED PHOSPHORUS, MANURE, OR LIME ON UPTAKE OF LEAD FROM SOIL,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5B.
W77-09435

A METHOD FOR SECTIONING SATURATED SOIL CORES,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
K. R. Reddy, and W. H. Patrick, Jr.
Soil Science Society of America Journal, Vol. 40, No. 4, p 611-614, July-August 1976. 3 fig, 2 tab, 5 ref.

Descriptors: *Laboratory tests, *Sampling, Soils, Soil physical properties, Soil investigations, Ions, *Cores, *Methodology.

A simple system for sectioning water-saturated cores without prior freezing is described. The method described can be used for studying the distribution and movement of ions in soil or sediment cores prepared in the laboratory or obtained in undisturbed form from the field. The average coefficient of variation was 4.8% for the sectioning of the cores prepared in the laboratory and 10.5% for the sectioning of the cores obtained from the field. (Skogerboe-Colorado State)
W77-09436

NITRIFICATION-DENITRIFICATION REACTIONS IN FLOODED SOILS AND WATER BOTTOMS: DEPENDENCE ON OXYGEN SUPPLY AND AMMONIUM DIFFUSION,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
W. H. Patrick, Jr., and K. R. Reddy.
Journal of Environmental Quality, Vol 5, No 4, p 469-472, October-December 1976. 5 fig, 10 ref.

Descriptors: *Nitrogen, *Denitrification, *Nitrification, *Oxygen, Anaerobic, Aerobic, Soils, Soil investigations, Nitrate, Ammonium, *Soil chemistry, Flooding.
Identifiers: *Ammonium diffusion, Submerged soils, Flooded soils.

Ammonium nitrogen in a flooded soil or water bottom exposed to oxygen from the water column undergoes sequential nitrification and denitrification. Oxygen moving through the overlying water column causes the development of an aerobic surface layer of soil or sediment. Ammonium in this aerobic surface layer in nitrified and the resulting ammonium concentration gradient across the aerobic layer and the underlying anaerobic layer causes ammonium in the anaerobic layer to diffuse upward into the aerobic layer where it also undergoes nitrification. Nitrate produced in the aerobic layer then diffuses downward into the anaerobic layer where it is denitrified to N2 and N2O. Nitrate derived from ammonium nitrogen in the aerobic layer appears as an intermediate product in the nitrification-denitrification reaction. A laboratory experiment utilizing N-15 as a tracer showed that approximately one-half of the nitrogen involved in the nitrification-denitrific tion process was ammonium originally present the surface aerobic soil or water bottom layer wi the remainder diffusing up from the underlyi anaerobic layer. Where oxygen was absent limiting, nitrification either did not occur or o curred at a lower rate, resulting in a reduc amount of nitrate available for the denitrificati process. (Skogerboe-Colorado State)
W77-09437

FATE OF FERTILIZER NITROGEN IN FLOODED RICE SOIL,
Louisiana State Univ., Baton Rouge. Lab. Flooded Soils and Sediments; and Louisiana St Univ., Baton Rouge. Dept. of Agronomy.
W. H. Patrick, Jr., and K. R. Reddy.
Soil Science Society of America Journal, Vol No 5, p 678-681, September-October 1976. 3 fig, tab, 11 ref.

Descriptors: *Rice, *Fertilization, *Nitroge Nutrients, Soil investigations, Flood irrigation, rigation affects, Irrigation, Flooding, Fertilizers.
Identifiers: *Rice fertilization, Flooded soils.

In order to improve the efficiency of fertilizer utilization by rice, it is important to know wh happens to N applied to the soil. Field experime utilizing N15-enriched ammonium sulfate we carried out to determine the fate of fertilizer (100 kg N/ha) applied to Crowley silt loam s The distribution of fertilizer N in the plant-s system at harvest time was determined using 2 sq m plots. The distribution of fertilizer N in plant-soil-floodwater system at six times dur the growing season was measured in smaller pl (0.28 sq m). The results from the larger pl showed that fertilizer N recovered in the gr ranged from 30.9 to 37.3 kg N/ha depending on method of application. Recovery of fertilizer N the straw ranged from 18.2 to 24.2 kg N/ha. A co siderable portion of fertilizer N (24.2 to 27.1 N/ha) remained in the soil (including roots) af cropping. Total recovery of the 100 kg/ha additi of labelled fertilizer N in the soil-plant system w 75.0 to 85.6 kg N/ha for the different methods of application examined. Experiments using smaller 0.28 sq m plots showed rapid uptake of f tilizer N immediately after application, with no parent further uptake after about 3 weeks. Soil was the major and perhaps sole source of N for plant during the last part of the growing seas (Skogerboe-Colorado State)
W77-09438

ADSORPTION OF SELENITE A PHOSPHATE ON AN ALLOPHANE CLAY,
Ruakura Agricultural Research Center, Hamil (New Zealand). Soil Chemistry Group.
S. S. S. Rajan, and J. H. Watkinson.
Soil Science Society of America Journal, Vol No 1, p 51-54, January-February 1976. 3 fig, 3 t 20 ref.

Descriptors: *Adsorption, *Clays, *Phosphat Soils, Soil investigations, Soil properties, S chemistry, Anions, Anion adsorption, *Sulfates
Identifiers: *Selenite, *Allophane clays.

Selenite was adsorbed on an allophane clay fr solutions of different concentrations at pH 5.0, 30C, and under a N2 atmosphere, and the amou of sulfate, silicate and hydroxyl ions released w measured. The results were compared with th from a similar study with phosphate on the sa clay. The results indicate that at low concent tions both phosphate and selenite exchanged w adsorbed sulfate, adsorbed silicate, and aquo hydroxo groups. About three times m phosphate than selenite was adsorbed, due ma due to phosphate displacing more aquo groups thus making the surface less positive. At high c centrations, whereas the selenite adsorpt reached a maximum, phosphate continued to adsorbed. The latter was due to phosphate displ

structural silicate and probably also to disrup- of hydrous oxide polymers. A two-term Lang- r equation distinguished adsorption by surface nd exchange from these other reactions at high centration. (Skogerboe-Colorado State)
7-09439

TEROVALENT CATION EXCHANGE UILIBRIA IN SOILS WITH VARIABLE AND TEROGENEOUS CHARGE,
ifornia Univ., Davis. Dept. of Soil Science.
N. Munns.
l Science Society of America Journal, Vol 40, 6, p 841-845, November-December 1976. 4 fig, b, 15 ref.

scriptors: *Cation exchange, *Leaching, Soil perties, Soil investigations, *Calcium, agnesium, Lime, Ion exchange, *Potassium.

alent cations were incrementally displaced, m limed and un-limed samples of three soils, by pending the soils in increasing volumes of 2mM l. Mass action coefficients for exchange ween Ca and Mg were constant. But for the hange of divalent cations by K, the exchange fficients of Kerr, Vanselow, Gapon, Krish- noorthy and Overstreet, and Gaines and omas increased markedly as potassium satura- n or pH increased. For each cation species, arate fractions which were relatively loosely orbed could be estimated by a simple regres- n analysis. The loosely adsorbed Ca, which may ntrol Ca availability to plants, could be indepen- ntly estimated by a leaching procedure. Mass ion exchange coefficients for the loosely ad- bed cations were approximately constant under conditions tested. The variable charge mobil- d by liming differed from the fixed charge in ving a slightly higher proportion of sites with h divalent affinity, in an Oxisol, and a much ver proportion in a Vertisol and a Mollisol. ogerboe-Colorado State)
7-09440

SITU MEASUREMENT OF GAS DIFFUSION EFFICIENT IN SOILS,
chigan State Univ., East Lansing. Dept. of Crop d Soil Sciences.
H. Lai, J. M. Tiedje, and E. Erickson.
il Science Society of America Journal, Vol 40, 1, p 3-6, January-February 1976. 4 fig, 3 tab, 12 .

scriptors: Soils, Soil investigations, Soil ofiles, Gas chromatography, Soil properties, rbon dioxide, *Gases, Diffusion, Oxygen.
entifiers: *In situ measurement, *Gas diffusion, ffusion coefficient.

method for determination of the gas diffusion efficient of soils without disturbing the natural te of the soil was developed. The method was sed on the theory of radial diffusion of a finite antity of gas into a semi-infinite porous medium. eedles were inserted into the soil through which was injected. The change of concentration of injected 02 was determined by gas chromatog- phy through the same needle after increasing riods of time. A least square fit between the easured 02 concentrations and that of the eoretical values was conducted to find the best value of the diffusion coefficient. The diffusion efficient determined by the proposed method s used to calculate the flux of C02 in field soils. e flux so calculated was compared to that mea- red from the field with good agreement. The ethod was used in several different field soils d conditions to determine the diffusion coeffi- ents. (Skogerboe-Colorado State)
7-09442

HOSPHORUS FERTILIZATION WITH DRIP RIGATION,
lifornia Univ., Davis. Dept. of Land, Air, and ater Resources.

For primary bibliographic entry see Field 3F.
W77-09443

INFLUENCE OF PESTICIDES ON DENITRIFICATION IN SOIL AND WITH AN ISOLATED BACTERIUM,
Pennsylvania State Univ., University Park. Dept. of Soil Microbiology.
For primary bibliographic entry see Field 5B.
W77-09445

METHYLATION OF MERCURY IN AGRICULTURAL SOILS,
Environmental Protection Agency, Las Vegas, Nev. Office of Research and Development.
R. D. Rogers.
Journal of Environmental Quality, Vol 5, No 4, p 454-458, October-December 1976. 7 tab, 24 ref.

Descriptors: *Mercury, *Soil texture, *Soil moisture, Soil temperature, Soils, Soil investigations, Ions, Heavy metals, Water pollution.
Identifiers: *Methylation, *Methylmercury, Mercuric nitrate, *Agricultural soils.

Methylation of applied divalent mercury ion was found to occur in agricultural soils. The production of methylmercury was affected by soil texture, soil moisture content, soil temperature, concentration of the ionic mercury amendment, and time. Methylation was directly proportional to clay content, moisture content, temperature, and mercury concentration. After an initial build-up of methylmercury in the soil, there appeared to be a mechanism that decreased the methylmercury content with increasing time. (Skogerboe-Colorado State)
W77-09447

PHYSICAL AND HYDROPHYSICAL PROPERTIES OF THE SOILS AT THE GREENHOUSE UNIT ISALNITA-DOLJ, (IN RUMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
S. Balan, V. Sandu, G. Enache, and I. Naramzoiu.
An Inst Stud Cercet Pedol. 40, p 73-88, 1972.

Descriptors: Soils, Greenhouses, *Soil physical properties, *Soil texture, Drainage, *Soil density, Soil profiles, Soil compaction, Permeability, Porosity.
Identifiers: *Romania.

The soils are, generally of a fine texture in which the colloidal fraction prevails. The physical, mechanical and hydric properties of these soils are deficient in texture, permeability, total and aeration porosity, compaction, resistance to cultivation, etc. In the top and subsurface layers, the apparent densities are very high, generally above 1.50 to 1.70. The extremely high values of the apparent density are accounted for by soil subsidence and compaction resulting from seedbed preparation, management and, particularly, harvesting of greenhouse crops. In all profiles, the values of the total and aeration porosities are very low and unsatisfactory. The permeability of the same soils, assessed quantitatively by hydraulic conductivity, also show values that are very low (<10) or nil, varying according to soil texture and compaction. Due to their geomorphological position, and hydrogeological and hydrological status, as well as their deficiencies such as compaction and extremely low permeability, the soils of the area studied (Romania) need to be drained and meliorated as regards their physical and hydrophysical properties, by using sand, polystyrene, peat and other materials.--Copyright 1975, Biological Abstracts, Inc.
W77-09488

CORN CULTIVATION IN THE SAND OF THE BUKHARA OASIS, (IN RUSSIAN),
Bukharskii Gosudarstvennyi Pedagogicheskii Institut (USSR).

For primary bibliographic entry see Field 3F.
W77-09496

FOREST SITE CONDITIONS OF BARCHANS UNDERLAIN BY TAKYRS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
N. K. Lalymenko.
Probl Osvoeniya Pustyn'. 6, p 42-50, 1973.

Descriptors: *Clays, Plant physiology, *Forests, *Classification, Distribution, Groundwater, *Sands, Soil horizons, Arid lands.
Identifiers: *Barchans, Calligonum, Salsola-paletzkiana, Salsola-richteri, *Takyrs.

A broad classification of forest site conditions on small and medium barchans underlain by takyrs (clay-surface deserts) is presented. The habitat of the plants, the thickness of the sand deposits, relief, particle-size distribution of the soils, characteristics of the structure of the lithologic profile, moisture factors (precipitation, takyr surface runoff, mudflows, etc.), depth of occurrence of moist soil horizons and groundwaters and characteristics of the root system of sand binders are included. Salsola richteri, Salsola paletzkiana and various Calligonum spp. are recommended for afforestation.--Copyright 1975, Biological Abstracts, Inc.
W77-09497

CHARACTERISTICS OF THE MEANA-CHAACHIN PLAIN SOIL-FORMING PROCESS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
I. G. Tolstolykin, A. P. Lavrov, and E. V. Larin.
Probl Osvoeniya Pustyn'. 3, p 21-28, 1974.

Descriptors: *Soil formation, Drainage, Saline soils, Soil types, Irrigation, Land reclamation.
Identifiers: *USSR(Meana-Chaachin plains), Takyo soils.

Takyr-like virgin and irrigated soils, takyr-like virgin and irrigated sierozems, typical takyrs, residual and typical solonchaks are common for the territory of the Meana-Chaachinskaya plain (USSR). The soils have a heavy mechanical composition with large silty fraction, high rates of salinization and metabolic capacity. The major proportion of lands fit for reclamation are 30-35 m above the Karakum canal. Irrigation is accomplished by pumping. To prevent secondary soil salination, the erection of water collector-drainage network is necessary.--Copyright 1975, Biological Abstracts, Inc.
W77-09502

ON THE PHYSICAL INTERPRETATION OF THE SOIL WATER DIFFUSIVITY IN TERMS OF THE THEORY OF MARKOV PROCESSES,
Arizona Univ., Tucson. Dept. of Mathematics.
R. Bhattacharya, V. Gupta, and G. Sposito.
Soil Science, Vol. 121, No. 5, p 313-314 1976.
OWRT B-046-ARIZ(2), 14-34-0001-6057.

Descriptors: *Markov processes, *Soil water movement, Diffusion, *Diffusivity.
Identifiers: Standard Brownian motion.

In a recent paper, Laroussi and De Backer (See W76-01851) have given an interpretation of the soil water diffusivity in terms of the theory of Markov processes with space and time dependent coefficients. However, their analysis is based on a complete analogy with the theory of the standard Brownian motion process. This analogy is incorrect if the Markovian coefficients are space and time dependent. This fact is illustrated in detail for pointing out that the physical interpretation of soil water diffusivity given by Laroussi and DeBaker is invalid. (See also W76-04305)
W77-09594

2H. Lakes

HYDROGRAPHIC SURVEYING TURNS TO ELECTRONICS,
Tibbetts Abbett, McCarthy and Stratton, Seattle, Wash.
For primary bibliographic entry see Field 7B.
W77-09105

RECORDING RIVER AND RESERVOIR WATER DEPTH,
Moore, Gardner and Associates, Inc., Asheboro, N. C.
For primary bibliographic entry see Field 7B.
W77-09106

THE ENVIRONMENTAL IMPULSE AND ITS COMPETITORS: ATTITUDES, INTERESTS, AND INSTITUTIONS AT LAKE TAHOE,
California Univ., Davis. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W77-09145

A BACTERIAL WATER QUALITY INVESTIGATION OF CANYON LAKE, ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 5C.
W77-09150

A REVIEW OF EPA'S GREAT LAKES MODELING PROGRAM,
Environmental Research Lab.-Duluth, Gross Ile, Mich. Large Lakes Research Station.
For primary bibliographic entry see Field 5B.
W77-09157

COMPARISON OF EUTROPHICATION MODELS,
Environmental Protection Agency, Atlanta, Ga. Technical Support Branch.
For primary bibliographic entry see Field 5C.
W77-09159

MATHEMATICAL MODEL OF A GREAT LAKES ESTUARY,
Environmental Protection Agency, Chicago, Ill.
For primary bibliographic entry see Field 5B.
W77-09166

RADIONUCLIDE TRANSPORT IN THE GREAT LAKES,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5B.
W77-09175

MODELING THE HYDRODYNAMIC EFFECTS OF LARGE MAN-MADE MODIFICATION TO LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W77-09177

AN EMPIRICAL MODEL FOR NUTRIENT RATES IN LAKE ONTARIO,
Environmental Protection Agency, Rochester, New York. Rochester Field Office.
For primary bibliographic entry see Field 5C.
W77-09178

EFFECTS OF IMPOUNDMENT ON WATER AND SEDIMENT IN THE ARKANSAS RIVER AT PUEBLO RESERVOIR,
University of Southern Colorado, Pueblo.
For primary bibliographic entry see Field 5B.
W77-09224

WETLANDS-RELATED LEGISLATION IN THE UNITED STATES,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 6E.
W77-09324

ESTIMATING THE SUSPENDED SEDIMENT LOAD IN RESERVOIRS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W77-09331

ON THE FLUCTUATIONS IN LEVELS OF CLOSED LAKES,
Commonwealth Scientific and Indu
D. J. Gates, and M. Diesendorf.
Journal of Hydrology, Vol. 33, No. 3/4, p 267-285, 1977. 1 fig, 11 ref, 1 append.

Descriptors: *Australia, *Lakes, *Stochastic processes, Lake basins, Model studies, Beaches, *Water levels, Climatic data, Runoff, Precipitation(Atmospheric), *Water level fluctuations.
Identifiers: *Closed Lakes, *Lake George, *New South Wales, Stochastic differential equation, Standard deviation, Late-quaternary climate, Beach formation, Runoff rate.

A stochastic differential equation model of closed lakes was introduced and analyzed, with particular reference to Lake George in New South Wales, Australia. Results indicated that the standard deviation in water level at the prehistoric 30-m level is approximately equal to the 1977 value at the 3-m level. At low water levels, the theory predicted that the expected level is slightly higher than that predicted by a purely deterministic theory. The model provided a more fundamental and complementary approach to the fluctuation calculations of Langbein. Also, the model provided some support for the work of Galloway, predicting a dry late-Quaternary climate, although the question of beach formation remained unresolved. (Roberts-ISWS)
W77-09338

THE SPACIAL DISTRIBUTION OF GROUNDWATER DISCHARGE INTO THE LITTORAL ZONE OF A NEW ZEALAND LAKE,
Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
For primary bibliographic entry see Field 2F.
W77-09341

A BIOLOGICAL AND CHEMICAL COMPARISON OF VARIOUS AREAS OF A RESERVOIR,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-09342

USE OF LARGE SUBMERGED CHAMBERS TO MEASURE SEDIMENT-WATER INTERACTIONS,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W77-09343

OXYGEN CONSUMPTION BY FRESHWATER SEDIMENTS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering; and Clemson Univ., S.C. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-09348

PRECIPITATION LOADING OF ACID AN HEAVY METALS TO A SMALL ACID LAK NEAR SUDBURY (ONTARIO),
Fisheries and Marine Service, Nanaimo (Britis Columbia). Biological Station.
For primary bibliographic entry see Field 5A.
W77-09353

LACUSTRINE SEDIMENTS IN THE AL LEGHENY PLATEAU OF ERIE COUNTY, NE YORK: THEIR CHARACTERISTICS, DI TRIBUTION, AND LAND USE PROBLEMS,
Cornell Univ., Ithaca, N.Y. Agricultural Exper ment Station.
For primary bibliographic entry see Field 2J.
W77-09357

ENVIRONMENTAL CHANGES IN LAKE ERI AND THEIR FUTURE IMPACT ON LAK RESOURCES.
Michigan State Univ., East Lansing. Dept. Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-09454

ECOLOGICAL STUDIES ON ALGAL-LYSIN BACTERIA IN FRESH WATERS,
Dundee Univ. (Scotland). Dept. of Biologic Sciences.
For primary bibliographic entry see Field 5C.
W77-09469

ON THE OCCURRENCE OF THE SPECIES SYNURA (CHRYSOPHYCEAE),
For primary bibliographic entry see Field 5C.
W77-09476

MINERALOGICAL COMPOSITION OF SU MERGED AQUATIC MACROPHYTES FRO CONNECTICUT,
For primary bibliographic entry see Field 5A.
W77-09477

MICROSTRATIFICATION OF LA WASHINGTON SEDIMENTS,
For primary bibliographic entry see Field 5C.
W77-09483

DISTRIBUTION AND SEASONAL VARIATI OF BENTHIC FAUNA IN LAKE MANITOBA,
For primary bibliographic entry see Field 5C.
W77-09484

CARBON DIOXIDE EXCHANGE A PRODUCTIVITY IN LAKE ERIE AND LA ONTARIO,
For primary bibliographic entry see Field 5C.
W77-09485

THE AQUATIC THERMAL CAPSULE,
Southern Illinois Univ. at Carbondale. Dept. Botany.
For primary bibliographic entry see Field 5C.
W77-09486

EFFECTS OF MAN-INDUCED AND NATUR LOADING OF PHOSPHORUS AND NITROG ON THE LARGE SWEDISH LAKES,
For primary bibliographic entry see Field 5C.
W77-09487

ANALYSIS OF THE MACROFAUNA-COMM NITY ON STRATIOTES VEGETATIONS,
For primary bibliographic entry see Field 5C.
W77-09489

PHYTOPLANKTON PERIODICITY IN A NEW RESERVOIR, LAKE ANNA, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 5C.
W77-09493

INTERACTIONS BETWEEN POPULATION DENSITY AND WATER QUALITY PARAMETERS DURING A DINOFLAGELLATE BLOOM,
For primary bibliographic entry see Field 5C.
W77-09494

TOTAL AND HYPOLIMNETIC AERATION OF LAKES IN WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W77-09495

THE ECOLOGICAL BEHAVIOR OF PLUTONIUM AND AMERICIUM IN A FRESHWATER POND,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 5C.
W77-09501

PHYTOPLANKTON OF LAKE RUSALKA (POLAND), (IN POLISH),
Adam Mickiewicz Univ., Poznan (Poland). Inst. of Systematic Geography and Plant Protection.
E. Kotlinska.
Poznan Tow Przyj Nauk Wydz Mat-Przyr Pr Kom Biol 42, p 3-53, 1976.

Descriptors: *Artificial lakes, *Phytoplankton, *On-site investigations, *Diatoms, Biorhythms, Distribution patterns, Lakes, Systematics, Algae, Biological communities, *Chlorophyta, Cyanophyta.
Identifiers: *Lake Rusalka(Poland), *Poland, Seasonal changes.

The specific composition, quantitative conditions, changes in the yearly cycle and periodic appearances of planktonic algae in artificial Lake Rusalka in Poznan (Poland) are discussed. Samples were taken from June 1969-1970 from 3 positions on the surface with a plankton net. During the summer there is a public bath near the lake. In the summer pollution increases near the public bath. In 1969/70, 328 taxa were determined. The greatest number of taxa occurred in the diatoms (120) and Chlorophyceae (89). Cyanophyceae dominated communities of algae. Considerable differences in the qualitative and quantitative composition of phytoplankton in particular seasons of the year are demonstrated. The greatest abundance of forms was noted during the spring, less during the summer. The richest communities of phytoplankton with respect to qualitative and quantitative composition were observed at the inflow of the River Bogdanka into the lake, a less rich one near the public bath and the poorest at the outflow of the river from the lake. This was influenced mainly by water contamination and by algae from the river Bogdanka.--Copyright 1977, Biological Abstracts, Inc.
W77-09507

SEGMENTED POPULATION MODEL OF PRIMARY PRODUCTIVITY,
NUS Corp., Pittsburgh, Pa. Ecological Science Div.
For primary bibliographic entry see Field 5C.
W77-09512

A SPECIES OF STYLOSCOLEX MICHAELSEN (OLIGOCHAETA, LUMBRICULIDAE) FOUND IN TWO LAKES IN NORTHERN ALASKA,
Naturhistoriska Riksmuseet, Stockholm (Sweden). Section for Invertebrate Zoology.
For primary bibliographic entry see Field 5C.
W77-09513

PHYTOPLANKTON OF LAKE MALTA (POLAND) (IN POLISH),
Adam Mickiewicz Univ., Poznan (Poland). Institute of Systematic Geography and Plant Protection.
For primary bibliographic entry see Field 5C.
W77-09515

LAKE DRAWDOWN AS A METHOD OF IMPROVING WATER QUALITY,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5G.
W77-09516

ON ALEXANDROVIA ONEGENSIS HRAVE FROM ALASKA, WITH A REVISION OF THE TELMATODRILINAE (OLIGOCHAETA, TUBIFICIDAE),
Naturhistoriska Riksmuseet, Stockholm (Sweden). Section for Invertebrate Zoology.
For primary bibliographic entry see Field 5C.
W77-09518

THERMAL CONDUCTIVITY OF ORGANIC SEDIMENTS FROM TWO WISCONSIN LAKES,
Cold Regions Research and Engineering Lab., Hanover, N.H. Earth Sciences Branch.
For primary bibliographic entry see Field 2J.
W77-09521

THE SEDIMENTS OF LAKE GEORGE (UGANDA). II: RELEASE OF AMMONIA AND PHOSPHATE FROM AN UNDISTURBED MUD SURFACE,
Malaya Univ., Kuala Lumpur (Malaysia). School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-09523

OCCURRENCE OF OSCILLATORIA AGARDHII GOM. IN SOME SHALLOW EUTROPHIC LAKES,
For primary bibliographic entry see Field 5C.
W77-09525

EFFECT OF CRUDE OIL ON POPULATIONS OF BACTERIA AND ALGAE IN ARTIFICIAL PONDS SUBJECT TO WINTER WEATHER AND ICE FORMATION,
For primary bibliographic entry see Field 5C.
W77-09526

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN.
Environmental Protection Agency, Washington, D.C. Water Quality Office.
For primary bibliographic entry see Field 5G.
W77-09528

FEEDING OF THE KILKA, CLUPEONELLA DELICATULA CASPIA MORPHA TACHARCHALENSIS (BORODIN) IN THE KUIBYSHEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Tolyatti. Institut Biologii Vnutrennykh Vod.
A. V. Kogan, and E. M. Zaitseva.
Vopr Ikhtiol. 14(3), p 477-482, 1974.

Descriptors: Reservoirs, *Food habits, *Freshwater fish, Fish, Daphnia, Waterfleas, *Fish diets, *Fish food organisms.
Identifiers: Acanthocyclops, Bosmina, Chydorus, *Clupeonella delicatula caspia m tsch, *Kilka, *Kuibyshev Reservoir(USSR), Food spectrum, Leptodora, *USSR.

The kilka was first discovered in the Kuibyshev Reservoir (Russian SFSR, USSR) in 1964. With respect to the main meristic and morphological characters, the Kuibyshev kilka is close to the Charkhal kilka Clupeonela delicatula caspia m. tscharchalensis, the freshwater form of the common Caspian kilka C. delicatula caspia. Information is presented on the food spectrum of the kilka of the Kuibyshev Reservoir. Characteristic foods of the kilka were the older copepodid stages of Cyclopoida, Chydorus, Bosmina, Daphnia, Acanthocyclops and Lepotodora. Changes of the food composition of the kilka as it grows were established.--Copyright 1975, Biological Abstracts, Inc.
W77-09540

ARTIFICIAL WATER REGULATION OF LAKE SUPERIOR--A TAKING,
Washington Coll. of Law D. C.
For primary bibliographic entry see Field 6E.
W77-09551

FEEDING OF FRY OF VALUABLE FISHES OF THE ARAKUM WATER BODIES AT EARLY STAGES OF DEVELOPMENT AND DEGREE OF SIMILARITY OF THEIR DIET, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Makhachkala (USSR). Dagestanskii Div.
O. N. Nasukhov.
Vopr Ikhtiol. 14(3), p 483-491, 1974.

Descriptors: *Fry, Bodies of water, *Fish diets, *Foods, *Freshwater fish, Perches, Habitats, Growth stages, *Fish food organisms.
Identifiers: Arakum, Perca fluviatilis, Rutilus frisii kutum, Rutilus rutilus caspia, Scardinius erythrophthalmus, *USSR, Roach, Kutum, Rudd, *Dagestan ASSR.

The qualitative and quantitative composition of the food of fry of the Caspian roach (Rutilus rutilus caspia), kutum (Rutilus frisii kutum), rudd (Scardinius erythrophthalmus) and perch (Perca fluviatilis) in Arakum water bodies (area about 16,000 ha) in the northeastern part of Dagestan ASSR (USSR) was investigated. The degree of similarity of the diet of these fishes at different stages of development was determined. The maximum degree of similarity (61.5-69.2%) was noted in the fry of the kutum and roach, which was attributed to their joint habitation in the better reacted, open areas of water.--Copyright 1975, Biological Abstracts, Inc.
W77-09592

2I. Water In Plants

ANNUAL WOODY PRODUCTIVITY DURING A 10-YEAR PERIOD AT VIRELLES-BLAIMONT, (BELGIUM), (IN FRENCH),
Brussels Univ. (Belgium). Laboratoire de Botanique Systematique et d'Ecologie.
Paule Kestemont.
Bull Soc R Bot Belg. 107(2), p 233-243, 1974.

Descriptors: *Dendrochronology, *Productivity, *Plant growth, Precipitation(Atmospheric), Annual, Growth rates.
Identifiers: *Belgium(Virelles-Blaimont).

Annual productivity of aerial woody parts was studied for 3 different standing crops in the forest of Virelles-Blaimont. Individual and specific differences, low production during a dry year (1964), high production during moist years (1965 and 1966) were analyzed. Annual production ranged from 5.2 t/ha-11.7 t/ha.--Copyright 1975, Biological Abstracts, Inc.
W77-09143

EFFECT OF SEVERAL CULTURAL PRACTICES ON THE ESTABLISHMENT OF ALFALFA (MEDICAGO SATIVA L.),
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
For primary bibliographic entry see Field 3F.
W77-09144

DETERMINATION OF PHYSICAL AND HYDRAULIC PREFERENCES OF BROWN AND BROOK TROUT IN THE SELECTION OF SPAWNING LOCATIONS,
Wyoming Univ., Laramie. Water Resources Research Inst.
D. W. Reiser, and T. A. Wesche.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 273, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Series No. 64. May 1977. 100 p, 29 fig, 12 tab, 113 ref, 3 append. OWRT C-7002 (No. 6201)(2), 14-34-0001-6201.

Descriptors: *Spawning, *Brook trout, *Brown trout, *Streamflow, *Aquatic habitats, *Fish behavior, *Wyoming, Incubation, Permeability.
Identifiers: *Spawning criteria, *Spawning behavior, Spawning environment, Spawning flow, Instream flow, Stream resource maintenance flow.

During the fall of 1975, 121 brown and 54 brook trout redds were located and intensively studied in seven stream sections of southeastern Wyoming. Depth, mean velocity, and point velocity were measured at the upper edge, pit, and tailspill of each redd. A representative substrate sample was collected from the tailspill and later analyzed using a series of 9 sieves. Permeability of the substrate was measured at the redd site using a Mark IV standpipe. The distance to the nearest usable cover was also measured for each redd. Spawning criteria were then developed for brown and brook trout using the middle 80 percent of the upper-edge mean velocity measurements, the upper-edge depth which 90 percent of the measurements were greater than or equal to, and the substrate size interval comprising 70 percent of the total weight. For brook trout the criteria were determined to be: velocity, 0.12-1.11 fps; depth, > 0.2 ft; substrate size, 0.132-1.99 in; For brown trout: velocity, 0.45-1.50 fps; depth, > 0.3 ft; substrate size, 0.25-2.99 in. The criteria can be used to aid in determining suitable spawning flows for Wyoming's smaller streams. An egg-planting experiment was conducted to attempt to determine the combination of parameters affording the highes percentage survival of brown trout eggs.
W77-09153

ANNUAL WOODY PRODUCTIVITY DURING A 10-YEAR PERIOD AT MIRWART (BELGIUM), (IN FRENCH),
Brussels Univ. (Belgium). Laboratoire de Botanique Systematique et d'Ecologie.
Paule Kestemont.
Bull Soc R Bot Belg. 107(2), p 223-232, 1974.

Descriptors: *Dendrochonology, *Productivity, Precipitation(Atmospheric), Annual, Dating, Growth rates, *Plant growth.
Identifiers: *Belgium(Mirwart).

Thickening growth ring width was studied in a Fagetum, a Quercetum and a Piceetum established on the same bedrock at Mirwart, Belgium. Specific and individual differences were observed. Characteristic annual productivities (low productivity during 1964 and 1968 corresponding to little precipitation; high productivity in 1962 in relation to abundant precipitation) are discussed.--Copyright 1975, Biological Abstracts, Inc.
W77-09227

GROWTH AND WATER ECONOMY OF THE TREE SPECIES ALNUS AND SALIX, (IN GERMAN),
Freiburg Univ. (West Germany). Institut fuer Biologische Holzforschung.
H. J. Braun.
Z Pflanzenphysiol. 74(1), p 91-94, 1974.

Descriptors: Trees, *Plant growth, Growth rates, Water consumption, Water conservation, Leaves, *Willow trees.
Identifiers: *Alnus-glutinosa, *Salix-alba.

Amount of basal increment, growth and volume increment of stem, number, area and volume of leaves, water consumption (absolute and per m2 leaf area) and water economy during a vegetation period were studied in Alnus glutinosa and Salix alba. Volume increment (stem and leaves) of Salix is only slightly larger than with Alnus. Salix consumes more water than Alnus with the same leaf mass. Salix is less economical in its water use than Alnus.--Copyright 1975, Biological Abstracts, Inc.
W77-09233

EFFECT OF PARASITES ON THE CONDITION AND GROWTH OF YOUNG FISH OF THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
T. I. Komarova, and T. D. Petrichenko.
Gidrobiol Zh. 10(2), p 87-89, 1974.

Descriptors: *Fish parasites, *Growth rates, Reservoirs, Larval growth stage, Trematodes, Juveniles, *Growth stages, Fish hatcheries.
Identifiers: *Bream, Ergasilus-sieboldi, Ichthyophthirius-multifiliis, Ide, Loach, Silver bream, Trematode, Trichodina-nigra, Tripartiella-incisa, Tripartiella-mutabilis, *USSR(Kremenchug reservoir), Dnieper River(USSR).

The effects of some species of parasites on the condition and average daily increment of young fishes of the Kremenchug reservoir on the Dnieper River were studied. Infestation of fish larvae by single specimens of Trichodina nigra, Tripartiella incisa and Tripartiella mutabilis reduced the condition factor of bream by 5.9%, silver bream by 6.8%, loach by 8.0% and ide by 3.0%. With an increase of the intensity of infestation to 15-20 specimens/fish the condition factor decreased respectively by 26.4%, 20%, 18.9% and 18.5%. In the case of combined infestation by these parasites and Ichthyophthirius multifiliis the condition factor of the fishes decreased by 20-25%. Not all parasites adversely affected the condition and increment of the fish; e.g., infestation of young fish by various species of trematodes had little effect on them. Infestation by Ergasilus sieboldi is also discussed.--Copyright 1975, Biological Abstracts, Inc.
W77-09278

LEAD EFFECTS ON SEVERAL ENZYMES AND NITROGENOUS COMPOUNDS IN SOYBEAN LEAF,
Taiwan Provincial Chung-Hsing Univ., Taichung.
For primary bibliographic entry see Field 5C.
W77-09280

GENOTYPIC RESPONSES IN SORGHUM TO DROUGHT STRESS. III. FREE PROLINE ACCUMULATION AND DROUGHT RESISTANCE,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
For primary bibliographic entry see Field 3F.
W77-09297

SOIL WATER-ROOT RELATIONS IN WHEAT: WATER EXTRACTION RATE OF WHEAT ROOTS THAT DEVELOPED UNDER DRY AND MOIST CONDITIONS,
Leeds Univ. (England). Dept. of Plant Sciences.
R. B. Sharma, and B. P. Ghildyal.
Agronomy Journal, Vol. 69, p 231-233, March April 1977. 2 fig, 2 tab, 8 ref.

Descriptors: *Soil water, *Soil-water-plant relationships, *Root systems, *Absorption, *Wheat, Dry farming, Soil moisture, Soil water movement, Clay loam, Root development, Root zone, Plant morphology, Consumptive use.
Identifiers: *Water extraction rate, Soil water tension, Root volume, Root water.

A greenhouse experiment was conducted in Pantnagar, India, to determine whether the root systems of wheat grown under different soil water conditions differed in capacity to extract water from the soil. The water extraction rate per unit root volume was measured for two wheat (Treticum aestivum L.) genotypes grown for 60 days after sowing in pots maintained under three soil water tension regimes of 0.3-0.8,2.0-2.5, and 4.0-4.5 bars. Under study were the one-gene dwarf Snalika RR-21 and three-gene dwarf UP 301; the soil was silty clay loam of the Mollisol order. Sixty days after sowing, the transpirational losses under different soil water tension regimes were measured for 12 days by covering the pots with polyethylene sheet and weighing.. Root volume and total root water extracted decreased significantly for both genotypes. Results suggest that root systems which develop under relatively dry soil conditions extract more soil water on a unit root volume basis than those in moist conditions. Findings also indicate that roots under dry conditions develop a more intricate morphology and exploit the soil water more completely. (Jahns-Arizona)
W77-09300

LEAF GROWTH IN RELATION TO ATP LEVELS IN WATER STRESSED CORN PLANTS,
Macquarie Univ., North Ryde (Australia). School of Biological Sciences.
For primary bibliographic entry see Field 3F.
W77-09301

EFFECT OF WATER STRESS DURING DIFFERENT STAGES OF GROWTH OF SOYBEAN,
Pahlavi Univ., Shiraz (Iran).
N. Sionit, and P. J. Kramer.
Agronomy Journal, Vol. 69, p 274-278, March-April 1977. 5 fig, 1 tab, 15 ref.

Descriptors: *Moisture stress, *Plant growth, *Crop response, *Soybean, Water requirements, Drought, Flowering, Germination, Photoperiodism, Seeds, Crop production.
Identifiers: Leaf water potential, Pod formation.

Two varieties of soybean (Glycine max, L. Merr.; 'Ransom' and 'Bragg') were studied to determine the effects on yield of controlled water stress at various stages of development. The plants were grown in a controlled environment chamber at 28/17 C with a 8 9-hour photoperiod at 450 hlx and an interrupted dark period which was then suspended for 7 days to induce flowering. Water stress was applied to plant groups during flower induction, flowering, pod formation and pod filling. Leaf water during stress dropped as low as -23 bars but returned to approximately normal after rewatering. Leaves were more susceptible to drought at later stages of growth, probably bacause they were already approaching senescence. Plants stressed during flower induction and flowering produced fewer flowers, pods and seeds than controls because of a shortened flowering period and abortion of some flowers. The greatest reduction of pods and seeds at harvest was due to stress during early pod formation, but the yield as measured by seed weight was most affected by stress during early formation and pod filling. Stress did not affect the oil or protein content of seeds, although total oil and protein produced per plant were less because of lower seed yields. (Jahns-Arizona)

W77-09302

SORGHUM GENOTYPE VARIATION IN STOMATAL SENSITIVITY TO LEAF WATER DEFICIT,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
R. G. Henzell, K. J. McCree, C. H. M. Van Bavel, and K. F. Schertz.
Crop Science, Vol. 16, p 660-662, Sept-Oct. 1976. 2 fig, 2 tab, 15 ref.

Descriptors: *Grain sorghum, *Stomata, *Moisture stress, *Crop response, *Drought resistance, Leaves, Plant physiology, Water utilization, Conductivity, Adaptation, Genetics.
Identifiers: *Genotype, *Stomatal sensitivity, Leaf water potential, Leaf diffusive resistance, Stomatal conductance.

Four sorghum (Sorghum bicolor (L.) Moench) genotypes progressively stressed for moisture in a growth chamber at College Station, Texas, were studied to determine the relationship between leaf diffusive resistance and leaf water potential. The four genotypes tested covered the stomal sensitivity range reported by Henzell et al (L975). Stomatal conductance of leaves of 'Alpha' and 'Shallu' declined repidly as leaf water potential dropped, while declines were slower in 'I.S.1598C' and 'M35-1'. Behavior of F1 hybrids was generally similar to their most sensitive parent, but the correspondence was not consistent. The relevance of differences in stomatal sensitivity for drought resistance is discussed. Such sensitivity may be an important element of intergenotype variation in drought resistance; however, there may be other criteria for distinguishing genotypes in terms of adaptation to drought conditions. (Jahns-Arizona)
W77-09303

STAND ESTABLISHMENT OF WHEAT LINES UNDER DIFFERENT LEVELS OF WATER POTENTIAL,
Kabul Univ. (Afghanistan). Faculty of Agriculture.
For primary bibliographic entry see Field 3F.
W77-09304

INFLUENCE OF INDETERMINATE GROWTH HABIT ON YIELD AND IRRIGATION WATER-USE EFFICIENCY IN UPLAND COTTON,
Agricultural Research Service, Lubbock, Tex. Oklahoma-Texas Area.
For primary bibliographic entry see Field 3F.
W77-09306

EFFECTS OF CONDENSED PHOSPHATES ON PLANT GROWTH AND PHOSPHORUS UPTAKE,
Edinburgh Univ. (Scotland). School of Agriculture.
For primary bibliographic entry see Field 3F.
W77-09307

MEASUREMENT OF WATER FLUXES AND POTENTIALS IN A SINGLE ROOT-SOIL SYSTEM I. THE TENSIOMETER-POTOMETER SYSTEM,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.
H. B. So, L. A. G. Aylmore, and J. P. Quirk.
Plant and Soil, Vol. 45, p 577-594, 1976. 12 fig, 4 tab, 17 ref.

Descriptors: *Root systems, *Water measurement, *Tensiometers, *Soil water movement, Phytometers, Xylem, Soil-water-plant relationships, Steady flow, Root zone, On-site tests.
Identifiers: *Water flux, Root water potential.

The construction and operation of a tensiometer-potometer system which can measure xylem water potential, root-soil interface water potential, and flux of water for a plant root subjected to steady state conditions is described. Using hybrid maize seedlings, experiments were conducted to test the tensiometer response time and the response to root water potential changes. Response time of the tensiometer-root system depends on the flux of water into the root; the tensiometer was more suitable for steady state than transient conditions. It was also demonstrated that a unique linear relationship exists between the resistance to water flow and root tissue water status. (Jahns-Arizona)
W77-09308

EFFECTS OF DROUGHT AND SALINITY ON SOME GROWTH CONTRIBUTING PARAMETERS IN WHEAT AND BARLEY,
Assiut Univ. (Egypt). Dept. of Botany.
For primary bibliographic entry see Field 3C.
W77-09312

THE EFFECTS OF DRYING OF THE TOPSOIL AND OF MICRONUTRIENTS IN THE SUBSOIL ON MICRONUTRIENT UPTAKE BY AN INTERMITTENTLY DEFOILATED RYEGRASS,
Adelaide Univ. (Australia). Dept. of Agronomy.
E. K. S. Nambiar.
Plant and Soil, Vol. 46, p 185-193, 1977. 6 tab, 5 ref.

Descriptors: *Topsoil, *Drying, *Nutrient requirements, *Soil investigations, *Absorption, *Australia, Soil-water-plant relationships, Soil management, Deficient elements, Manganese, Dry farming, Wilting, Crop production, Mulching, Zinc, Copper.
Identifiers: *Micronutrient uptake, *Ryegrass, Defoliation, Dry matter yield.

A greenhouse experiment was conducted in South Australia to determine the effects of topsoil water content on the micronutrient uptake of Italian ryegrass (Lolium multiflorum Lam.) grown in a siliceous sandy soil of marginal micronutrient status. Without micronutrient supplies from deeper layers, topsoil drying after defoliation reduced dry matter yield by causing micronutrient deficiency, especially of manganese. Yield reductions were slight when small amounts of micronutrients were added to the lower compartment 7 days after the commencement of drying. Mulching of the soil also reduced yield losses after drying but was not as effective as micronutrient supply. The benefit from adding micronutrients appears related to manganese supply; improved micronutrient supply in the lower layer enhanced the efficiency of manganese absorption from dry topsoil. As long as roots have access to water in the subsoils, significant amounts of manganese, zinc and copper can be absorbed from topsoils as dry or drier than wilting point. (Jahns-Arizona)
W77-09314

A TRANSPORT KINETIC CONCEPT FOR ION UPTAKE BY PLANTS, III. TEST OF THE CONCEPT BY RESULTS FROM WATER CULTURE AND POT EXPERIMENTS,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Soil Fertility and Plant Nutrition.
N. E. Nielsen.
Plant and Soil, Vol. 45, p 659-677, 1976. 3 fig, 10 tab, 11 ref, append.

Descriptors: *Hydraulic models, *Model studies, *Absorption, *Ion transport, Plant growth, Copper, Barley, Aqueous solutions, Soil-water-plant relationships.
Identifiers: *Transport kinetic model(Plants), Michaelis-Menton Constant, Mean Maximal Rate.

A previously proposed transport kinetic model for ion uptake by plants was tested using data for copper uptake by barley grown in soil or water culture and corresponding data for copper concentration in the soil or culture solutions. Experimental results were consistent with the values calculated by using the model, which allows the Michaelis-Menten Constant (Km) of ion uptake and the Mean Maximal Rate of ion uptake to be calculated for various time intervals of the plants' growth periods. Results indicate that the rate of copper uptake by whole plants and that by aerial parts from soil and water culture can be expressed as a function of the copper concentration in the bulk-solution by using the proposed equations. The Km values for copper uptake by barley grown in soil and in water culture were the same if the chemical composition of both solutions was the same. Copper concentrations in the soil soil solution, where the copper uptake rate was zero, were 2-4 times greater than corresponding values in water culture solution. (Jahns-Arizona)
W77-09315

EXPERIENCE IN USING PARASITES FOR A QUANTITATIVE EVALUATION OF FISH FEEDING, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
B. I. Kuperman.
Vopr Ikhtiol 15(5), p 931-934, 1975.

Descriptors: *Fish diets, *Indicators, Worms, *Fish parasites, Carp, Oligochaetes, Perch, Pike.
Identifiers: Acerina-Cernua, Cestode, Eubothrium-Rugosum, Lota-Lota, Perca-Fluviatilis, Triaenophorus-Crassus, Triaenophorus-Nodulosus, *Tapeworms.

Using the tapeworm Eubothrium rugosum as an indicator of the feeding of the burbot (Lota lota) it was established that parasites can serve as an objective index of not only the qualitative but also the quantitative characteristics of fish feeding. Using the tapeworms Triaenophorus nodulosus and T. crassus the number of perch (Perca fluviatilis) and ruff (Acerina cernua) eaten by pike can be estimated; cestodes of the family Caryophylieidae can serve as an indicator of the consumption of Oligochaeta by carp, etc.--Copyright 1976, Biological Abstracts, Inc.
W77-09400

HELMINTH FAUNA OF BELONIFORM FISH, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
A. M. Parukhin.
Gidrobiol Zh. 9(3), p 58-64, 1973.

Descriptors: *Fish parasites, *Worms, Larvae.
Identifiers: Ablennes-Hians, Belone-Belone, *Beloniform fish, Carnivorous fish, Cypselurus-Bachyensis, Cypselurus-Furcatus, Cypselurus-Robustris, Cypselurus-Spp, Euleptorhamphus-Brevoorti, Euleptorhampus-Longirostis, Exocoetus-Obtusirostris, Exocoetus-Volitans, *Helminths, Hemiramphus-Marginatus, Hyporamphus-Balinensis, Parexocoetus-Brachypterus, Scomberesox-Saurus, Thylosurus-Crocodilus.

A comparative analysis of parasitic worm fauna of 4 Beloniform families (Exocoetidae, Hemirhamphidae, Belonidae and Scomberosocidae) showed specific helminth associations within each family, that were considered to be related to host habitat and food. A wide variety of helminth larvae were found. beloniforms serve as an additional host for helminths, whose adult stages infest large carnivorous fishes. The species examined were Exocoetus volitans, E. obtusirostris, Cypselurus bachyensis, C. robustris, C. furcatus, Cypselunis spp., Parexoetus brachypterus, Euleptorhamphus longirostris, E. brevoorti, Hemiramphus marginatus, Hyporamphus balinensis, Ablennes hians, Thylosurus crocodilus, Belone belone, and Scomberesox saurus.--Copyright 1975, Biological Abstracts, Inc.
W77-09403

FOREST SITE CONDITIONS OF BARCHANS UNDERLAIN BY TAKYRS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 2G.
W77-09497

ESTABLISHING ARTIFICIAL PASTURES AND MEADOWS IN THE CHARTAK ADYRS OF THE FERGANA VALLEY, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Institut Bataniki.
O. Kh. Khasanov, R. S. Vernik, A. Usmanaliev, and E. Abdullazhanov.
Probl Osvoeniya Pustyn'. 6, p 68-71, 1973.

Descriptors: *Pastures, *Meadows, *Desert plants, *Root systems, Drought, Drought resistance, *Plant growth, Arid lands, Planting management.
Identifiers: Adyrs, Artificial pastures, Fergana, *Onobrychis-ferganica, USSR.

Rapid growth and efficient root system of desert and semi-desert plants were established as the principal biological features of plant resistance to soil drought and high atmospheric temperatures. Some soft-stem species (Onobrychis ferganica) are recommended for pasture improvement. The plants complete vegetational cycle and form considerable amounts of overground mass before drought occurs.--Copyright 1975, Biological Abstracts, Inc.
W77-09498

ALGOFLORA OF SOME DRAINAGE CANALS OF THE CHARDZHOU OBLAST, (IN RUSSIAN),
Izv Akad Nauk Turkm SSR Ser Biol Nauk 1, p 17-22, 1976.

Descriptors: Canals, *Aquatic algae, *Systematics, Drainage systems, Algae, *Diatoms, *Benthic flora, Phytoplankton.
Identifiers: *Chardzhou Oblast(USSR), Oblast, *USSR, Turkmen SSR.

Specific and intraspecific taxons of algae (263) were recorded in drainage canals of the Turkmen SSR (USSR) Chardzhou region, diatomic forms being in excess (up to 70%). As for the cenotic aspects, benthic and epiphytic forms predominate. Phytoplankton is poorly developed. The distinctive feature of the drainage system algoflora is a predominance of diatomic forms in all the seasons of the year.--Copyright 1977, Biological Abstracts, Inc.
W77-09508

ELEVATED SUCTION TENSIONS AND MORPHOLOGICAL ALTERATIONS CAUSED BY TRANSVERSE CUTS IN A TAXUS STEM, (IN GERMAN),
Hochschule fuer Bodenkultur, Vienna (Austria). Botanisches Institut.
H. Richter.
Flora (Jena). 163(4), p 291-309, 1974.

Descriptors: *Stemflow, *Trees, *Transpiration, *Vapor pressure, *Moisture uptake, Specific conductivity, Plant morphology.
Identifiers: Morphological consequences(Trees), *Suction tension(Trees), Taxus baccata, Transport resistance.

The influence of SR (frictional tension due to water movement in soil and plant) on total potentials in the crown of a large tree may be simulated exprimentally by means of a double sawcut in the stem of a small tree, which increases transport resistances of the conduit. Such an experiment was set up with a large bush of yew (T. baccata L.), and suction tensions were followed with a pressure bomb. Diurnal courses of suction tensions are presented for typical days. Tensions were always higher in the experimental part than in the control, but the extent of the difference depended on the climatic conditions. Values in the control reached a minimum in the late evening, while those in the experimental twigs continued to decline during the night. An eventual coincidence of the 2 curves was prevented by the onset of transpiration in the morning. Tensions in the control followed changes in the vapor pressure deficit rather closely, while the experimental part showed a tendency to hold a plateau value at about 21 atm under different atmospheric conditions. Thus, maximum tension differences occurred whenever there was a sudden fall in delta p (vapor pressure deficit) values. Such a situation led to a rapid tension drop in the control twigs, while the experimental parts remained at their previous high level, sometimes for a prolonged period. Differences in the tension pattern similar to those described may play an important role in the establishment of physiological and morphological differences between the lower and upper crown of a high tree. Shoot and needle lengths and needle distances were compared for experimental and control parts. The results agree with previous work on artificial drought and its morphological consequences in conifers. Since in most earlier experiments drought was induced in young plants by means of infrequent irrigation, the similarity of results obtained in an old tree by the sawcut technique seems to be of some significance.--Copyright 1975, Biological Abstracts, Inc.
W77-09530

SECONDARY AUTUMN SHOOT FORMATION IN SPRING WHEAT: I. THE ROLE OF DROUGHT DAMAGE AND DEVELOPMENTAL STAGES, (IN RUSSIAN),
Akademiya Nauk SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
S. S. Mordkovich, and S. A. Mokridova.
Izv Sib Otd Akad Nauk Sssr Ser Biol Nauk 3, p 107-115, 1974.

Descriptors: *Wheat, Drought, *Drought resistance, *Plant growth, *Growth rates, Growth stages, Seasonal, Autumn, *Temperature.

The significance of high temperatures was indicated in experimental drought conditions during the basic development stages of wheat in subsequent sprout formation of the secondary growth. Secondary sprouts were formed from aboveground nodes; they were characterized by extremely rapid growth and development, reduced size of straw and foliar surface.
W77-09545

2J. Erosion and Sedimentation

A SEDIMENT TRANSPORT MODEL FOR STRAIGHT ALLUVIAL CHANNELS,
Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
F. Engelund, and J. Fredsoe.
Nordic Hydrology, Vol. 7, No. 5, p 293-306, 1976. 4 fig, 20 ref.

Descriptors: *Sediment transport, *Alluvial channels, *Model studies, *Mathematical models, Suspended load, Suspended solids, Bed load, Sedimentation, Rivers, Erosion, Flow, Streamflow, Particle size, Sands, Sediment loads, Tractive forces, Transfer, Sedimentation.

A simple mathematical model for sediment transport in straight alluvial channels is presented. The model, which is based on physical ideas related to those introduced by Bagnold, was originally developed in two steps, the first describing the bed load transport and the second accounting for the suspended load. The model was assumed to have two advantages as compared with empirical models: first, it is based on a description of physical processes, second, it gives some information about the quantity and size of the sand particles in suspension and the bed particles. (Sims-ISWS)
W77-09104

RECORDING RIVER AND RESERVOIR WATER DEPTH,
Moore, Gardner and Associates, Inc., Asheboro, N. C.
For primary bibliographic entry see Field 7B.
W77-09106

PROFILE DESATURATION DURING SEDIMENT DEPOSITION IN A GROUNDWATER RECHARGE TRENCH,
Mississippi Agricultural and Forestry Experiment Station, Mississippi State. Dept. of Agronomy.
For primary bibliographic entry see Field 4B.
W77-09115

HERBICIDES FROM CROPPED WATERSHEDS IN STREAM AND ESTUARINE SEDIMENTS IN HAWAII,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 5B.
W77-09129

LOCATION OF MAJOR DELTAS,
Imperial Coll. of Science and Technology, London (England). Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-09133

EROSION CAUSED BY INTENSE RAINFALL IN A SMALL CATCHMENT IN NEW YORK STATE,
Clark Univ., Worcester, Mass. Graduate school of Geography.
W. H. Renwick.
Geology, Vol 5, No 6, p 361-364, June 1977. 4 fig, 3 tab, 17 ref.

Descriptors: *Excessive precipitation, *Rainfall, *New York, *Erosion, *Gullies, Thunderstorms, Precipitation(Atmospheric), Landslides, Debris avalanches, Erosion, Sediments, Sedimentation, Watersheds(Basins), Flood plains, Streams, Alluvial fans, Channels, Channel erosion, Cloud bursts, Slopes, Storms.
Identifiers: *Fall Creek(NY).

This paper described landslides and debris flows triggered by intense rainfall in a very small gully in New York State. The incised channel is 150 m long, and 500 cu m of material were removed in one event, amounting to about 1% of the total volume of the gully. Large amounts of very coarse material were transported from the tributary to the floodplain of the larger stream. Although such events are relatively infrequent, they are an essential link in the total system of sediment movement including both the enlargement of the gully and the addition of coarse debris to the larger stream. Long-term processes such as weathering and creep are important in making material available for transport in extreme events. Different parts of the sediment movement system function at different spatial and temporal frequencies, and the interaction of these parts may be masked in data on total basin output. It was suggested that more attention should be focused on subsystem interactions of this type in studies of drainage basin dynamics. (Sims-ISWS)
W77-09134

EFFECTS OF IMPOUNDMENT ON WATER AND SEDIMENT IN THE ARKANSAS RIVER AT PUEBLO RESERVOIR,
University of Southern Colorado, Pueblo.
For primary bibliographic entry see Field 5B.
W77-09224

PEBBLE-COBBLE DEPOSIT IN MONTEREY
AY, CALIFORNIA.
aval Postgraduate School, Monterey, Calif.
or primary bibliographic entry see Field 2L.
77-09228

IOTOGRAPHIC RECONNAISSANCE OF
ONTINENTAL SLOPE AND UPPER CON-
NENTAL RISE,
mont-Doherty Geological Observatory,
lisades, N.Y.
or primary bibliographic entry see Field 5B.
77-09247

'LASH EROSION OF PRIMARY PARTICLES
ND AGGREGATES,
ommonwealth Scientific and Industrial Research
rganization, Canberra (Australia). Div. of Soils.
I. A. Kinnell.
oil Science Society of America Journal, Vol. 40,
o. 6, p 966-968, November-December 1976. 1 fig,
ab, 3 ref.

escriptors: *Erosion, Rainfall, Soils, Soil proper-
s, Soil investigations, Soil tests, Precipita-
on(Atmospheric), *Raindrops,
mpact(Rainfall).
entifiers: *Splash erosion.

he previously supposed similarity between pri-
ary particles and aggregates in resisting splash
osion was shown to be partially incorrect.
athematical treatment of splash-cup data on
hich the earlier conclusion was based showed
at for surfaces containing aggregates, the quanti-
of material lost per unit quantity of artificial
infall varied with rainfall intensity; a result
hich contrasts to observations for primary parti-
es. (Skogerboe-Colorado State)
77-09288

OMMENTS ON THE MECHANISM OF SOIL
ETACHMENT BY RAINFALL,
ebrew Univ., Jerusalem (Israel). Dept. of Geolo-
.
or primary bibliographic entry see Field 2G.
77-09313

ROCEEDINGS OF THE EIGHTH DREDGING
EMINAR.
exas A and M Univ., College Station. Center for
redging Studies.
or primary bibliographic entry see Field 2L.
77-09325

NE-GRAINED SEDIMENT AND INDUSTRIAL
ASTE DISTRIBUTION AND DISPERSAL IN
EW BEDFORD HARBOR AND WESTERN
UZZARDS BAY, MASSACHUSETTS,
oods Hole Oceanographic Institution, Mass.
ept. of Geology and Geophysics.
or primary bibliographic entry see Field 5B.
77-09326

HE CITIZEN'S GUIDE TO NORTH
AROLINA'S SHIFTING INLETS,
orth Carolina State Univ. at Raleigh. Center for
rban Affairs and Community Services.
or primary bibliographic entry see Field 2L.
77-09327

ERFORMANCE ANALYSIS OF A TETHERED
LOAT BREAKWATER,
alifornia Univ., San Diego, La Jolla. Inst. of
arine Resources.
or primary bibliographic entry see Field 8B.
77-09328

ESTIMATING THE SUSPENDED SEDIMENT LOAD IN RESERVOIRS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. R. McHenry,, J. C. Ritchie, and F. R. Schiebe.
Water Resources Bulletin, Vol. 12, No. 6, p 81-92, December 1976. 3 fig, 5 tab, 12 ref.

Descriptors: *Reservoir silting, *Mississippi, *Sedimentation, *Suspended load, Suspended solids, Remote sensing, Reservoirs, Sediment transport, Hydrology, Equations, *Estimating.
Identifiers: *Suspended sediment concentration, Reflect solar radiation, Sediment measurement.

The total suspended sediment loads of four north Mississippi reservoirs were determined from measurements of concentrations of suspended sediment in a vertical profile at several locations on each reservoir made during the year. The data were combined with the state-height and known stage-volume relationships for each reservoir in a numerical integration to determine the total suspended sediment in the water body. Total suspended sediments were estimated using the product of the suspended sediment concentration in the surface water by the appropriate reservoir volume. The averaged ratios of the estimated to measured suspended sediment loads for each reservoir exceeded 0.90. Since the concentration of suspended sediments in surface waters of north Mississippi reservoirs has been shown as highly correlated with spectral reflectance, estimating the total suspended sediment of these reservoirs using remotely sensed spectral reflectance data is possible. (Lee-ISWS)
W77-09331

USE OF LARGE SUBMERGED CHAMBERS TO MEASURE SEDIMENT-WATER INTERACTIONS,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W77-09343

LACUSTRINE SEDIMENTS IN THE ALLEGHENY PLATEAU OF ERIE COUNTY, NEW YORK: THEIR CHARACTERISTICS, DISTRIBUTION, AND LAND USE PROBLEMS,
Cornell Univ., Ithaca, N.Y. Agricultural Experiment Station.
D. W. Owens, R. B. Daniels, and G. B. Brauen.
Journal of Soil and Water Conservation, Vol. 32, No. 2, p 93-97, March-April, 1977. 6 fig, 2 tab, 8 ref.

Descriptors: *Soils, *Sediments, *Land use, *New York, Lake sediments, Soil types, Glaciers, Geomorphology, Glacial soils, Mass transfer, Landslides, Hazards, Construction, Geology, History.
Identifiers: *Allegheny Plateau(NY), *Erie County(NY), Lacustrine sediments.

Temporary glacial lakes developed in many Allegheny Plateau river valleys 12,000 to 13,000 years ago when glacial ice dammed the north-flowing streams. The lakes were only 1 to 2 miles wide and 5 to 10 miles long, but more than 100 feet of illitic lacustrine silts and clays were deposited in some of the valleys before the lakes were drained. In most areas, 2 to 10 feet of sand and gravel were deposited over the lacustrine materials shortly after the lakes were drained. Erosion since the glacial ice melted has cut into the glacial, glaciofluvial, and lacustrine sediments in the narrow valleys, resulting in extremely complex but predictable soil patterns. A thorough knowledge of the glacial geology of the area is needed to map the areas underlain by lacustrine sediments because most soils are formed in the sand and gravel of the glaciofluvial cap. Many of the areas underlain by lacustrine sediments would be missed if only the surficial soil properties were used. The steep slopes underlain by lacustrine sediments are attractive building sites because they are close to ski resorts, they are visually pleasant most of the year, and they are near a large city with an expanding urban population. But large areas of the most attractive building sites are on or close to steep slopes that are subject to mass movement when disturbed by normal building activities. Building on the unstable materials has resulted in considerable difficulty in maintaining the roadbed of a railroad and roads and in maintaining utility lines and foundations in a housing development. (Sims-ISWS)
W77-09357

A PORTABLE RAINFALL SIMULATOR FOR ERODIBILITY AND INFILTRATION MEASUREMENTS ON RUGGED TERRAIN,
Klamath National Forest, Yreka, Calif.
J. R. Munn, Jr., and G. L. Huntington.
Soil Science Society of America Journal, Vol 40, No 4, p 622-624, July-August 1976. 1 fig, 1 tab, 17 ref.

Descriptors: *Erosion, *Infiltration, *Rainfall simulators, Rainfall-runoff relationships, Rainfall.

A portable rainfall simulator for field study of erosion potential and infiltration on mountainous terrain is described. Polyethylene tubes produce 3.2-mm drops which fall 2.5 m onto a 61 by 61 cm plot. The maximum rainfall intensity is 23 cm/hour. A 16% intensity variation across the plot area was measured, but the variation between separate simulated storms was < 1% for identical intensity settings. The unit is suited to one man operation on slopes up to 60%. (Skogerboe-Colorado State)
W77-09441

THERMAL CONDUCTIVITY OF ORGANIC SEDIMENTS FROM TWO WISCONSIN LAKES,
Cold Regions Research and Engineering Lab., Hanover, N.H. Earth Sciences Branch.
R. McGaw.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-025 086, Price codes: A02 in paper copy, A01 in microfiche. USA CRREL Special Report 129, November 1974. 14 p, 10 fig, 2 tab, 9 ref. DA-1T-061102-B-52-A-02.

Descriptors: *Thermal conductivity, *Lake sediments, *Organic matter, *Wisconsin, Cold regions, On-site investigations.
Identifiers: *Stewart's Dark Lake(Wis), *Tub Lake(Wis).

Thermal conductivities of four specimens from partially-gelatinous bottom sediments in Stewart's Dark Lake and Tub Lake, in northwestern Wisconsin, were measured to learn whether adding gelatinous or amorphous organic matter to water would raise or lower the conductivity. One specimen was taken from the center of each lake and the other represented sediments near the shore. The probe used is shown schematically and consists of a stainless steel sheath enclosing a heating coil of constantan wire within which is mounted a chromel/constantan thermocouple at mid-length. A molded plastic connector supports the thermocouple and power leads. Free length below the connector is 21 cm whereas the outer diameter of the sheath is 0.5 mm. Length/diameter ratio is approximately 420. The test indicated that fibrous organic material decreases conductivity to below that of water. The thermal conductivity of a fibrous sediment appears to be independent of increased heat flow. The conductivity of a gelled sediment approaches the conductivity of water as heat flow is increased. (Auen-Wisconsin)
W77-09521

2K. Chemical Processes

THE AGE OF GROUNDWATER IN THE LINCOLNSHIRE LIMESTONE, ENGLAND AND ITS RELEVANCE TO THE FLOW MECHANISM,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W77-09107

PLEISTOCENE ICE AT THE BASE OF THE BARNES ICE CAP, BAFFIN ISLAND, N.W.T., CANADA,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2C.
W77-09116

EXTRACTION OF TRACE COMPONETS FROM LARGE QUANTITIES OF ICE IN BORE HOLES,
Bern Univ. (Switzerland). Physikalisches Institut.
For primary bibliographic entry see Field 2C.
W77-09121

A METHOD OF CONCENTRATING THE MAJOR IMPURITIES CONTAINED IN ICE BY ION EXCHANGE,
Grenoble-1 Univ. (France). Institut de Geographie Alpine.
For primary bibliographic entry see Field 2C.
W77-09122

MICRONUTRIENT ANALYSIS OF SEAWATER SAMPLES TAKEN AT DEEPWATER DUMPSITE 106--MAY 1974,
National Marine Fisheries Service, Narragansett, R.I. MARMAP Field Group.
For primary bibliographic entry see Field 5A.
W77-09250

ANALYTICAL RESULTS FOR WATER-COLUMN SAMPLES COLLECTED AT DEEPWATER DUMPSITE 106--MAY 1974,
Environmental Protection Agency, Edison, N.J. Technical Support Group.
For primary bibliographic entry see Field 5A.
W77-09251

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 1.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 5A.
W77-09259

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 2,
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-09260

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 3.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-09261

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 4.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-09262

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C
For primary bibliographic entry see Field 5A.
W77-09263

THE CHEMICAL COMPOSITION OF THE LYSIMETRIC WATER FROM SANDY PODZOLIC SOIL AND CHANGES AFFECTED BY FERTILIZERS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
N. M. Shakhova, and E. I. Shilova.
Vestn Leningr Univ Ser Biol. 28(4), p 119-124, 1973.

Descriptors: Lysimeters, Sands, Podzols, Pine trees, Fertilizers, Chemical analysis, Acidity, *Carbamate pesticides, Acidic soils, Ions, Calcium, Phosphates, Chlorides, Ammonium, Potassium.

Lysimetric solutions of sandy podzolic soil forming under 8-yr-old pines have low concentration and high acidity, mainly due to non-volatile acids. The application of carbamide leads to abrupt increase of general concentration of the litter solution and displacement of the pH value towards the neutrality. The carbamide together with the superphosphate and KCl increases the acidity of the solution, its general concentration and the content of ions Ca++, K+, NH4+ and Cl.--Copyright 1974, Biological Abstracts, Inc.
W77-09277

BEHAVIOR OF CHROMIUM IN SOILS: II. HEXAVALENT FORMS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2G.
W77-09283

POTASSIUM STATUS OF SOME ALLUVIAL SOILS IN KENTUCKY,
Kentucky Univ., Lexington. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09290

CALCIUM RETENTION IN RESPONSE TO PHOSPHATE SORPTION BY SOILS,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-09291

CORRECTION OF 'TUBE CONTRIBUTION' INTERFERENCE IN THE DETERMINATION OF HEAVY METALS BY X-RAY SPECTROSCOPY USING THE 'ADDITIONS TECHNIQUE',
Maryland Agricultural Experiment Station, College Park. Dept. of Soil Science.
For primary bibliographic entry see Field 5A.
W77-09292

A SEMIAUTOMATED PROCEDURE FOR TOTAL NITROGEN IN PLANT AND SOIL SAMPLES,
Florida Univ., Gainesville. Dept. of Agronomy.
R. N. Gallaher, C. O. Weldon, and F. C. Boswell.
Soil Science Society of America Journal, Vol. 40, No. 6, p 887-889, November-December 1976. 2 fig, 1 tab, 12 ref.

Descriptors: *Nitrogen, Laboratory tests, Laboratories, Soil investigations, Soil properties, Pollutant identification, Automation, Soil analysis, Soil chemistry, Plant physiology.
Identifiers: *Total nitrogen determination.

This study evaluated inexpensive alternatives for the determination of total N in plant and soil samples. Plant and soil samples which varied widely in N concentration were digested in a 126-sample capacity Al block digester followed by determination of total N with the ammonium electrode in a semiautomated reaction vessel assembly. The proposed Ammonium electrode semiautomated (AES) procedure was compared to standard micro-Kjeldahl and aluminum block digested steam distilled-titrated (ABDDT) procedures. Thirty to 50 more samples could be analyzed per 8 hour day with the proposed semiautomated procedure as compared to standard micro-Kjeldahl methods. The precision of the methods were comparable but significantly more N was found by using the ABDDT procedure. (Skogerboe-Colorado State)
W77-09294

AN IMPROVED TECHNIQUE FOR MEASURING SOIL PH,
Montana Agricultural Experiment Station, Bozeman.
For primary bibliographic entry see Field 2G.
W77-09295

PRECIPITABLE WATER VAPOR IN ATMOSPHERES CHARACTERIZED BY TEMPERATURE INVERSIONS,
Consiglio Nazionale della Ricerche, Bologna (Italy). Sezione Microfisica dell Atmosfera.
For primary bibliographic entry see Field 2B.
W77-09330

CHEMICAL REDUCTION OF NITRATE BY FERROUS IRON,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 5A.
W77-09426

BEHAVIOR OF CHROMIUM IN SOILS: III. TRIVALENT FORMS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2G.
W77-09432

A METHOD FOR SECTIONING SATURATED SOIL CORES,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09436

NITRIFICATION-DENITRIFICATION REACTIONS IN FLOODED SOILS AND WATER BOTTOMS: DEPENDENCE ON OXYGEN SUPPLY AND AMMONIUM DIFFUSION,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09437

ADSORPTION OF SELENITE AND PHOSPHATE ON AN ALLOPHANE CLAY,
Ruakura Agricultural Research Center, Hamilton (New Zealand). Soil Chemistry Group.
For primary bibliographic entry see Field 2G.
W77-09439

HETEROVALENT CATION EXCHANGE EQUILIBRIA IN SOILS WITH VARIABLE AND HETEROGENEOUS CHARGE,
California Univ., Davis. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-09440

IN SITU MEASUREMENT OF GAS DIFFUSION COEFFICIENT IN SOILS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 2G.

77-09442

.. Estuaries

DROGRAPHIC SURVEYING TURNS TO ECTRONICS,
betts Abbett, McCarthy and Stratton, Seattle, sh.
r primary bibliographic entry see Field 7B.
7-09105

RBICIDES FROM CROPPED WATERSHEDS STREAM AND ESTUARINE SEDIMENTS IN WAII,
waii Univ., Honolulu. Dept. of Agronomy and l Science.
r primary bibliographic entry see Field 5B.
7-09129

ASSESSMENT OF WATERSPOUT EQUENCIES ALONG THE U.S. EAST AND LF COASTS,
tional Oceanic and Atmospheric Administra-n, Boulder, Colo. Environmental Research Lab.
r primary bibliographic entry see Field 2B.
7-09130

CLINING POTENTIOMETRIC LEVELS IN RT WALTON BEACH AREA, FLORIDA,
rthwest Florida Water Management District, lahassee.
r primary bibliographic entry see Field 4B.
7-09132

CATION OF MAJOR DELTAS,
perial Coll. of Science and Technology, London ngland). Dept. of Geology.
G. Audley-Charles, J. R. Curray, and G. Evans.
ology, Vol 5, No 6, p 341-344, June 1977. 2 fig, 1 , 18 ref.

scriptors: *Deltas, *Rivers, *Drainage systems, asts, Sites, Geology, Erosion, Sedimentation, ologic history, Geomorphology, ds(Geologic), Drainage.
ntifiers: *Delta locations, Tectonic settings, jor deltas.

alysis of major modern deltas in terms of inage patterns supplying the delta and the tec-ic setting of the deltaic accumulation revealed t there are four principal types: namely, (1) in-cratonic, (2) rifted-continental-margin deltas h either Afrotype or Amerotype drainage, (3) rginal-basin deltas, and (4) deltas at the bounda- between a craton and Mesozoic-Cenozoic genic belts with grain-parallel drainage. The ferent types of delta are expressed in the racter of their basement and the lithostratig-hy of their deltaic pile. Recognition of the dif-ent delta types is useful for predicting the eogeographic situation and structural history of ient deltas. (Sims-ISWS)
7-09133

OSPHATE AND TRIPOLYPHOSPHATE AD-RPTION BY CLAY MINERALS AND TUARINE SEDIMENTS,
ginia Inst. of Marine Science, Gloucester Point.
primary bibliographic entry see Field 5C.
7-09152

MULTI-PARAMETER ESTUARY MODEL,
ra Tech., Inc., Lafayette, Calif.
primary bibliographic entry see Field 5B.
7-09165

THEMATICAL MODEL OF A GREAT KES ESTUARY,
vironmental Protection Agency, Chicago, Ill.
For primary bibliographic entry see Field 5B.
W77-09166

FEDBAK03 - A COMPUTER PROGRAM FOR THE MODELLING OF FIRST ORDER CONSECUTIVE REACTIONS WITH FEEDBACK UNDER A STEADY STATE MULTIDIMENSIONAL NATURAL AQUATIC SYSTEM,
Environmental Protection Agency, New York. Data Systems Branch.
For primary bibliographic entry see Field 5B.
W77-09176

A COMPUTER MODELING STUDY TO ASSESS THE EFFECTS OF A PROPOSED MARINA ON A COASTAL LAGOON,
Connell/Metcalf and Eddy, Coral Gables, Fla.
For primary bibliographic entry see Field 5C.
W77-09194

A PEBBLE-COBBLE DEPOSIT IN MONTEREY BAY, CALIFORNIA.
Naval Postgraduate School, Monterey, Calif.
M. J. Malone.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A021 297, Price codes: A03 in paper copy, A01 in microfiche. Master's Thesis, June 1970. 46 p, 10 fig, 3 tab, 18 ref.

Descriptors: *Baseline studies, *Continental Shelf, *California, Water resources, Geology, Sediments, Pleistocene epoch, Bays, *Sediment deposition.
Identifiers: *Outer Continental Shelf, *Pebbles, *Cobble, *Monterey Bay(Calif).

A deposit of pebbles and cobbles was discovered in approximately 60 fm of water on the continental shelf in Monterey Bay, California. Samples were taken in the area and the extent of the deposit was determined. The material was characterized well as rounded, moderately well sorted coarse pebbles derived mainly for the granites of the Santa Lucia Formation with lesser amounts of alluvium from the Salinas Drainage Basin which flows into Monterey Bay. It was established that the deposit probably represents a marine terrace of Pleistocene Age, indicating a relative lowering of sea level of about 300 to 360 ft. This appears to be the first reported evidence of submerged marine terraces in Northern California. (Sinha-OEIS)
W77-09228

METHANE PRODUCTION AND CONSUMPTION IN ANOXIC MARINE SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5C.
W77-09230

WAVE FORCES ON MODELS OF SUBMERGED OFFSHORE STRUCTURES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-09232

THE EVALUATION OF THE TEST PROCEDURE FOR HAZARDOUS BINARY COMBINATIONS OF MATERIALS IN MARINE TRANSPORTATION,
Coast Guard Academy, New London, Conn.
For primary bibliographic entry see Field 5G.
W77-09236

AT SEA TESTING OF A HIGH SEA OIL RECOVERY SYSTEM,
Ocean Systems, Inc., Reston, Va.
For primary bibliographic entry see Field 5G.
W77-09237

OIL TRANSPORTATION BY TANKERS: AN ANALYSIS OF MARINE POLLUTION AND SAFETY MEASURES.
Office of Technology Assessment, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-09238

VULNERABILITY MODEL: A SIMULATION SYSTEM FOR ASSESSING DAMAGE RESULTING FROM MARINE SPILLS,
Enviro Control, Inc., Rockville, Md.
For primary bibliographic entry see Field 5C.
W77-09239

TRACE METALS IN MANGROVE SEEDLINGS FROM POLLUTED AND UNPOLLUTED BAYS IN PUERTO RICO,
Puerto Rico Nuclear Center, Mayaguez. Marine Ecology Div.
For primary bibliographic entry see Field 5A.
W77-09240

COASTAL ZONE MANAGEMENT FOCUS ON NEW ENGLAND; AN ANNOTATED SELECTED BIBLIOGRAPHY,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 6B.
W77-09241

MAY 1974 BASELINE INVESTIGATION OF DEEPWATER DUMPSITE 106.
National Oceanic and Atmospheric Administration, Washington, D.C.; and Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W77-09243

NOAA SHIP ALBATROSS IV CRUISE 74-5 REPORT OF MAY 9-24, 1974 SURVEY OF DEEPWATER DUMPSITE 106,
NOAA National Marine Fisheries Service, Narragansett, R.I. Atlantic Environmental Group.
For primary bibliographic entry see Field 5B.
W77-09244

EFFECT OF DISSOLVED OXYGEN ON REDOX POTENTIAL AND NITRATE REMOVAL IN FLOODED SWAMP,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W77-09286

DISTRIBUTION OF NUTRIENTS IN LOUISIANA'S COASTAL WATERS INFLUENCED BY THE MISSISSIPPI RIVER,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science; and Louisiana Wildlife and Fisheries Commission, Baton Rouge. Seafood Div.
For primary bibliographic entry see Field 5B.
W77-09323

WETLANDS-RELATED LEGISLATION IN THE UNITED STATES,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 6E.
W77-09324

PROCEEDINGS OF THE EIGHTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
Texas A and M University Sea Grant Program Report No. TAMU-SG-77-102, December 1976. 248 p. Also as Center for Dredging Studies CDS Report No. 195. J. B. Herbich (Ed.).

Descriptors: *Dredging, *Channel(Waterways), *Beach erosion, *Waste disposal, *Water quality, *Environmental effects, Spoil, Sedimentation, Texas, North Carolina, Georgia.

This volume of 10 papers constitutes the Proceedings of the Eighth Dredging Seminar held in Houston, Texas on November 8, 1975. Titles include: Physical Factors Affecting Dredged Material Islands in a Shallow Water Environment; A New Concept for Dredged Material Disposal; Dredging Opertions in the Galveston District; Dredge Material Containment in Nylon Bags in the Construction of Mini-Projects for Beach Stabilization; Vessel Traffic System Houston-Galveston; The National Dredging Study; An Investigation of the Environmental Impacts Associated with the Disposal of Dredged Material at the Offshore Disposal Site, Galveston, Texas; Use of Remote Sensing in Evaluating Turbidity Plumes; Hydrologic and Sedimentologic Study of the Offshore Dredge Disposal Area, Savannah, Georgia, and Aquatic Disposal of Dredged Material, Release of Contaminants During and After Disposal. (NOAA)
W77-09325

FINE-GRAINED SEDIMENT AND INDUSTRIAL WASTE DISTRIBUTION AND DISPERSAL IN NEW BEDFORD HARBOR AND WESTERN BUZZARDS BAY, MASSACHUSETTS,
Woods Hole Oceanographic Institution, Mass. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W77-09326

THE CITIZEN'S GUIDE TO NORTH CAROLINA'S SHIFTING INLETS,
North Carolina State Univ. at Raleigh. Center for Urban Affairs and Community Services.
S. Baker.
North Carolina University Sea Grant Publication No. UNC-SG-77-08, March 1977. 32 p. Also as Center for Urban Affairs and Community Services Information Report No. 2. Chiefly aerial photos. SG-04-6-058-44054.

Descriptors: *Aerial photography, *Inlets(Waterways), *Barrier islands, *North Carolina, Erosion, Coasts, Sedimentation, *Maps.

This pamphlet is intended for the use of citizens who do not have a scientific or engineering background. Aerial photographs are marked to show the numerous significant changes in the position and size of barrier island and inlets caused by various coastal processes. (NOAA)
W77-09327

PERFORMANCE ANALYSIS OF A TETHERED FLOAT BREAKWATER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 8B.
W77-09328

COASTAL ENGINEERING DATA NETWORK. SECOND SEMI-ANNUAL REPORT JULY 1976 TO DECEMBER 1976,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 8B.
W77-09329

SEWAGE DISCHARGES FROM SHIPS TRANSITING COASTAL SALT WATERS,
David W. Taylor Naval Ship Research and Development Center, Annapolis, Md. Pollution Abatement Div.
For primary bibliographic entry see Field 5B.
W77-09333

STUDIES OF THE MIXING OF COASTAL WATERS IN LIVERPOOL BAY USING DISSOLVED SILICATE AS A TRACER,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
D. T. E. Hunt, and P. Foster.
Water Research, Vol. 11, No. 5, p 465-470, May 1977. 5 fig, 1 tab, 25 ref.

Descriptors: *Mixing, *Bays, *Tracers, *Model studies, Mathematical models, Coasts, Foreign countries, Foreign research, Estuaries, *Silica, Salinity, Temperature, Water temperature, Circulation, Water circulation, Surveys, On-site investigations, Rivers, Oceanography.
Identifiers: *Liverpool Bay(England), *Dissolved silica.

The essential prerequisites to be met by a natural tracer in coastal waters were stated, an assessment was made of the suitability of dissolved silicate. The application of silicate as a tracer, in conjunction with salinity and temperature, was illustrated with reference to a four-component mixing model of Liverpool Bay during January 1975. The model provides evidence for an anticlockwise residual surface circulaton of the coastal waters. (Sims-ISWS)
W77-09347

CURRENTS IN JOHNSTONE STRAIT, BRITISH COLUMBIA: SUPPLEMENTAL DATA ON THE VANCOUVER ISLAND SIDE,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
R. E. Thomson.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 5, p 697-703, May 1977. 5 fig, 1 ref.

Descriptors: *Currents(Water), *Straits, *Current meters, *Canada, Tides, Tidal waters, Circulation, Water circulation, Estuaries, Flow, Measurement, Data processing.
Identifiers: *Johnstone Strait(British Columbia), *British Columbia, *Vancouver Island(British Columbia).

Records from a current meter recently found adrift after 3 yr were used to complete previously published cross sections of mean flow and tidal currents in Johnstone Strait. The new plots emphasize the cross-channel asymmetry of the estuarine circulation and the large phase lag of the upper layer current relative to the bottom currents for the diurnal tidal constituent. A recalculation of the net volume transport showed that its magnitude and direction remain undeterminable to the order of + or - 1000 cu m/s. (Sims-ISWS)
W77-09354

DISSOLVED AMINO ACIDS IN THE EQUATORIAL PACIFIC, THE SARGASSO SEA, AND BISCAYNE BAY,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W77-09356

SATELLITE AND CURRENT DROGUE STUDIES OF OCEAN-DISPOSED WASTE DRIFT,
Delaware Univ., Newark. Center for Remote Sensing.
For primary bibliographic entry see Field 5B.
W77-09358

ENVIRONMENTAL IMPACTS FROM OFFSHORE EXPLORATION AND PRODUCTION OF OIL AND GAS.
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 6G.
W77-09460

REMOTE SENSING OF SUBMERGE AQUATIC VEGETATION IN THE LOWE CHEASAPEAKE BAY,
Virginia Inst., of Marine Science, Glouces Point. Div. of Biological Oceanography.
R. J. Orth, and H. Gordon.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as N76-187 Price codes: A05 in paper copy, A01 in microfic Report NASA CR-144918, April 1975. 68 p. 29 f 3 tab., 14 ref. NAS1-10720.

Descriptors: *Remote sensing, *Submer plants, Feasibility, Mapping, *Chesapeake B *Aerial photography, Elasmobranchs, Mar plants.
Identifiers: Photography films, Zostera mari Eelgrass, Cownose rays.

The feasibility of using remote sensing to: delineate submerged aquatic vegetation, prima eelgrass, in the lower Chesapeake Bay, (2) map present distribution of submerged aquatics, determine the extent of loss or recovery of grass in the lower Chesapeake Bay since 1972, (4) judge the effectiveness of various photograp films and techniques in delineating submer vegetation, were assessed. It was concluded remote sensing is a useful tool for studying spatial distribution and temporal variation of merged vegetation. There was a 36% reductio the amount of submerged aquatics in the west part of the lower Chesapeake Bay from 197 1974, with the York, Plankatank and Rappah nock rivers experiencing the greatest loss. Fo ing Cownose rays were suspected as a main fa in the destruction of a number of the grass b while recovery of beds occurred primarily thro seedling recruitment and subsequent grow Kodak's experimental water penetration proved more useful than black and white near frared film. Optimal results from the new were obtained with the camera aperture closed stop from suggested settings, and flying at a titude of 5000 feet at low tide in the morning w wind conditions were minimal. (Luedtke-Wis sin).
W77-09468

CONTRIBUTIONS OF SUSPENDED AND SOLVED SUBSTANCES TO THE ARC OCEAN DURING BREAKUP OF THE C VILLE RIVER, ALASKA,
Louisiana State Univ., Baton Rouge. Coastal dies Inst.
For primary bibliographic entry see Field 5C.
W77-09503

DEGRADATION OF PARATHION IN S WATER,
Institut fuer Meeresforschung, Bremerh (West Germany).
For primary bibliographic entry see Field 5B.
W77-09506

FILAMENT FORMATION IN THE DIAT SKELETONEMA COSTATUM,
University of Southern Mississippi, Hattiesb Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-09510

THE DYNAMICS OF AN ESTUARY A NATURAL ECOSYSTEM.
South Carolina Univ., Columbia. Belle W. Ba Inst. for Marine Biology and Coastal Research
For primary bibliographic entry see Field 5C.
W77-09517

USER'S MANUAL FOR THE M TRANSIENT WATER QUALITY NETW

ODEL--INCLUDING NITROGEN-CYCLE
NAMICS FOR RIVERS AND ESTUARIES,
ssachusetts Inst. of Tech., Cambridge. Dept. of
vil Engineering.
r primary bibliographic entry see Field 5B.
7-09519

IE USE OF WETLANDS AS NUTRIENT
MOVAL SYSTEMS,
rginia Inst. of Marine Science, Gloucester Point.
r primary bibliographic entry see Field 5G.
7-09520

ODEGRADATION OF CELLULOSIC SUB-
RATES,
uisiana State Univ., Baton Rouge.
r primary bibliographic entry see Field 5B.
7-09522

DERALISM AND THE DEVELOPMENT OF
TER CONTINENTAL SHELF MINERAL
SOURCES,
ami Univ., Fla. School of Law.
r primary bibliographic entry see Field 6E.
7-09531

ND USE CONTROL IN THE COASTAL
NE: THE DELAWARE EXAMPLE,
tural Resources Law Inst. Portland, Oreg.
r primary bibliographic entry see Field 6F.
7-09533

GULATING DEVELOPMENT ALONG THE
LIFORNIA COAST,
lifornia Univ., Davis. Environmental Studies
ogram.
r primary bibliographic entry see Field 4A.
7-09534

IE LEGAL IMPLEMENTATION OF
OASTAL ZONE MANAGEMENT: THE
RTH CAROLINA MODEL,
rth Carolina Univ. at Chapel Hill. School of
w.
r primary bibliographic entry see Field 6E.
7-09547

DE-INDUCED RESIDUAL CURRENT-VERIFI-
TION OF A NUMERICAL MODEL,
lhousie Univ., Halifax (Nova Scotia). Dept. of
eanography.
T. Tee.
rnal of Physical Oceanography, Vol. 7, No. 3, p
-402, May 1977. 8 fig, 2 tab, 10 ref.

scriptors: *Tides, *Currents(Water), *Model
dies, *On-site investigations, Tidal waters,
al effects, Circulation, Water circulation, Ed-
s, Mathematical models, Data processing,
alytical techniques, Estuaries, Oceanography.
ntifiers: *Minas Bay(Nova Scotia), *Minas
annel(Nova Scotia), *Bay of Fundy(Nova
otia), *Nova Scotia, Residual currents.

a previous paper, tide-induced residual currents
he Minas Channel and Minas Basin were stu-
d with a two-dimensional nonlinear numerical
l model. It was shown that the model could
roduce well the observations obtained in 1960
1965. In this paper, further observations ob-
ed in 1974 were presented. The analyzed
ults confirm the calculated tidal and residual
rents and the mechanism that was suggested
the generation of the residual currents. Calcu-
d and experimental results showed that the
ximum M sub 2 tidal current occurs earlier in
sheltered areas. (Sims-ISWS)
7-0959

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

MEASURES FOR REDUCING RETURN FLOWS FROM THE WELLTON-MOHAWK IRRIGATION AND DRAINAGE DISTRICT, ANNUAL REPORT FOR FY 1976.
Bureau of Reclamation, Washington, D.C. Wellton-Mohawk Irrigation and Drainage District.
For primary bibliographic entry see Field 4A.
W77-09276

SYSTEM DESIGN OF A TUBULAR REVERSE OSMOSIS PLANT,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5F.
W77-09319

COLORADO RIVER WATER QUALITY IMPROVEMENT PROGRAM (FINAL ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-09527

3B. Water Yield Improvement

AUGMENTING SUMMER STREAMFLOW BY USE OF A SILICONE ANTITRANSPIRANT,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
G. H. Belt, J. G. King, and H. F. Haupt.
Water Resources Research, Vol 13, No 2, p 267-272, April 1977. 4 fig, 1 tab, 20 ref.

Descriptors: *Streamflow, *Transpiration control, *Idaho, Emulsions, Aqueous solutions, Transpiration, Soil water, Watersheds(Basins), Regression analysis, Seasonal, Summer, Spraying.
Identifiers: *Silicone antitranspirant, Aqueous emulsion, Silicone oil, Leaf water potential, Regression equations.

A 65-acre (26.3-ha) cedar-hemlock catchment in northern Idaho was sprayed with a 5% aqueous emulsion of silicone oil to reduce transpiration. The antitranspirant, Dow Corning XEF-4-3561, was applied by helicopter at the rate of 40 gal/acre (375 l/ha). From June 1 to September 15, 1974, streamflow, soil water, and leaf water potential were monitored on the 65-acre (26.3 ha) treated watershed and on an adjacent 50-acre (20.2 ha) control watershed. By using the paired watershed method with regression equations based on 6 years of pretreatment data, predicted and observed streamflow were obtained for the period June 1 to Septermber 15. Differences between predicted and observed streamflow were compared by using the paired 't' test and were found to be significant at the 97.5% confidence level. During a 63-day period, a 12% increase in streamflow resulted from the antitranspirant application. During the same period, soil water storage was greater on the treated watershed than on the control watershed; however, the difference was not statistically significant. Seasonal leaf water potential in cedar indicated that stress was greater on the control watershed than on the treated watershed. Systematic differences in leaf potential for hemlock did not occur. (Robert-ISWS)
W77-09126

INVESTIGATION OF THE APAC WATER SEEPAGE BARRIER,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
R. K. Frobel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 362, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 67 p, 19 fig, 6 tab, 20 ref, 2 append. OWRT A-059-ARIZ(1), 14-31-0001-5003.

Descriptors: *Asphalt, *Seepage control, *Barriers, *Water yield improvement, Plastics, Slope stability, Testing, *Sealants.
Identifiers: *Asphalt-plastic-asphalt-chip seepage barrier, Hydrostatic puncture resistance, Slope stability-cover aggregate, Overlap seal strength, Surface temperature, Asphalt emulsion, Asphalt residue.

The APAC (Asphalt-Plastic-Asphalt-Chip-Coated) water seepage barrier was investigated. Three testing methods were utilized. The first test evaluated the hydrostatic puncture resistance of the asphalt-polyethylene combination. The second test was that of slope stability of a 3/8 in. (9.5 mm) cover aggregate. This test was designed to determine the displacement characteristics of a cover aggregate as related to slope, temperature, and asphalt residue quantity. The third test was used to determine the overlap seal strength of three available adhesive materials. ASTM test procedures were utilized for this phase of testing. Both asphalt layers in the APAC treatment effectively increased puncture resistance over that of plain polyethylene. The 2:1 slope was stable up to a surface temperature of 122F (50C); the 3:1 and 4:1 slopes remained stable throughout testing. An increase in asphalt spread quantity reduces downslope displacement of the embedded cover aggregate. The Presstite mastic was the best suited adhesive for sealing polyethylene overlaps.
W77-09140

AEROSOL OVER THE HIGH PLAINS OF THE UNITED STATES,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5A.
W77-09225

A SUGGESTED TECHNIQUE FOR THE ANALYSIS OF AIRBORNE CONTINUOUS ICE NUCLEUS DATA,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
J. A. Heimbach, Jr., A. B. Super, and J. T. McPartland.
Journal of Applied Meteorology, Vol. 16, No. 3, p 255-261, March 1977. 7 fig, 4 tab, 11 ref, 1 append.

Descriptors: *Data processing, *Analytical techniques, *Nucleation, Atmosphere, Aircraft, On-site investigations, Sampling, Silver iodide, Cloud seeding, Instrumentation, Calibrations, Measurement, Cloud physics, Meteorology.
Identifiers: *Ice nuclei, *Ice nucleus counters.

The problem of reducing data from continuously recording ice nucleus counters was addressed. The instruments characteristically have long response times which make their data difficult to interpret. A statistical theory of instrument response was developed which parameterizes the response of the instruments and reconstructs an estimate of the true count-versus-time profiles. Data from two NCAR ice nucleus counters used on separate field projects were summarized to provide example response characteristics. Field calibration techniques for these NCAR counters also were described. Although intended for use on ice nucleus counters, the interpretation techniques are applicable to other continuously recording instruments having significant response times. (Sims-ISWS)
W77-09361

3C. Use Of Water Of Impaired Quality

MEASURES FOR REDUCING RETURN FLOWS FROM THE WELLTON-MOHAWK IRRIGATION AND DRAINAGE DISTRICT, ANNUAL REPORT FOR FY 1976.
Bureau of Reclamation, Washington, D.C. Wellton-Mohawk Irrigation and Drainage District.
For primary bibliographic entry see Field 4A.
W77-09276

THE CHEMICAL COMPOSITION OF THE LYSIMETRIC WATER FROM SANDY PODZOLIC SOIL AND CHANGES AFFECTED BY FERTILIZERS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2K.
W77-09277

NITROGEN BALANCE IN THE SOUTHERN SAN JOAQUIN VALLEY,
California Univ., Davis. Water Science and Engineering Section.
For primary bibliographic entry see Field 5B.
W77-09284

EFFECTS OF DROUGHT AND SALINITY ON SOME GROWTH CONTRIBUTING PARAMETERS IN WHEAT AND BARLEY,
Assiut Univ. (Egypt). Dept. of Botany.
H. M. El-Sharkawi, and F. M. Salama.
Plant and Soil, Vol. 46, p. 423-433, 1977. 4 fig, 2 tab, 17 ref.

Descriptors: *Drought resistance, *Salt tolerance, *Crop response, *Wheat, *Barley, Planting management, *Plant growth, Transpiration control, Soil water, Plant physiology, Plant morphology, Chlorophyll, *Salinity, On-site investions, Moisture stress, Osmosis, Water balance, Growth rates.
Identifiers: *Egypt, Osmotic potential, Matric potential.

Wheat and barley cultivars grown at the Assiut Desert Experiment Station in Egypt were studied to determine the effects of salinity and reduced soil water potential on transpiration efficiency (dry matter/transpiration ratio), leaf/root ratio, chlorophyll content and stability to heat, and anatomical modifications. Results indicated greater transpiration efficiency in Mexican 'super-x' wheat than in the Egyptian 'Giza-155' cultivars under reduced soil water matric or osmotic potentials. Reduced matric potential usually caused an increased dry matter/transpiration ratio, and salinity had a suppressing effect on most cultivars tested. Super-x chlorophyll content increased and chlorophyll heat stability decreased leaf/root ratio. Among barley cultivars, traspiration effeciency was higher in Giza-117 than in Borg El-Arab under reduced soil water osmotic potential. Lower leaf/root ratios in the Giza-117 make that cultivar preferable for saline soils, while Borg El-Arab is favored for drought resistance. (Jahns-Arizona)
W77-09312

WATER RECLAMATION: TECHNOLOGY AND PUBLIC ACCEPTANCE,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W77-09317

3D. Conservation In Domestic and Municipal Use

MODELING URBAN RUNOFF FROM A PLANNED COMMUNITY,
Espey, Huston and Associates, Inc., Austin, Tex.
For primary bibliographic entry see Field 5B.
W77-09190

APPLICATION OF STORM AND SWMM FOR ASSESSMENT OF URBAN DRAINAGE ALTERNATIVES IN CANADA,
MacLaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 5B.
W77-09199

MALVERN URBAN TEST CATCHMENT, VOLUME I,
Canada Centre for Inland Water, Burlington (Ontario).
For primary bibliographic entry see Field 4D.
W77-09217

URBAN WATER PLANNING, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 6B.
W77-09264

URBAN WATER RUNOFF AND WATER QUALITY CONTROL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-09267

3E. Conservation In Industry

RADIONUCLIDE REMOVAL BY THE PH ADJUSTMENT OF PHOSPHATE MILL EFFLUENT WATER,
Eastern Environmental Radiation Facility, Montgomery, Ala.
For primary bibliographic entry see Field 5D.
W77-09180

AEROBIC DIGESTION OF ORGANIC SLUDGES CONTAINING INORGANIC PHOSPHORUS PRECIPITATES, VOLUME II, SLUDGES PRECIPITATED BY LIME ADDITIONS TO RAW SEWAGE,
Toronto Univ. (Ontario). Dept. of Civil Engineering; and Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
For primary bibliographic entry see Field 5D.
W77-09216

MANUFACTURING WATER USE SURVEY, 1972 - A SUMMARY OF RESULTS,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
D. M. Tate.
Social Science Series No 17, 1977. 14 p, 9 tab.

Descriptors: *Water utilization, *Water consumption, Industrial water, Industrial plants, Surveys, Data collections, Intakes, Recirculated water, Discharge(Water), Sewers, Surface waters, *Canada, Water conservation.
Identifiers: Provincial consumption rates.

Results are summarized of the Manufacturing Section of the 1972 Survey of Industrial Water Use, the first of its kind to be undertaken nationally in Canada. Figures and discussion are presented on various parameters of water used by industry, such as intake, recirculation and discharge. Similar figures are given for water used by industry within each province. This survey is the first of a continuing series of surveys to be undertaken at five-year intervals, with the next survey beginning early in 1977. These statistics will provide a valuable input to water management, planning and related activities such as water needs forecasting. (WATDOC)
W77-09219

WATER RECLAMATION: TECHNOLOGY AND PUBLIC ACCEPTANCE,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W77-09317

CONVERSION OF CATTLE MANURE INTO USEFUL PRODUCTS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 5D.
W77-09395

ACTIVATED CARBONS FOR EFFLUENT AND WATER TREATMENT,
For primary bibliographic entry see Field 5D.
W77-09409

TREATING WASTE WATER FROM BECKMA PREPN. OF LACTAM--BY TWO STAG CONCN. EXTN. OF RESIDUAL LACTAM RESIDUE COMBUSTION, SULFUR DIOXID RECOVERY AND CONVERSION TO SU FURIC ACID FOR RECYCLING.
For primary bibliographic entry see Field 5D.
W77-09410

SOME CONSIDERATIONS ON TH RECOVERY AND DISPOSAL OF PHOTOLA WASTE,
For primary bibliographic entry see Field 5D.
W77-09411

MEMBRANE ULTRAFILTRATION FO TREATMENT AND WATER REUSE OF TN MANUFACTURING WASTES,
Kentucky Univ., Lexington. Dept. of Chemic Engineering.
For primary bibliographic entry see Field 5D.
W77-09412

TREATING DISTILLERY EFFLUENT RECOVERING TARTAR AND ORGAN MATTER--WITHOUT INCREASING THE VO OF EFFLUENT DURING PURIFICN.
For primary bibliographic entry see Field 5D.
W77-09414

A THERMAL CONTROLLER FOR THE SHOR COD DETERMINATION,
Agricultural Research and Education Cent Lake Alfred, Fla.
For primary bibliographic entry see Field 5A.
W77-09415

ANAEROBIC DIGESTION OF RUM STILLAG
National Research Council of Canada, (Ontari Div. of Biological Sciences.
For primary bibliographic entry see Field 5D.
W77-09416

'NOT ONE DROP OF EFFLUENT HYDROCHLORIC ACID RECOVERY FRO SPENT PICKLE LIQUOR.
For primary bibliographic entry see Field 5D.
W77-09417

ALTERNATIVE METHODS OF PHEN WASTEWATER CONTROL,
Envirex Inc., Waukesha, Wis.
For primary bibliographic entry see Field 5D.
W77-09419

NEW TRENDS IN SOUR WATER STRIPPING
Shell Canada Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5D.
W77-09421

MOVING HEAVY METALS IN TEXTILE
ASTE,
mutit Co., Paramus, N.J.
r primary bibliographic entry see Field 5D.
7-09423

DUSTRIAL WATER USE,
blic Health Service, Washington, D.C. Div. of
ter Supply and Pollution Control.
r primary bibliographic entry see Field 6D.
7-09449

ONOMIC IMPACT OF EPA'S REGULA-
ONS ON THE PETROLEUM REFINING IN-
STRY. VOLUME 1. EXECUTIVE SUMMA-
,
otka and Co., Inc., Stamford, Conn.
r primary bibliographic entry see Field 5G.
7-09451

ONOMIC IMPACT OF EPA'S REGULA-
ONS ON THE PET. REFINING IND. VOL. 2,
S 1 AND 2. IND. DESCRIPTION AND TECH.
ALYSIS,
otka and Co., Inc., Stamford, Conn.
r primary bibliographic entry see Field 5G.
7-09452

ONOMIC IMPACT OF EPA'S REGULA-
ONS ON THE PETROLEUM REFINING IN-
STRY. VOL. 3, PT. 3. ECONOMIC IMPACT
ALYSIS,
otka and Co., Inc., Stamford, Conn.
primary bibliographic entry see Field 5G.
7-09453

TENTIAL ENVIRONMENTAL IMPACTS
OM THE PRODUCTION OF SYNTHETIC
ELS FROM COAL.
anization for Economic Co-Operation and
velopment, Paris (France).
primary bibliographic entry see Field 5B.
7-09458

ING OF MAJOR ENERGY FACILITIES.
anization for Economic Co-Operation and
velopment, Paris (France).
primary bibliographic entry see Field 6G.
7-09459

RVEY OF INDUSTRIAL PROCESSING
TA. TASK I-HEXACHLOROBENZENE AND
XACHLOROBUTADIENE POLLUTION
OM CHLOROCARBON PROCESSING,
west Research Inst., Kansas City, Mo.
primary bibliographic entry see Field 5B.
7-09475

THODOLOGY FOR ASSESSING ENVIRON-
NTAL IMPLICATIONS AND TECHNOLO-
S: NONFERROUS METALS INDUSTRIES,
elle-Columbus Labs., Columbus, Ohio.
primary bibliographic entry see Field 5G.
7-09479

Conservation In Agriculture

DICTING ATTAINABLE IRRIGATION EF-
IENCIES IN THE UPPER SNAKE RIVER
ION,
o Univ., Moscow. Dept. of Civil Engineering.
. Claiborn.
ilable from the National Technical Informa-
Service, Springfield, VA 22161 as PB-269 361,
e codes: A10 in paper copy, A01 in microfiche.
Thesis, May 1975. 197 p, 10 fig, 18 tab, 45 ref,
pend. Idaho Water Resources Research In-
te, Moscow. OWRT A-040-IDA(1), 14-31-
-5012.

Descriptors: *Irrigation practices, Irrigation districts, Consumptive use, *Irrigation efficiency, *Idaho, *Forecasting.
Identifiers: Reasonably attainable efficiency, *Upper Snake River Region(Idaho).

1974 irrigation season water use was studied on six independent irrigation districts in the Upper Snake River Region of southern Idaho. Present efficiencies and reasonably attainable efficiencies were evaluated. River diversion data, conveyance system seepage loss data, crop distribution and return flow data were compiled. Deep percolation losses and irrigation efficiencies were derived using an inflow-outflow water balance analysis. Farm efficiencies ranged from 11 to 62 percent, compared to 10 to 42 percent project efficiency. Reasonably attainable project irrigation efficiencies were projected to range from 35 to 51 percent. Low present farm irrigation efficiencies were attributed to over irrigation caused by long field runs combined with high intake rate soils. Lining main canal systems to reduce seepage would not significantly increase project irrigation efficiencies. Large decreases in river diversion could be obtained by increasing farm irrigation efficiencies.
W77-09137

EFFECT OF SEVERAL CULTURAL PRACTICES ON THE ESTABLISHMENT OF ALFALFA (MEDICAGO SATIVA L.),
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
A. Meddeb.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 506, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 49 p, 8 fig, 8 tab, 34 ref. OWRT A-034-ARIZ(2), 14-31-0001-5003.

Descriptors: *Alfalfa, *Cultivation, Seedlings, Seeds, Seed treatment, *Planting management, Oats, Greenhouses, *Soil treatment, Crop production.
Identifiers: *Sulfuric acid, *Phosphoric acid, *Soil crusting, *Seedling emergence.

Alfalfa (Medicago sativa var. Hayden) was planted in a greenhouse and field experiment to determine the effect of surface applied phosphoric acid, seeding method, seeding rate, and delayed overseeding with oats (Avena sativa L.) on seedling emergence and yield. The research was conducted to identify improved methods of alfalfa stand establishment. Under greenhouse conditions significantly more seedlings emerged when seed were planted at 1.25 as compared to 2.50 cm depth. When 1,300 l/ha of 12% phosphoric acid were applied to the soil surface after planting, crusting was reduced and significantly more seedlings emerged from soil in the treated pots. In the field experiment weight of seedlings from plots treated with phosphoric acid was greater than from plots receiving soil incorporated phosphorus. Rains that occurred after planting the field experiment prevented the formation of serious soil crusts. Surface applied phosphoric acid did not increase the number of emerged seedlings under these conditions. Seedling counts were made 10 days after planting. When seed were broadcast and the soil was cultipacked and treated with acid, significantly more seedlings were produced. For broadcast plantings, seedlings were significantly larger when taken from the cultipacked furrow than from the ridge. Forage yields from the first harvest did not differ significantly for the 11.2 and 22.4 kg/ha broadcast seeding rates, but were significantly less for the lower seeding rate when seed were drilled. Delayed overseeding with oats did not significantly increase forage yield.
W77-09144

SIMULATION OF AGRICULTURAL RUNOFF,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5B.
W77-09173

INFLUENCE OF CROP MANAGEMENT PRACTICES ON NUTRIENT MOVEMENT BELOW THE ROOT ZONE IN NEBRASKA SOILS,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
For primary bibliographic entry see Field 2G.
W77-09279

LEAD EFFECTS ON SEVERAL ENZYMES AND NITROGENOUS COMPOUNDS IN SOYBEAN LEAF,
Taiwan Provincial Chung-Hsing Univ., Taichung.
For primary bibliographic entry see Field 5C.
W77-09280

THE ROLE OF SYSTEMS ANALYSIS IN THE USE OF AGRICULTURAL WASTES,
Manitoba Univ., Winnipeg Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W77-09282

RESIDUES OF DICHLOBENIL IN IRRIGATION WATER,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Irrigation Research Lab.
For primary bibliographic entry see Field 5B.
W77-09287

GENOTYPIC RESPONSES IN SORGHUM TO DROUGHT STRESS. III. FREE PROLINE ACCUMULATION AND DROUGHT RESISTANCE,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
A. Blum, and A. Ebercon.
Crop Science, Vol. 16, p 428-431, May-June 1976. 1 fig, 3 tab, 25 ref.

Descriptors: *Crop response, *Grain sorghum, *Moisture stress, *Drought resistance, *Amino acids, Plant growth, *Drought tolerance, Ammonia, Respiration, Plant physiology, Genetics, Dry farming.
Identifiers: *Genotype, *Israel, Leaf water potential, Desiccation tolerance, Recovery resistance.

Grain sorghum (Sorghum bicolor (L.) Moench) cultivars grown in the field under dryland conditions at Bet Dagan, Israel, and in a growth chamber were studied to determine the association between free proline amino acid accumulation in water-stressed leaves and drought resistance. Eight cultivars were grown in a growth chamber under a drying cycle (to a leaf water potential of -18 to -21 bars) and subsequent recovery phase. Desiccation tolerance and recovery upon rehydration ('recovery resistance') were studied. Rapid proline accumulation began in leaves of all cultivars when leaf water potential dropped to -14 to -16 bars. Free ammonia concentration did not change significantly during the drying cycle but increased rapidly within 24 hours after rewatering while free proline content decreased. Cultivars differed significantly in maximum free proline accumulation and post-stress ammonia concentration, dark respiration rate and recovery rating. Correlations indicated desiccation tolerance was unrelated to the attributes measured. Free proline accumulation during water stress was correlated with the post-stress recovery rating, free ammonia concentration and dark respiration rate. Results indicate proline accumulation is associated positively with recovery resistance, possibly as a source of respiratory energy in the recovering plant. (Jahns-Arizona)
W77-09297

SOIL WATER-ROOT RELATIONS IN WHEAT: WATER EXTRACTION RATE OF WHEAT ROOTS THAT DEVELOPED UNDER DRY AND MOIST CONDITIONS,
Leeds Univ. (England). Dept. of Plant Sciences.
For primary bibliographic entry see Field 2I.

W77-09300

LEAF GROWTH IN RELATION TO ATP LEVELS IN WATER STRESSED CORN PLANTS,
Macquarie Univ., North Ryde (Australia). School of Biological Sciences.
E. W. R. Barlow, T. M. Ching, and L. Boersma.
Crop Science, Vol. 16, p 405-407, May-June 1976. 2 fig, 19 ref.

Descriptors: *Plant growth, *Moisture stress, *Corn(Field), *Leaves, *Plant growth substances, Amino acids, Turgidity, Plant physiology, Metabolism.
Identifiers: *Adenosine triphosphate, Cell water potential, Turgor potential, Leaf elongation, Leaf water potential.

Early physical and metabolic changes in water stressed corn (Zea mays L. 'Pride 5') plants grown from seed in soil slabs were studied by monitoring for 48 hours the cell water potential, turgor potential, leaf elongation, adenylate energy charge, free amino acids and ATP concentrations of elongating leaves. Reduced cell turgor and leaf elongation rate induced by gradually decreasing the leaf water potential from -2.6 to -18 bars under continuous light caused a 40% drop in the ATP concentration of the elongating zone within 3 hours and a 25% drop in adenylate energy charge within 12 hours. Free amino acid concentration increased about 20% during the first 6 hours and over 250% in the full 48 hours. Possible causes and significance of a decrease in ATP concentrations are discussed. The response may indicate that ATP acts as a modulator of metabolic activity within the cell during brief periods of water stress cycles which often occur with field grown plants. ATP's regulation of biosynthesis at the enzymatic level may allow the plant to survive a stress cycle without undergoing an ontogenic shift. (Jahns-Arizona)
W77-09301

EFFECT OF WATER STRESS DURING DIFFERENT STAGES OF GROWTH OF SOYBEAN,
Pahlavi Univ., Shiraz (Iran).
For primary bibliographic entry see Field 2I.
W77-09302

SORGHUM GENOTYPE VARIATION IN STOMATAL SENSITIVITY TO LEAF WATER DEFICIT,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 2I.
W77-09303

STAND ESTABLISHMENT OF WHEAT LINES UNDER DIFFERENT LEVELS OF WATER POTENTIAL,
Kabul Univ. (Afghanistan). Faculty of Agriculture.
A. Gul, and R. E. Allan.
Crop Science, Vol. 16, p. 611-615, September-October 1976. 1 fig, 4 tab, 11 ref.

Descriptors: *Plant growth, *Germination, *Wheat, *Soil water, *Soil-water-plant relationships, Planting management, Laboratory tests, On-site tests, Seeds, Root development, Correlation analysis.
Identifiers: *Soil water potential, *Seedling emergence, Emergence rate index(ERI), Coleoptile, Total stand(TS).

Four soil water levels were used in a study of seedling emergence and growth of 93 wheat (Triticum aestivum L. em Thell) lines and four check cultivars. The purpose was to determine if selected groups of wheat lines differ in ability to germinate and emerge under various soil water potentials and to consider the feasibility of laboratory tests to screen germplasm for germination and emergence capability at low water potential. Wheat lines used were developed by recurrent selection for improved seedling vigor; studies were conducted at four soil water levels in laboratory tests and at different planting depths and locations in three field tests. Soil water potential strongly influenced emergence rate index (ERI), although lines differed markedly in emergence characteristics. The ERI was high for a number of lines in all four water potentials (-2.2, -6.0, -10.2 and -14.4 bars) and in field tests, indicating almost a doubling of emergence time for each -4 bars decrease in water potential. Total stand, coleoptile length, seedling weight were generally related in field tests, and root weights of 9 promising lines were correlated at the lowest water potential in laboratory tests. (Jahns-Arizona)
W77-09304

INFLUENCE OF INDETERMINATE GROWTH HABIT ON YIELD AND IRRIGATION WATER-USE EFFICIENCY IN UPLAND COTTON,
Agricultural Research Service, Lubbock, Tex. Oklahoma-Texas Area.
J. E. Quisenberry, and B. Roark.
Crop Science, Vol. 16 p 762-765, November-December 1976. 3 tab, 17 ref.

Descriptors: *Plant growth, *Crop production, *Cotton, *Irrigation efficiency, *Soil-water-plant relationships, Irrigation effects, Texas, Irrigation practices, Semiarid climates, Planting management, Dry farming, Soil moisture, Crop response, Water requirement.
Identifiers: *Indeterminate growth, Lint yield.

Studies of 12 cultivars of upland cotton (Gossypium hirsutum L.) grown at three moisture levels at Lubbock, Texas were conducted to evaluate the relationships between the degree of indeterminate growth habit, irrigation water-use efficiency and lint yield in upland cotton. Moisture regimes were dryland, preplant irrigation and full irrigation. Cultivars were placed according to their growth habit in four groups designated as High Plains-determinate, High Plains-moderately determinate, High Plains-indeterminate and non High Plains-indeterminate. Lint yields were higher in the indeterminate groups at all moisture levels; irrigation water-use efficiency was higher at the indeterminate moisture level (preplant irrigation). Indeterminate cultivars grown at the intermediate moisture level had a higher irrigation water-use efficiency than did determinate cultivars. Efficiency was greater for determinate cultivars at the higher moisture level. Correlation analyses suggested that a cultivar with a relatively indeterminate growth habit is better adapted to a nonirrigated simiarid environment. (Jahns-Arizona)
W77-09306

EFFECTS OF CONDENSED PHOSPHATES ON PLANT GROWTH AND PHOSPHORUS UPTAKE,
Edinburgh Univ. (Scotland). School of Agriculture.
F. M. El-Reweiny, K. Simpson, P. Crooks, and S. McIntosh.
Plant and Soil, Vol. 44, p. 1-14, 1976. 4 fig, 3 tab, 15 ref.

Descriptors: *Plant growth, *Phosphates, *Nutrient removal, Hydrolysis, Acidic soils, Alkaline soils, Soil dynamics, Grasses, Phosphorous, Soil-water-plant relationships, *Absorption.
Identifiers: *Phosphorus uptake, *Orthophosphates, *Ryegrass, Citric acid.

Four condensed phosphate, including ring- and chain-structured molecules, were equivalent to orthophosphate in terms of phosphorus uptake and dry matter yield of ryegrass grown in two soils in pots. Equivalence held for 6 samplings during two seasons and for aggregate yield. All sources had significant yield and P-uptake increases over control on both soils. Applied P uptake increase greatly with higher N rates, but there was no dif ferential effect with different P sources, nor an interaction between source and application rate There was no leaching of P, indicating rapi phosphate adsorption by soils. Hydrolysis of con densed phosphates was fairly rapid in a neutral ph soil and slower in an acid soil. A good correlatio was observed between P uptake by ryegrass an the additional orthophosphate released by an aci hydrolysis of soil extracts. Citric acid extract made at intervals may indicate the rate of con densed phosphate hydrolysis. Equality of per formance by condensed phosphates an orthophospate was probably due to rapid hydroly sis of the condensed phosphates. (Jahns-Arizona)
W77-09307

EFFECTS OF DROUGHT AND SALINITY O SOME GROWTH CONTRIBUTING PARAME TERS IN WHEAT AND BARLEY,
Assiut Univ. (Egypt). Dept. of Botany.
For primary bibliographic entry see Field 3C.
W77-09312

THE EFFECTS OF DRYING OF THE TOPSOI AND OF MICRONUTRIENTS IN THE SUBSOI ON MICRONUTRIENT UPTAKE BY AN INTE MITTENTLY DEFOILATED RYEGRASS,
Adelaide Univ. (Australia). Dept. of Agronomy.
For primary bibliographic entry see Field 2I.
W77-09314

ESTIMATED EVAPOTRANSPIRATION AN IRRIGATION REQUIREMENTS FOR CITRUS,
Florida Univ., Gainesville. Inst. of Food a Agricultural Science.
For primary bibliographic entry see Field 2D.
W77-09406

FATE OF FERTILIZER NITROGEN IN FLOODED RICE SOIL,
Louisiana State Univ., Baton Rouge. Lab. Flooded Soils and Sediments; and Louisiana Sta Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09438

PHOSPHORUS FERTILIZATION WITH DR IRRIGATION,
California Univ., Davis. Dept. of Land, Air, a Water Resources.
R. S. Rauschkolb, D. E. Rolston, R. J. Miller, A. Carlton, and R. G. Burau.
Soil Science Society of America Journal, Vol No 1, p 68-72, January-February 1976. 3 fig, 3 t 10 ref.

Descriptors: *Phosphorus, *Nutrien *Fertilization, *Fertilizers, Irrigation, Irrigati systems, Irrigation effects, Irrigation operati and maintenance, Rates of application, Pla physiology.
Identifiers: Phosphorus movement, *Drip irri tion.

Application of plant nutrients with drip irrigati systems is desirable for labor and energy savi and flexibility in timing nutrient applicatio Evaluations of P movement in the soil and upta by tomatoes were made when orthophosphate a glycero-phosphate were applied through a drip rigation system and in comparision with 26 kg P/ha banded below the seed at planting. A signi cantly higher P content was measured in seedli leaves when 26 kg of P/ha was applied by drip rigation than when the same rate was banded. differences in P content of whole tops of seedli were measured at equal rates of inorganic or ganic P applied through the drip system. There w a significant linear response of P uptake to P ra With drip irrigation, orthophosphate moved much greater istance into the soil than had be

reviously observed for comparable application
tes per hectare. Glycerophosphate moved 5 to 10
n farther through the soil at application rates of
5 and 13 kg of P/ha than did orthophosphate.
kogerboe-Colorado State)
77-09443

ORN CULTIVATION IN THE SAND OF THE
UKHARA OASIS, (IN RUSSIAN),
ukharskii Gosudarstvennyi Pedagogicheskii In-
itut (USSR).
K. Nazarov.
obl Osvoeniya Pustyn'. 6, p 71-73, 1973.

escriptors: *Corn(Field), *Fertilization,
Nitrogen, Irrigation, Land reclamation,
Cultivation, *Sands, Arid lands.
entifiers: *USSR(Bukhara Oasis).

eclamation of sands (2 m in depth) involves
mplete leveling of the surface. The application
200 kg of N and systematic irrigation of the area
sulted in an abundant harvest of
rasnodarskaya 49' maize.--Copyright 1975,
ological Abstracts, Inc.
77-09496

IE ROLE OF IRRIGATION IN FOOD
RODUCTION,
od and Agriculture Organization of the United
ations, Rome (Italy). Land and Water Develop-
nt Div.
Doorenbos.
griculture and Environment, Vol 2, No 1, p 39-
June 1975. 3 tab, 15 ref.

escriptors: *Food abundance, *Irrigation ef-
cts, *Agriculture, *Climatic data, *Irrigation ef-
iency, Food and cover crops, Irrigation
stems, Water distribution(Applied), Irrigation
actices, Agricultural engineering, Farm manage-
nt, Water resources, Ecology, Costs, Cost-
nefit analysis.
entifiers: *Climate control.

e world food situation is deteriorating at a slow
t steady pace. Figures and projections indicate
t while the food supply improvement rate is ris-
, the food demand is rising even faster. This ar-
le suggests a plan for fighting the growing food
on a worldwide basis. Fluctuations in food
oduction need to be minimized, and because the
nate is responsible, more research must be
ne into the possibility of climate control. Land
eds to be used more intensively. The quickest
y to raise production per acre is through in-
ased irrigation. Investment in irrigation and
inage work must therefore be regarded as basic
gricultural development and, consequently, to
g term goals for social and economic develop-
nt. Farmers must be given the ability to make
with less water and to use it more wisely. The
jor problem with this approach is that materials
expensive, and the cost presently seems
hibitive for an expansion worldwide in irriga-
. Also, wherever and whenever possible, the
l approach to an area's ecology must be con-
ered before land is developed. Finally, a com-
hensive series of options ranked according to
ority must be created so that future develop-
nt will be as orderly as possible. (Frank-
rida)
7-09535

CONDARY AUTUMN SHOOT FORMATION
SPRING WHEAT: I. THE ROLE OF
OUGHT DAMAGE AND DEVELOPMENTAL
AGES, (IN RUSSIAN),
demiya Nauk SSSR, Novosibirsk. Inst. of Soil
nces and Agrochemistry.
primary bibliographic entry see Field 2I.
7-09545

PERMIT PROGRAM REGULATIONS FOR AGRICULTURAL ACTIVITIES, (NPDES), (PROPOSED).
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 6E.
W77-09560

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

RECORDING RIVER AND RESERVOIR WATER DEPTH,
Moore, Gardner and Associates, Inc., Asheboro, N. C.
For primary bibliographic entry see Field 7B.
W77-09106

THEORETICAL PROBABILITY DISTRIBUTION OF CRITICAL HYDROLOGIC EVENTS BY THE PARTIAL-DURATION SERIES METHOD,
Rome Univ. (Italy). Istituto di Costruzioni Idrauliche.
For primary bibliographic entry see Field 2B.
W77-09109

CRITERION TO CHOOSE STEP LENGTH FOR SOME NUMERICAL METHODS USED IN HYDROLOGY,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W77-09110

OPTIMAL FILTERING TECHNIQUES FOR HYDROLOGICAL FORECASTING,
Public Power Corp., Athens (Greece).
For primary bibliographic entry see Field 2E.
W77-09111

THE CALIBRATION OF SHARP CRESTED WEIRS BY THE PONDAGE DRAWDOWN METHOD,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 8C.
W77-09113

THE EFFECT OF RAINFALL INTENSITY ON STORM FLOW AND PEAK DISCHARGE FROM FOREST LAND,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 2B.
W77-09125

AUGMENTING SUMMER STREAMFLOW BY USE OF A SILICONE ANTITRANSPIRANT,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
For primary bibliographic entry see Field 3B.
W77-09126

AN OPERATIONAL APPROACH TO PRESERVING SKEW IN HYDROLOGIC MODELS OF LONG-TERM PERSISTENCE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-09127

RURAL WATER DISTRICTS IN KANSAS.
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 6D.
W77-09135

PREDICTING ATTAINABLE IRRIGATION EFFICIENCIES IN THE UPPER SNAKE RIVER REGION,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3F.
W77-09137

INVESTIGATION OF THE APAC WATER SEEPAGE BARRIER,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 3B.
W77-09140

THE UTILITY OF COMPUTERS IN LANDSCAPE PLANNING, THE SELECTION AND APPLICATION OF A COMPUTER MAPPING AND ASSESSMENT SYSTEM FOR THE METROPOLITAN LANDSCAPE MODEL (METLAND),
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional Planning.
For primary bibliographic entry see Field 6A.
W77-09151

MODELING HYDROLOGIC LAND-USE INTERACTIONS IN FLORIDA,
Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5B.
W77-09189

MODELING URBAN RUNOFF FROM A PLANNED COMMUNITY,
Espey, Huston and Associates, Inc., Austin, Tex.
For primary bibliographic entry see Field 5B.
W77-09190

ENVIRONMENTAL, FISCAL AND SOCIO-ECONOMIC IMPACT OF LAND USE POLICIES: TOWARD AN INTERACTIVE ANALYSIS,
Meta Systems Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6B.
W77-09196

APPLICATION OF STORM AND SWMM FOR ASSESSMENT OF URBAN DRAINAGE ALTERNATIVES IN CANADA,
MacLaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 5B.
W77-09199

SIMULATION AND MATHEMATICAL MODELING OF WATER SUPPLY SYSTEMS - STATE-OF-THE-ART,
Michigan Univ., Ann Arbor. School of Public Health.
R. A. Deininger.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 634-638, July 1976. 106 ref.

Descriptors: *Simulation analysis, *Water supply, *Mathematical models, Demand, Forecasting, Design, Operations, Regions, Networks, Treatment facilities, Water distribution(Applied), Water quality, Systems analysis.

Mathematical modeling and simulation techniques have been used extensively in many parts of the overall water supply system ranging from the actual abstraction of water from ground and surface water sources to the primary collection and con-

veyance system, the water treatment plant, and the final distribution system. This arcticle presents a brief survey of the following areas: population projections and forecasts of demand; design and operation of well fields; regional water supply networks; design and operation of treatment plants; and design and operation of the distribution system. Considered is the development of a drinking water quality index. It is concluded that the use of mathematical models and simulation techniques, including linear and dynamic programming, aids in the analysis of water supply systems in four major ways; (1) allows more alternatives at every level of decision making; (2) allows better testing of assumptions and estimation of the influence of uncertainties; (3) provides for making explicit judgements which are clearly ladi out; and (4) serves as a communication tool for all professionals involved in water supply systems plannng. (See also W77-09154) (Bell-Cornell)
W77-09200

HYDROLOGIC IMPACT STUDIES OF ALTERNATIVES TO MEET WATER NEEDS IN SOUTH CENTRAL PENNSYLVANIA,
Resource Analysis Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6D.
W77-09203

THE OPERATIONAL WATER QUANTITY MODEL,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
A. N. Shahane, P. Berger, and R. L. Hamrick.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 657-663, July 1976. 8 fig, 4 tab, 10 ref.

Descriptors: Hydrology, *Simulation analysis, *Rainfall, *Watersheds(Basins), *Streamflow, *Methodology, Estimating, River basins, Water conveyance, Lakes, Canals, Water levels, Water loss, Water storage, Evapotranspiration, Computer programs, Hydraulics, Equations, Mathematical models, Systems analysis.
Identifiers: *Water quantity, *Routing model, Kissimmee River basin(Fla).

A recently completed operational water quantity model based on hydrologic-hydraulic simulations is presented. Using the rainfall input, initial state conditions and basin parameters, the model estimates, among many hydrologic entities, the streamflows contributed by the watersheds. An iterative type routing model is then developed to distribute the simulated streamflows through the primary conveyance systems of lakes, canals, and channelized river controlled by the gate operations at the controlling structures. The designed methodology is demonstrated for the Kissimmee River basin in Florida for the year 1970 by considering 21 canals, 14 lakes, and 14 controlling structures. The outcome of the model relates to simulated lake stags, water levels at tailwater and headwater sides of the controlling structures and simulated discharges through controlling structures every 3 hours for the full year of 1970. The comparison of simulated values with the corresponding historical data indicates clearly the 'working' of all the individual pieces of the operational water quantity model, although a few critical links are currently being refined to obtain better simulated lake stages. (See also W77-09154) (Bell-Cornell)
W77-09204

THE COST OF WATER SUPPLY UTILITY MANAGEMENT,
Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
For primary bibliographic entry see Field 6B.
W77-09209

DEVELOPMENT OF THE SPRING CREEK DATA ACQUISITION SYSTEM,
Montana State Univ., Bozeman. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7A.
W77-09258

PREDICTING CHANGES IN LAND-USE PATTERNS RESULTING FROM WATER RESOURCE INVESTMENT USING A NON STATIONARY MARKOV PROCESS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-09268

LAND MANAGEMENT IN THE LAKE ONTARIO BASIN,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 6B.
W77-09275

MEASURES FOR REDUCING RETURN FLOWS FROM THE WELLTON-MOHAWK IRRIGATION AND DRAINAGE DISTRICT, ANNUAL REPORT FOR FY 1976.
Bureau of Reclamation, Washington, D.C. Wellton-Mohawk Irrigation and Drainage District.
Prepared by the Technical Field Committee, October 1976. 87 p, 3 fig, 5 tab, 2 append.

Descriptors: *Return flow, Drainage districts, Irrigation districts, Irrigation efficiency, Irrigable land, Irrigation programs, Irrigation engineering, Project planning, Southwest U. S., Distribution systems, Drainage engineering, Salinity, Desalination plants, Management, Projections
Identifiers: Wellton-Mohawk Irrigation and Drainage District.

The Special Report, September 1974, Measures for Reducing Return Flows from the Wellton-Mohawk Irrigation and Drainage District described a program to improve irrigation efficiencies in the Wellton-Mohawk Irrigation and Drainage District. By reducing the volume of the return flows from the District, the size of the desalting plant authorized under Public Law 93-320 can also be reduced. The objective is to reduce return flows from the original level of about 215,000 acre-feet per year to the program level 3 of about 136,000 acre-feet per year. This report describes the progress for fiscal year 1976; the first annual report covering activities for fiscal year 1975 was published in October 1975. The program involves reduction of the irrigable acreage in the District from 75,000 to 65,000 acres and structural and management improvements on the farms in the District. Onfarm irrigation efficiencies are to be improved from the present level of about 56 percent to 64 percent with an ultimately practicable goal of 72 percent. The program includes technical assistance to farmers, research and demonstration of advance agronomic practices, and an intensive education and information effort to advance community acceptance of the program. (Bur Reclam)
W77-09276

WATER RESOURCE AND LAND USE PROBLEMS IN WESTERN AUSTRALIA,
Perth Public Works Dept. (Australia). Planning Design and Investigation Branch.
For primary bibliographic entry see Field 4C.
W77-09296

THE CENTRAL ARIZONA PROJECT: AN INQUIRY INTO ITS POTENTIAL IMPACTS,
Arizona Univ., Tucson. Coll. of Business and Public Administration.
For primary bibliographic entry see Field 6B.
W77-09298

INSTITUTIONAL CONSTRAINTS ON WATER RESOURCE DEVELOPMENT IN ARID LANDS,
For primary bibliographic entry see Field 6E.
W77-09316

PREDICTING STORMFLOW AND PEAKFLOW FROM SMALL BASINS IN HUMID AREAS BY THE R-INDEX METHOD,
Georgia Univ., Athens, School of Forest Resources.
J. D. Hewlett, G. B. Cunningham, and C. A. Troendle.
Water Resources Bulletin, Vol. 13, No. 2, p 231-253, April 1977. 8 fig, 6 tab, 18 ref.

Descriptors: *Forecasting, *Storm runoff, *Peak discharge, *Forest watersheds, Humid areas, Model studies, Mathematical models, Equations, Watersheds(Basins), Precipitation(Atmospheric), Rainfall-runoff relationships, Forests, Discharge(Water), Storms, Rainfall, Runoff, Surface waters, Hydrology, Methodology.
Identifiers: *Eastern U.S., *R-index method.

The R-index method was proposed as a practica tool in forest and wildland management. Similar t the SCS runoff curve number method, the R-inde method requires no prior assumptions about infil tration capacities of forest lands, but the metho calls for the mapping of all first-order streams fo the average storage capacity index R, i.e., th mean hydrologic response of the source area Tested against the runoff curve method on four in dependent basins, predictions by the R-inde method were considerably more accurate whe field information normally available to planner and managers was used in both methods. (Sims ISWS)
W77-09334

ON THE FLUCTUATIONS IN LEVELS O CLOSED LAKES,
Commonwealth Scientific and Indu
For primary bibliographic entry see Field 2H.
W77-09338

BAYESIAN GENERATION OF SYNTHETI STREAMFLOWS, 2. THE MULTIVARIAT CASE,
Simon Bolivar Univ., Caracas (Venezuela).
For primary bibliographic entry see Field 2E.
W77-09349

THE USE OF THE PEARSON TYPE 3 AND LO PEARSON TYPE 3 DISTRIBUTION REVISITED,
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 2E.
W77-09352

FLOOD PLAIN INFORMATION: RIO SA JOSE, PUEBLO OF ACOMA, NEW MEXICO.
Army Engineer District, Albuquerque, N.M.
Prepared by Ken O'Brien and Associates for t Army Corps of Engineers and the Pueblo Acoma Council, June, 1975. 30 p, 1 fig, 25 plates, tab.

Descriptors: *Floods, *Flood hazard, *Flo damage, *Flood peak, *Flood plains, *Flo profiles, Flood flow, Flow characteristics, *Ne Mexico, Flood plain zoning, Flood forecastin Flood frequency, Flood proofing, Non-structu alternatives.
Identifiers: Intermediate Regional Flood, *Rio S Jose(NM), Rinconada Creek(NM), Lar Creek(NM), McCartys(NM), *Acoma Indi Reservation(NM).

Flood hazard areas adjoining the Rio San Jos Rinconada Creek and Largo Creek, within t Acoma Indian Reservation located in New Me ico, are analyzed. The study area extends 1

iles along the Rio San Jose between the east
undary of the reservation and McCartys. Mea-
red from the confluence with Rio San Jose, 2.16
les of Rinconada Creek and 1.05 miles of Largo
eek are studied. Drainage areas of Rio San Jose
Rinconada Creek is 949 square miles, Rin-
nada Creek at Rio San Jose, 34 sq. mi., Rio San
se at Largo Creek, 915 sq. mi., and Largo Creek
Rio San Jose, 74 sq. mi. Runoff for most
eams in the study area is intermittent; it is
used by general summer storms and thun-
rstorms. There is little development in the flood
in. Stream gaging stations on the Rio San Jose
ve been maintained intermittently since 1914. In
ent years flooding has occurred in 1965, 1972
d 1973. The channels of all three streams are
ll defined. Obstructions to flow include brush,
mes, bridges, culverts and pipeline crossings.
river mile 51.48 the Standard Project Flood
uld flow at 51,600 cubic feet per second (cfs),
e 7.6 feet at 0.9 feet per hour and last 38 hours.
e Intermediate Regional Flood would peak at
,900 cfs, rise 3.0 feet at 0.7 feet per hour and last
hours. Velocities in main channel and overbank
uld reach 4.5 and 2.7 feet per second for the
F, and 4.2 and 1.1 for the IRF. Guidelines for
od plain management are presented, including
ning, building codes, floodproofing measures,
alth regulations, governmental development
licies, and flood forecasting. The report does
t present specific plans or recommendations.
entry-NC)
77-09363

**OOD PLAIN INFORMATION: BIG AND LIT-
E FOSSIL CREEKS, FORT WORTH, TEXAS.**
my Engineer District, Fort Worth, Tex.
epared for the City of Fort Worth, Texas, May
4. 46 p, 6 tab, 23 plates, 10 fig, 1 exhibit.

scriptors: *Texas, *Maximum probable flood,
lood data, *Non-structural alternatives, Floods,
oding, Flood flow, Flood forecasting, Historic
ods, Flood frequency, Flood stages, Peak
charge, Flood plains, Flood protection, Flood
in zoning, Flood plain insurance, Building
les, Land use, Planning, Zoning, Standard Pro-
t Flood.
ntifiers: *Big Fossil Creek(TX), *Little Fossil
eek(TX), Fort Worth(TX), Tarrant County(TX),
ermediate Regional Flood.

e Big Fossil Creek watershed is located in north
ntral Tarrant County in north central Texas. The
ncipal city in the watershed is Fort Worth.
ny residential and commercial developments
on or adjacent to the flood plain. Flood data
re obtained from two stream gages maintained
the U.S. Geological Survey (USGS) since
uary 1959, a third USGS gage maintained since
8, newspaper records, the Texas Highway De-
tment, City Engineering Departments, and
d investigations. The main flood season is
ng and fall and results from prolonged or suc-
sive storms producing heavy rainfall. The
atest recorded flood flow on Big Fossil Creek
urred on September 7, 1962, discharging 27,000
ic feet per second (cfs) and cresting at 516.38
mean sea level datum (MSL). The Inter-
diate Regional Flood is expected to discharge
00 cfs on Big Fossil Creek, while the Standard
ject Flood is expected to discharge 56,400 cfs.
y-two of the 68 bridges in the watershed will
tribute to the flood problem since they would
vertopped by the SPF. Although intended for
rmational purposes, this report recommends
describes non-structural flood control mea-
s, including zoning, subdivision controls,
ding codes, health codes, fee purchase of lands
pen space, acquisition of flooding easements,
flood insurance. (Nessa-NC)
7-09364

**OD PLAIN INFORMATION: WARD CREEK
TRIBUTARIES, BATON ROUGE, LOUI-
NA, NO. 2.**
y Engineer District, New Orleans, La.

Prepared for the City of Baton Rouge, October 1972. 32 p, 20 fig, 48 plates, 6 tab.

Descriptors: *Louisiana, *Floods, *Flood forecasting, *Peak discharge, Flow characteristics, *Flood plains, Flood flow, Streamflow forecasting, Hurricanes, Historic floods, Flood data, Flood frequency, Flow duration, Channels, Flood protection, Channel improvement, Standard Project Flood.
Identifiers: *Ward Creek(LA), Dawson Creek(LA), Bayou Duplanier(LA), North Branch Ward Creek(LA), Baton Rouge(LA), Intermediate Regional Flood.

Ward Creek, draining 44.7 square miles, is a tributary of Bayou Manchac. The flood plain is narrow within the city of Baton Rouge but broadens quickly downstream. The tributaries of Ward Creek included in the study are Dawson Creek, Bayou Duplanier and North Branch Ward Creek, which drain 16.3, 7.7 and 7.8 square miles, respectively, areas which lie mostly within Baton Rouge. The flood plains are largely undeveloped, containing a few concentrations of single-family dwellings. The U.S. Geological Survey gage records on Ward Creek are available from 1954. The main flood season is winter and spring. Vegetation, bridges, culverts and buildings obstruct flood flow. The only existing flood reduction measures are channel improvements, which have effectively reduced flood stages since 1954. The highest flood on record on Ward Creek occurred in May 1953, cresting at 24.7 feet mean sea level (MSL), with a peak discharge of 3,840 cubic feet per second (cfs). The flow at the mouth of Ward Creek for an Intermediate Regional Flood and Standard Project Flood is 13,500 and 17,800 cfs, respectively. Channel velocities for both floods along Ward Creek would be 3 to 6 ft/sec (4 to 10 ft/sec in the concrete lined portion). Backwater from Bayou Manchac may cause a second flood peak along Ward Creek: the first 6 to 12 hours after bankfull, and then another after 18 to 30 hours. Peak stages for the tributaries should occur 3 to 11 hours after bankfull. (Gentry-NC)
W77-09365

FLOOD PLAIN INFORMATION: VERMILION RIVER AND TRIBUTARIES, LAFAYETTE, LOUISIANA.
Army Engineer District, New Orleans, La.
Prepared for City of Lafayette, LA., September 1973, 67 p, 44 fig, 43 plates, 10 tab.

Descriptors: *Floods, *Peak discharge, *Flood plains, Streamflow forecasting, Flood forecasting, Hurricanes, Historic floods, Flood data, Flood frequency, Flow duration, Flow characteristics, Flood damage, Channels, Standard Project Flood, Flood protection, Channel improvement, Flood flow, *Louisiana.
Identifiers: *Vermilion River(LA), Lafayette(LA), Intermediate Regional Flood.

The upper reaches of the Vermilion River, around Lafayette(LA), located in Lafayette Parish in southwest Louisiana, are studied. Most development in Lafayette, a town of 71,500 people, is situated on high ridges above the flood plain, but the flood plain includes extensive residential, commercial and industrial development. The U.S. Geological Survey and the Corps of Engineers have maintained gages and flood records on the Vermilion River. Floods occur usually in winter and spring, but may be caused by severe thunderstorms and hurricanes which occur from June to October. The greatest known flood occurred in August 1940 and approximated the Standard Project Flood; it occurred as a consequence of a tropical hurricane. The most recent significant flood occurred in December 1971. The 1940 flood crested at 22.02 feet mean sea level (MSL) at the Pinhook-Surrey Bridges gaging station, while the 1971 flood crested at 11.71 feet MSL. Obstructions to floodflow include vegetation, bridges, and highway and railroad embankments. Channel improvements were made between 1944 and 1957. Peak flows at the Pinhook Bridge for the Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) are 5,800 cubic feet per second (cfs) and 12,700 cfs, respectively. During an IRF flow velocities range from 1.2 to 8.5 feet per second in the main channel, 0.3 to 2.0 ft/sec overbank. Floods rise slowly and stay out of banks for long periods of time. (Gentry-NC)
W77-09366

FLOOD PLAIN INFORMATION, LITTLE RIVER, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, Va.
Prepared for Hanover County, VA, May 1976. 24 p, 6 tab, 5 fig, 22 plates.

Descriptors: *Floods, Flood data, *Flood control, *Historic floods, *Maximum probable floods, *Virginia, Flood peak, Flood protection, Flood plains, Flood flows, Flood damage.
Identifiers: *Little River(VA), Hanover County(VA), Louisa County(VA), 100-year flood, 500-year flood.

The study area includes approximately 29 miles of the Little River in Hanover County and Louisa County, VA. The flood plain consists mostly of wooded areas and open space, but the rapid development taking place in the watershed could soon impinge upon the flood plain. Flood data dating back to 1961 were obtained from a Virginia State Water Control Board stream gage near Doswell, U.S. Geological Survey 1:24,000 scale topographic sheets, and precipitation records. Supplementary data were obtained from newspaper files and historical documents. Floods occur at any time of year and are caused by intense short term rainfall or tropical disturbances. The worst flood of record occurred on August 21, 1969, cresting at 143.39 feet mean sea level (MSL), which is 6 feet above flood stage, and discharging 12,000 cubic feet/sec (cfs) at the Doswell gage. Flood damage exceeded $250,000. The 500-year flood is expected to crest at 144.3 feet MSL and discharge 17,800 cfs at the mouth of the Little River; the 100-year flood will crest at 143.1 feet MSL and discharge 10,900 cfs. Some existing residential property would be damaged by these floods. There are no existing or planned flood control structures that affect the 100- or 500-year flood. The Statewide building code requires protection of buildings from the 100-year flood. The report does not provide solutions to flood problems, but provides a basis for adoption of land use controls to guide land development in the future. (Nessa-NC)
W77-09367

FLOOD PLAIN INFORMATION, STONY RUN CREEK, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, Va.
Prepared for Hanover County, VA, September 1976. 22 p, 6 tab, 10 plates, 5 fig.

Descriptors: *Floods, *Flood data, *Flood control, *Maximum probable flood, *Historic floods, *Virginia, Flood peak, Flood protection, Flood damage, Flood plains.
Identifiers: *Stony Run Creek(VA), Topotomoy Creek(VA), Hanover County(VA), 100-year flood, 500-year flood.

The study area includes approximately 14 miles of Stony Run Creek in Hanover County, VA. The watershed is 17.6 sq mi in area. The flood plain consists mostly of wooded areas and open space, but the rapid development taking place in the watershed could soon impinge upon the floodplain. Since there are no stream gages on Stony Run Creek, data from the gaging station on Topotomoy Creek in an adjacent watershed were used as a surrogate. These data are considered indicative of the flood occurrences on Stony Run Creek. They date back to 1945. Supplementary data on Stony Run Creek floods were obtained

from U.S. Geological Survey 1:24,000 scale topographic maps, precipitation records, newspaper files, and historical documents. The worst flood on Topotomoy Creek occurred on August 13, 1955, cresting at 124.95 feet mean sea level and discharging 748 cubic feet/sec (cfs). At the mouth of Stony Run Creek, the 500-year is expected to discharge 12,000 cfs and crest at approximately 27.5 feet MSL. The 100-year flood should discharge 7,300 cfs and crest at approximately 122.0 feet MSL. There are no existing or planned flood control structures that affect the 100- or 500-year flood. The statewide building code requires protection of buildings that would be affected by the 100-year flood. The report does not provide solutions to flood problems; but provides a basis for adoption of land use controls to guide future flood plain development. (Nessa-NC)
W77-09368

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER AND LILLIBRIDGE CREEK, BOROUGH OF PORT ALLEGANY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, Pa.
Prepared for the Borough of Port Allegany and the Pennsylvania Department of Environmental Resources, December 1973. 45 p, 30 fig, 7 plates, 8 tab.

Descriptors: *Pennsylvania, *Floods, *Peak discharge, Flow characteristics, *Flood plains, Flood flow, Streamflow forecasting, Flood forecasting, Historic floods, Flood data, Flood frequency, Flow duration, Flood damage, Channels, Flood plain insurance, Control structures, Dams, Standard Project Flood.
Identifiers: Port Allegheny(PA), *Allegheny River(PA), Lillibridge Creek(PA), Intermediate Regional Flood.

The flood problems of the Borough of Port Allegany (PA) at the confluence of Lillibridge Creek and the Allegheny River are reviewed. The valley floor of the Allegheny River at Port Allegany is approximately 0.5 miles wide, with a bedslope of approximately three feet per mile. Developments in the Allegheny River flood plain include light industrial, commercial and residential structures, and notably the tracks of the Penn Central Railroad, the municipal sewage disposal plant and the Pierce Glass Company manufacturing plant. The Lillibridge Creek flood plain is largely undeveloped. The main flood season is November through April. Obstructions to flood flow include vegetation, dams, bridges and culverts. Earth dikes along the right bank of both river and creek, and participation in the National Flood Insurance Program are the current flood damage reduction measures. U.S. Geological Survey and National Weather Service gage records were used to obtain data. The highest recent flood occurred in June 1972, crested at 19.65 feet, discharging 22,000 cubic feet per second (cfs). The Intermediate Regional Flood (IRF) for the river and creek has a peak discharge of 28,000 cfs and 2,200 cfs respectively; for the Standard Project Flood (SPF) peak discharge is 42,000 cfs and 3,700 cfs respectively. The Allegheny River, for an IRF and SPF, will achieve channel velocities of 9 and 10 ft/sec, and overbank velocities of 3 ft/sec for both floods. Channel velocities of an IRF and SPF on Lillibridge Creek will be 13 and 15 ft/sec respectively, 3 and 4 ft/sec overbank. (Gentry-NC)
W77-09369

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, FOREST COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, Pa.
Prepared for Forest County Planning Commission and the Pennsylvania Department of Environmental Resources, December 1974. 26 p, 10 fig, 10 plates, 6 tab.

Descriptors: *Pennsylvania, *Floods, *Peak discharge, Flow characteristics, *Flood plains, *Standard Project Flood, Streamflow forecasting, Flood forecasting, Historic floods, Flood frequency, Flood damage, Flood protection, Flood stages.
Identifiers: Intermediate Regional Flood, *Allegheny River, Tionesta(PA), Forest County(PA), Tionesta Lake(PA), Tionesta Dam(PA), Kinzua Dam(PA).

The study reach is 14.1 miles of the Allegheny River lying within Forest County (PA). The average bed slope within the study reach is 3.3 feet per mile, with valley floor widths ranging from 0.1 to 0.5 mile. Development in the flood plain consists largely of recreation facilities, and private and public forest and park lands. The main flood season is December through April. U.S. Geological Survey and U.S. Weather Bureau station records from stream gaging stations were used to obtain data for flood elevations. Additional information was obtained from newspaper files and historical documents and records. Tionesta and Kinzua Dams are the principal flood damage reduction measures. Obstructions to flood flow include vegetation, dams, bridges, culverts and ice jams. The greatest recorded flood occurred on March 8, 1956, cresting at 17.2 feet at the West Hickory gage and discharging 101,000 cubic feet per second (cfs). Peak discharge for an Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) is 58,800 cfs and 73,000 cfs, respectively. Channel velocities for an IRF and SPF are 11 and 12 ft/sec respectively, and 3 ft/sec overbank velocity for both floods. Times of rise are 13.0 hours for IRF, 14.5 hours for the SPF. (Gentry-NC)
W77-09370

WEST FORK DES MOINES RIVER AND PERKINS CREEK FLOOD PLAIN INFORMATION, WINDOM, MINNESOTA.
Army Engineer District, Rock Island, Ill.
Prepared for the State of Minnesota Conservation Department, June 1972. 62 p, 11 tab, 42 fig, 14 plates.

Descriptors: *Flood control, *Flood plain zoning, *Non-structural alternatives, *Building codes, *Minnesota, Flood peak, Historic flood, Flood data, Flood plain, Standard Project Flood.
Identifiers: Windom(MN), Cottonwood County(MN), *West Fork Des Moines River(MN), *Perkins Creek(MN), Intermediate Regional Flood.

The study area includes 7 miles of the West Fork Des Moines River and 2.5 miles of the Perkins Creek flood plains in Windom, Cottonwood County, Southwest Minnesota. The drainage area at Windom is 1,110 square miles. Some residential and commercial establishments rest on or are adjacent to the flood plain. The highest record flood (in 1969) caused $175,000 in damages and evacuation of 128 families. Continuous flow records are not available. Precipitation and runoff data were collected after major floods in 1965 and 1969. Newspaper files and historical documents yielded information on past floods. Major floods occur from April through July and are caused by the spring melt, storms, or both. Six bridges and one dam cross the Des Moines, while Perkins has 5 road crossings. Natural obstructions include trees and vegetation. Minnesota law fixes mandatory minimum standards for flood plain management. The worst flood occurred on April 10-11, 1969, cresting at 7.54 feet. The gaged velocity was 15,700 cubic feet/second. The Intermediate Regional Flood (IRF) would be 1.6 feet higher and the Standard Project Flood (SPF) would be 5.6 feet higher. More extensive damage is expected from an IRF or SPF due to wider extent, greater depths, and higher flow velocities. Health problems could develop due to flooded septic tanks. A levee is planned along the north bank of the Des Moines, but non-structural remedies such as building codes, zoning and subdivision control are the principal controls relied upon. (Nessa-NC)
W77-09371

FLOOD PLAIN INFORMATION: LITTLE DRY FORK, LOVE BRANCH, BURGHER BRANCH CITY OF ROLLA, MISSOURI.
Army Engineer District, St. Louis, Mo.
Prepared for City of Rolla, MO., August, 1974. 2 p, 10 fig, 16 plates, 2 tab.

Descriptors: *Missouri, *Floods, *Maximu probable flood, *Flood data, *Flood peak, Floo flow, Streamflow forecasting, Flood forecastin Flood profiles, Historic floods, Flood frequenc Flow duration, Flow characteristics, Flood plain Flooding, Standard Project Flood, Land us Planning.
Identifiers: Little Dry Fork(MO), Lov Branch(MO), Burgher Branch(MO), Rolla(MO Intermediate Regional Flood.

The study area includes the Little Dry Fork, Lov Branch, and Burgher Branch in the vicinity Rolla, Missouri. The flood plain in the lower ha of the watershed is agricultural. Residential, com mercial, and industrial developments lie on or a jacent to the remaining flood plain areas. Floo data were obtained from rainfall records, U. Geological Survey (USGS) topographic map historical documents, newspaper files, and ga records from similar creeks in the area. Floo usually occur from May to September but they w occur at all times of the year. Floods are caused b high intensity, short duration rainfalls. Flo flows have high peaks, short duration, and lo volumes. Damaging floods have occurred reg larly in the past, but documentation of the ma nitudes and flood stages do not exist. At the mou of the Little Dry Fork, Love Branch and Burgh Branch, peak Standard Project Flood flows are e pected to be 27,400, 17,500 and 7,400 cubic fe per second (cfs), respectively. In the same orde peak Intermediate Flood flows will be 14,40 10,900, and 5,100 cfs, respectively. Although n intended to provide solutions to flood problem this report does provide the information necessa for the development of land use controls to gui flood plain development. (Nessa-NC)
W77-09372

FLOOD PLAIN INFORMATION: ST. CHARL COUNTY, MISSOURI, PART 3, CUIVRE RIVE AND TRIBUTARIES.
Army Engineer District, St. Louis, Mo.
Prepared for County of St. Charles, Missouri, Se tember 1973, 30 p, 15 fig, 25 plates, 4 tab.

Descriptors: *Missouri, *Floods, *Maxim probable flood, *Flood data, *Flood peak, Flo flow, Streamflow forecasting, Flood forecastin Flood profiles, Historic floods, Flood frequenc Peak discharge, Flow duration, Flow chara teristics, Flood plains, Land use, Planning, St dard Project Flood.
Identifiers: *Cuivre River(MO), Indian Ca Creek(MO), Big Creek(MO), McCoy Creek(MO St. Charles County(MO), Old Monroe(MO), Int mediate Regional Flood.

The study area involves 75 square miles of Cuivre River watershed, including Big Creek, dian Camp Creek and McCoy Creek, and the C of Old Monroe. The entire City of Old Monroe c be surrounded by flood water, and numerous oth developments exist in the flood plain. Flood d were obtained from precipitation record newspaper files, field reconnaisance, and U Geological Survey (USGS) topographic ma Floods occur at any time of year. Backwa flooding from the Mississippi River can extend t duration of a flood. The worst flood of record curred in October, 1969. On that date, the Cuiv Big Creek, McCoy Creek and Indian Camp Cre crested at 451.0, 458.9, 475.4, and 478.3 fe respectively. These crests compare with predict Intermediate Regional Flood crests of 453.7, 460 476.2 and 481.6 feet, respectively, and Standa Project Flood crests of 457.1, 463.4, 477.6, a 482.9 feet, respectively. Eight of the ten bridges the area will obstruct IRF flows. Although not

ded to provide solutions to flood problems, this ort does provide the information necessary for development of land use controls to guide od plain development. (Nessa-NC)
7-09373

OOD PLAIN INFORMATION: STE. NEVIEVE, MISSOURI: MISSISSIPPI RIVER, RTH AND SOUTH GABOURI CREEKS.
ny Engineer District, St. Louis, Mo.
pared for City of Ste. Genevieve, MO., Sep- ber 1974. 34 p, 15 fig, 22 plates, 5 tab.

scriptors: *Missouri, *Mississippi River, aximum probable flood, *Flood data, Floods, od flow, Streamflow forecasting, Flood ecasting, Flood profiles, Historic floods, Flood quency, Flood peak, Flood plains, Standard ject Flood.
ntifiers: *North Gabouri Creek(MO), *South bouri Creek(MO), Ste. Genevieve(MO), Inter- diate Regional Flood.

study area includes 3.41 miles of North bouri Creek and 3.41 miles of South Gabouri ek, the Mississippi River flood plain, and the of Ste. Genevieve. Commercial and re- ential developments lie on all three flood plains. od data were obtained from precipitation ords, U.S. Geological Survey (USGS) quadran- maps, gage records from similar creeks in the a, field observations and newspaper accounts. ods on the creeks can occur at any time of year are caused by heavy local rains, Mississippi er backwater, or both. Flooding along the Mis- ippi occurs in the spring and early summer en widespread rains can be augmented with ting snow. The worst floods on the two creeks urred on April 27, 1957, while the worst Missis- pi River flood occurred on April 28, 1973. On se occasions, North and South Gabouri Creeks sted at 393.0 and 394.5 feet, mean sea level im (MSL), while the Mississippi crested at 5 feet MSL. These values compare to Stan- d Project Flood elevations of 401.5, 399.4 and 0 ft MSL on the North and South Gabouri eks, and the Mississippi, respectively; and In- mediate Regional Flood crests of 397.0, 396.0 396.0 MSL on the North and South Gabouri eks, and Mississippi River, respectively. ssa-NC)
7-09374

OOD PLAIN INFORMATION, ADAMS EEK AND TRIBUTARIES, TULSA AND GONER COUNTIES, OK.
ny Engineer District, Tulsa, Okla.
pared for the City of Broken Arrow, OK, ember 1976. 28 p, 5 tab, 4 fig, 18 plates.

criptors: *Floods, *Flood data, *Flood con- *Non-structural alternatives, *Flood plain ng, Building codes, Flood peak, Maximum pable flood, Flood plains, *Oklahoma.
ntifiers: *Adams Creek(OK), Broken ow(OK), Tulsa County(OK), Wagoner Coun- OK), 100-year flood, 500-year flood, Develop- t policies, Stream crossing design.

study area includes about 10 miles of Adams ek and 11.4 miles of selected tributaries in the nity of the city of Broken Arrow in Tulsa and goner Counties, OK. Some residential proper- exist on the flood plain and rapid development atens further flood plain encroachment. ods occurred in the study area in 1943, 1970, , and 1976. Flood data were obtained from spaper files, historical documents, and ipitation records. High water marks of the l 1970, June 1974, and May 1976 floods were used. No stream gaging records are available. main flood season occurs in the spring and mer months, and results from local intense derstorms. The most severe flood was uced by the storm of April 1970. High water ks for the May 30, 1976 flood are shown on the flood profiles in this report, along with the 10-, 50-, 100-, and 500-year frequency floods. The 1976 flood crested approximately at the level of the 10-year frequency flood. The 500-year frequency flood is expected to crest 4.3 feet above low bank on Adams Creek and discharge 12,300 cubic feet/sec (cfs). The 100-year frequency flood should crest 3.7 above low bank and discharge 9,600 cfs. Twelve of the fifteen bridges in the study area will exacerbate the flood problem since they will be overtopped by the 100-year flood. Although intended for informational purposes, this report describes and recommends non-structural flood control measures, including building codes, health regulations, development policies, flood plain regulations, and appropriate design of future stream crossings. (Nessa-NC)
W77-09375

FLOOD PLAIN INFORMATION: HOLLIDAY AND MCGRATH CREEKS, WICHITA FALLS, TEXAS.
Army Engineer District, Tulsa, Okla.
Prepared for City of Wichita Falls, May 1976, 33 p, 7 fig, 10 plates, 5 tab.

Descriptors: *Texas, *Floods, Flood flow, *Flood forecasting, *Flood profiles, *Peak discharge, *Flow duration, Flow characteristics, *Flood plains, River flow, Historic floods, Flood data, Flood frequency, Flood stages, Standard Project Flood, Flood protection, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Building codes, Land use, Zoning, Dams, Reservoirs.
Identifiers: Wichita Falls(TX), *Holliday Creek(TX), *McGrath Creek(TX), Lake Wichita(TX), Intermediate Regional Flood.

The study reach comprises 11.4 miles of Holliday Creek and 2.0 miles of McGrath Creek, including their drainage area of 170 square miles, located in and around Wichita Falls, Texas. Most floods are the result of thunderstorms and frontal movements, occurring most frequently from May through October. Lake Wichita is located on mile 9.6 of Holliday Creek but is used primarily for water supply purposes. There is urban, commercial and industrial development along most of Holliday Creek below Lake Wichita. The city does not have zoning ordinances but can regulate development through the issuance of building permits and approving subdivisions. There are no stream gaging stations in the study area. Data were obtained from U.S. Geological Survey measurement for the 1950 flood and from other available sources. Flood data are limited. Major floods are known to have occurred in 1915, 1941, 1950 and 1975. At river mile 2.72 peak discharge for an Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) is 11,700 cubic feet per second (cfs) and 28,000 cfs, respectively. Floods will rise at a rate of 2.8 and 1.9 feet per hour, reaching a height of 5.3 and 10.5 feet above bankful for the IRF and SPF, respectively. For the IRF and SPF channel velocity would be 5.4 and 3.4 feet per second, 0.7 and 1.1 ft/sec in the overbank areas. Guidelines are presented for flood plain management, with non-structural alternatives such as zoning and subdivision regulations discussed. (Gentry-NC)
W77-09376

WATER TABLE LOWERING BETWEEN TWO DRAINAGE DITCHES IN NATURALLY LAYERED SOILS ON A SLOPE, (IN GERMAN),
C. Schuster.
Eidg Anst Forstl Versuchswes Mitt 50(1), 84 p, 1974.

Descriptors: *Water table, *Drainage, Soils, *Slopes, Soil stability, Slope stability, *Clays, Simulation analysis.

Observations of water table lowering in naturally layered soils are compared with the results of a simulation for non-stationary conditions (Luthin and Richard, 1965). Stationary design formulas are compared with the drainage effect in the field. The study site consisted of 2 parallel contour ditches, 270 cm apart, which drained a soil, rich in clay, to an impervious layer at 65 cm depth.--Copyright 1976, Biological Abstracts, Inc.
W77-09448

ECONOMIC INCENTIVES FOR LAND USE CONTROL,
CONSAD Research Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 6B.
W77-09467

FLOODPLAIN ZONING--AN ALTERNATIVE APPROACH TO LAND REGULATION IN FLOOD HAZARD AREAS: A CASE STUDY, KALAMAZOO, MICHIGAN,
For primary bibliographic entry see Field 6F.
W77-09532

LAND USE CONTROL IN THE COASTAL ZONE: THE DELAWARE EXAMPLE,
Natural Resources Law Inst. Portland, Oreg.
For primary bibliographic entry see Field 6F.
W77-09533

REGULATING DEVELOPMENT ALONG THE CALIFORNIA COAST,
California Univ., Davis. Environmental Studies Program.
P. Sabatier.
Journal of Soil and Water Conservation, Vol 3, No 4, p 146-51 July/August 1976. 2 photo, 1 tab, 22 ref.

Descriptors: *Coastal engineering, *Land use, *Regional development, *Conservation, *California, Legislation, Planning, State governments, Beaches, Beach erosion, Land management, Land development, Landscaping, Coasts, Shore protection.

In 1972 the voters of California passed an initiative that called for the establishment of a state coastal commission and six regional commissions. They will be in existence only until the 1976 legislature passes a comprehensive coastal plan; however, they already have had a great impact on California coastal development. As would be expected, developers and conservationists lined up on opposite sides of the fence concerning the proposed regulation of the coastline. In California, though, the developers suffered one defeat after another. The regional commissions bore down hard on all planned development. Among the factors that were examined were: cumulative impacts on land use; consistency with existing development; preservation of open space (both in terms of access and viewing); and transportation. Appeals were taken to the state commission, but they were approved only rarely over the regional boards' objections. Furthermore, the appellate courts have repeatedly upheld these original rulings, giving greater priority to conservation than to development. (Frank-Florida)
W77-09534

THE LEGAL IMPLEMENTATION OF COASTAL ZONE MANAGEMENT: THE NORTH CAROLINA MODEL,
North Carolina Univ. at Chapel Hill. School of Law.
For primary bibliographic entry see Field 6E.
W77-09547

ARTIFICIAL WATER REGULATION OF LAKE SUPERIOR--A TAKING,
Washington Coll. of Law D. C.
For primary bibliographic entry see Field 6E.
W77-09551

A SCREENING MODEL FOR FLOOD CONTROL PLANNING,
California Univ., Los Angeles.
A. R. Mokashi.
PhD Thesis, 1976. 123 p.

Descriptors: *Model studies, *Mathematical models, *Reservoirs, *Flood control, Flood protection, Flood data, Planning, River regulation, Reservoir design, Reservoir sites.
Identifiers: Screening model.

In order to reduce damages, a screening model was developed to aid determination of the number, location, and size of reservoirs at sites of potential flooding. Plans are judged by this model and then subjected to detailed simulation analysis for final selection. The model is a mathematical programming optimization model. The deterministic model uses the most severe historical floods as hydrologic input. Capacities of potential reservoirs are chosen by balancing annual damage against annual average costs of reservoir storage to prevent damage. For large basins, the system is divided into subsystems which are separately subjected to modeling. Design parameters employed by the screening model serve as input data for detailed simulation analysis. The chosen system must produce the maximum reduction in average annual damage. (Collins-FIRL)
W77-09595

4B. Groundwater Management

GROUNDWATER RESOURCES OF AUSTRALIA.
Australian Water Resources Council, Canberra.
Australian Government Printing Office, Canberra, 1975. 151 p, 30 fig, 11 plate, 27 tab, 3 append.

Descriptors: *Australia, *Groundwater resources, *Water resources development, Water utilization, Saline water, Bibliographies, Foreign countries, Foreign research, Maps, History, Groundwater, Aquifers, Hydrological aspects, Water quality, Groundwater basins, Aquifer systems, Data collections, Water supply, Unconsolidated aquifers, Groundwater availability, Geology, Climates.
Identifiers: Groundwater quality.

In 1965 the first substantial assessment of Australia's groundwater resources was published by the Australian Water Resources Council. The present publication updated and expanded the information published in 1965. Included in the new publication were four reference maps, extensive notes, and a bibliography. Appendix I contained a list of government authorities from whom more detailed information may be obtained. A glossary of important groundwater terms was provided in Appendix II, and a table of metric conversions appeared in Appendix III. (Froehlich-ISWS)
W77-09103

THE AGE OF GROUNDWATER IN THE LINCOLNSHIRE LIMESTONE, ENGLAND AND ITS RELEVANCE TO THE FLOW MECHANISM,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W77-09107

RECHARGE TO BUNTER SANDSTONE DETERMINED FROM LYSIMETERS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 2F.
W77-09108

VALIDATION OF AN AXISYMMETRIC PSEUDO-UNCONFINED TIME-VARIANT DIGITAL MODEL,
Birmingham Univ. (England). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2F.
W77-09112

NON-PENETRATING WELL IN A SEMI-INFINITE MEDIUM WITH NON-LINEAR FLOW,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-09114

PROFILE DESATURATION DURING SEDIMENT DEPOSITION IN A GROUNDWATER RECHARGE TRENCH,
Mississippi Agricultural and Forestry Experiment Station, Mississippi State. Dept. of Agronomy.
K. K. Watson, and F. D. Whisler.
Journal of Hydrology, Vol 33, No 3/4, p 397-401, 1977. 1 fig, 7 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Model studies, Mathematical models, Pit recharge, Sediments, Sedimentation, Seepage, Aquifers, Sands, Infiltration, Hydraulic conductivity, Soil water movement, Groundwater movement, Porous media, Groundwater.
Identifiers: *Recharge trenches.

When off-line recharge trenches are used for the artificial recharge of unconfined aquifers, the intake rate often decreases due to the deposition of a sediment layer on the surface of the recharge profile. The buildup of the impeding layer causes progressive hydraulic changes in the profile. The significance of the changes in relation to the intake rate depends on whether air is able to enter the pores of the saturated porous material beneath the trench when the air entry value of the material is exceeded. Flow rates were calculated for recharge through a profile of no. 17 sand for conditions of 'no air access' and 'adequate air access'. (Sims-ISWS)
W77-09115

DECLINING POTENTIOMETRIC LEVELS IN FORT WALTON BEACH AREA, FLORIDA,
Northwest Florida Water Management District, Tallahassee.
Z. Qureshi.
Water Resources Bulletin, Vol 12, No 6, p 117-123, December 1976. 3 fig, 3 ref.

Descriptors: *Potentiometric level, *Florida, *Drawdown, *Gulf of Mexico, Limestones, Water levels, Water quality, Aquifers, Pumping, Water wells, Saline water intrusion, Water management(Applied), Alternate planning, Water supply development, Aquicludes.
Identifiers: *Water level decline, *Floridan aquifer, Limestone aquifers.

The Fort Walton Beach area presently is faced with an excessive drawdown of the potentiometric level in the upper Floridan aquifer. Based on available data, the potentiometric level in the Floridan aquifer has dropped 162 feet since 1936. The declining potentiometric level can lead to problems and possible loss of the natural resource on a long-term basis. However, if corrective measures or programs for proper management of groundwater resources are undertaken at this time, the potential problems may be averted. (Visocky-ISWS)
W77-09132

DETERMINATION OF DUG WELL DEBIT UNDER CONDITIONS OF DESERT PASTURE LANDS, (IN RUSSIAN),
O. B. Khellenov.
Probl Osvoeniya Pustyn'. 1, p 89-91, 1974.

Descriptors: *Water wells, *Dug wells, Water sources, *Water supply, Pumping, Livestock, Deserts, Pastures, *Arid land.
Identifiers: *USSR(Karakum).

Water inflow was determined to be dependent on time at different dug well debits applied to the ranges of Karakum (USSR). Dynamic water column, water intake capacity and total daily yield of wells were determined. The data were used to determine livestock distribution and to determine the best operational conditions of water-pumping devices.—Copyright 1975, Biological Abstracts, Inc.
W77-09310

TRANSFORM APPROACH TO SOLUTION OF GROUNDWATER FLOW EQUATIONS,
Nevada Univ., Reno. Water Resources Center and Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2F.
W77-09318

TYPE CURVES FOR RECOVERY OF A DISCHARGING WELL WITH STORAGE,
Nevada Univ. System, Reno. Water Resource Center.
For primary bibliographic entry see Field 2F.
W77-09340

THE SPACIAL DISTRIBUTION OF GROUNDWATER DISCHARGE INTO THE LITTORAL ZONE OF A NEW ZEALAND LAKE,
Department of Scientific and Industrial Research Taupo (New Zealand). Freshwater Section.
For primary bibliographic entry see Field 2F.
W77-09341

FINITE-ELEMENT ANALYSIS OF GROUNDWATER FLOW IN MULTI-AQUIFER SYSTEMS, II. A QUASI THREE-DIMENSIONAL FLOW MODEL,
Kyoto Univ. (Japan). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W77-09362

SOIL NITRATES FOLLOWING FOUR YEARS CONTINUOUS CORN AND AS SURVEYED IN IRRIGATED FARM FIELDS OF CENTRAL AND EASTERN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-09429

SIMPLIFIED LONG TERM CONCEPT FOR EVALUATING LEACHING OF NITROGEN FROM AGRICULTURAL LAND,
Joint FAO/IAEA Div. of Atomic Energy in Agriculture, Vienna (Austria).
For primary bibliographic entry see Field 5B.
W77-09446

ENVIRONMENTAL IMPACTS OF HIGH LEVEL RADIOACTIVE WASTE DISPOSAL,
Pittsburgh Univ., Pa.
For primary bibliographic entry see Field 5C.
W77-09473

SECTION 1424(E) OF THE SAFE WATER DRINKING ACT: AN EFFECTIVE MEASURE AGAINST GROUNDWATER POLLUTION,
For primary bibliographic entry see Field 5G.
W77-09536

WATER LAW - WELL PERMITS - UNAPPROPRIATED WATER AND MAXIMUM UTILIZATION, HALL V. KUIPER, 510 P.2D 33 (COLO. 1973),
For primary bibliographic entry see Field 6D.
W77-09543

C. Effects On Water Of Man's Non-Water Activities

RBANIZATION AND FLOODING - AN EXAM-E,
ater Resources Engineers, Inc., Springfield, Va.
P. Shubinski, and W. N. Fitch.
Proceedings of the EPA Conference on En-onmental Modeling and Simulation, April 19-22, 76, Cincinnati, Ohio. Report EPA 600/9-76-016, S. Environmental Protection Agency, Washing-n, D.C., p 69-73, July 1976. 5 fig, 2 tab, 4 ref.

scriptors: *Flood control, *Model studies, mulation analysis, *Design flood, *Design rm, *Rainfall-runoff relationships, Vatersheds(Basins), Management, Urbaniza-n, Flooding, Hydrology, Statistical methods, ernative planning, Networks, Systems analy-, *Virginia.
ntifiers: Four Mile Run watershed(Va).

e Four Mile Run watershed in Northern Vir-ia is a classical example of the development of od problems with urbanization. The Corps of gineers has planned $29,000,000 in channel im-vements to alleviate the problem, but the Con-ss, concerned that future development in the in will create the problem again, required that a d management program be developed. The ected approach to land management is designed determine effective structural and nonstructural thods of flood abatement; emphasis is on the nstructural. The technical portions of the pro-m rely upon the use of two stormwater models. e first model, STORM (Storage, Treatment, erflow, Runoff Model), is a simple model based the rational method. It was used to develop a tistical analysis of the basins's hydrology, reby defining the design storm. Next, the so-sticated model WREM (Water Resources En-eers Model) was applied, using the design drology developed in STORM, to determine the ponse of the watershed to various control alter-ives. The use of these models together yielded best of both continuous simulation and single nt simulation. The results of this modeling will used to assign design shares for future develop-nt to each of the political subdivisions in the in. (See also W77-09154) (Bell-Cornell)
7-09161

FLUENCE OF VEGETATION MANAGE-NT ON YIELD AND QUALITY OF SURFACE NOFF,
xas A and M Univ., College Station. Dept. of ge Science.
E. Smeins.
ailable from the National Technical Informa-n Service, Springfield, VA 22161 as PB-269 410, ce codes: A04 in paper copy, A01 in microfiche.
xas Water Resources Institute. College Station, hnical Report No. 84, April 1977. 47 p. 12 tab, 6 21 ref. OWRT C-6310(No. 5233)(1).

scriptors: Sediments, Nitrogen, Infiltration, rients, Water pollution, *Agricultural runoff, face runoff, *Vegetation effects, tersheds(Basins), Water harvesting, *Water lity, *Texas, Great Plains, Water yield im-vement, *Grazing, *Pasture management.
ntifiers: *Edwards Plateau(Texas), Sonora earch Station(Tex), Sonora(Tex).

udy was conducted on the Edwards Plateau of as during 1974-76 to determine yield and quali-of surface runoff as influenced by grazing agement and site variables. Annually max-m runoff recorded was 12% of precipitation a continuously, heavily grazed pasture in poor e condition. This same pasture had the highest ff (39%) for a single rainfall event in July 5. These results show that annually little runoff rs, but for selected events significant amounts of runoff may occur from poorly managed areas. Good grazing management can help to reduce the amount of runoff. Greater runoff increases potential for sediment and nutrient loss. Sediment-N is the major contributor to nitrogen loss with values up to 4.2 ppm. Nitrite is always negligible, nitrate varies from negligible to 0.43 ppm, ammonia ranges from negligible to 0.61 ppm and organic nitrogen never exceeds 1 ppm. Maximum measured nitrogen loss for any runoff event when adjusted to flow rate was 1.5 kg/ha on July 11, 1976 from the continuously, heavily grazed pasture in poor condition. Other nutrients evaluated also had low concentrations in runoff waters. Soils have total nitrogen contents that range between 0.3 and 1.0 %. Total nitrogen is high, but exchangeable nitrogen is low. Ammonia nitrogen is the dominant form of exchangeable nitrogen and most values fall between 0.5 and 5.0 ppm. Exchangeable soil nitrogen available for movement into surface runoff water is low and does not present a major quality problem. Infiltration and sediment production studies indicate that overall these rangelands have high infiltration rates and even those in poor condition have relatively low sediment losses. Grazing management can increase infiltration and reduce runoff and sediment losses.
W77-09266

WATER RESOURCE AND LAND USE PROBLEMS IN WESTERN AUSTRALIA,
Perth Public Works Dept. (Australia). Planning Design and Investigation Branch.
B. S. Sadler.
In: Watershed Management on Range and Forest Lands, Proceedings of the Fifth Workshop of the U.S./Australia Rangelands Panel, Boise, Idaho, June 15-22, 1975. p 13-30. Published in March 1976. 8 fig, 4 ref.

Descriptors: *Water resources, *Australia, *Water resources development, *Land use, *Water utilization, Watershed management, Salinity, Planning, Research and development, Land management, Forest management, Runoff, Institutional constraints.
Identifiers: *Western Australia.

The State of Western Australia, one-third of the Australian continent, varies in climate from subtropical summer monsoons in the north to a winter rainfall temperate climate in the south, with arid or semi-arid climate in the interior. Average annual discharge of the state's rivers is only 14 1/2% of the national figure, and only a fraction of the surface water can be diverted to use. Resource distribution is uneven and unfavorable, 72% being in a region of low population. Short rivers and streams draining southern forests near the Perth Coastal Plain are the major water resources of the region. The main watershed management problem has been erosion and sediment transport caused by overgrazing. The salinity problem is serious. More than 50% of the usable surface water resources have been affected adversely by land use changes from forest to agricultural. Per capita urban water consumption rate is one of the highest in Australia. Control and distribution of water resources is outlined, along with adverse effects of current practices. Land use-water use conflicts relating to agriculture, forestry, mining, utilities and recreational sectors are discussed, along with research and planning requirements. (Jahns-Arizona)
W77-09296

LIFE AT THE DESERT'S EDGE.
Mosaic, Vol. 8, No. 1, p 21-27, Jan-Feb. 1977. 4 fig.

Descriptors: *Droughts, *Arid lands, *Africa, *Human population, Grazing, Planning, Political constraints, Range management, Arid climates, Semiarid climates, Weather patterns, Rainfall, Social adjustment, Social impact.
Identifiers: *Sahel, *Desertification.

The recent 5-year drought in the African Sahel focused attention on the problems of human populations in the world's arid zones. This disaster had a devastating impact on nomadic herdsmen who lost from 20 to 50% of their flocks, and on the farming population. Recurrent droughts are a harsh fact in the Sahel where the latest episode was itself less severe than that in 1910-13. Coupled with the variable climate in a desert ecosystem is the effect of introduced European technology and science which have increased population and consequent pressures on the land. Survival strategies in different portions of the Sahel include grazing in the north and sedentary farming in the south. Other resources to basic survival in this semiarid zone are discussed. There is some fear that pastoralists may be overrunning their resource base, thereby increasing damage possibilities from future droughts. Governmental control has encouraged a shift from a subsistence to a commercial economy in which more animals are produced for sale in distant markets. Impacts of ecological, economic, and political changes on desertification are presented. Possiblities for range management in the context of changing social patterns are also discussed. (Jahns-Arizona)
W77-09305

ON THE CAUSES OF LOCAL CLIMATIC ANOMALIES, WITH SPECIAL REFERENCE TO PRECIPITATION IN WASHINGTON STATE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 2B.
W77-09355

ENVIRONMENTAL CHANGES IN LAKE ERIE AND THEIR FUTURE IMPACT ON LAKE RESOURCES.
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-09454

4D. Watershed Protection

EROSION CAUSED BY INTENSE RAIN FALL IN A SMALL CATCHMENT IN NEW YORK STATE,
Clark Univ., Worcester, Mass. Graduate school of Geography.
For primary bibliographic entry see Field 2J.
W77-09134

URBANIZATION AND FLOODING - AN EXAMPLE,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 4C.
W77-09161

MALVERN URBAN TEST CATCHMENT, VOLUME I,
Canada Centre for Inland Water, Burlington (Ontario).
J. Marsalek.
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 57, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, 1977. 55 p, 9 fig, 8 tab, 7 ref, append. 73-3-12.

Descriptors: Basins, *Testing, *Cities, Topography, *Rainfall-runoff relationships, Surface drainage, Surface runoff, Sewers, Concrete pipes, Precipitation(Atmospheric), Storm runoff, Data collections, *Hydrographs, *Canada, *Watersheds(Basins), *Monitoring, Urban hydrology, *Urban runoff.
Identifiers: *Malvern, *Burlington, Ontario, *Urban watersheds.

An urban test catchment (Malvern), representing a modern residential development of 58 acres, was established and instrumented in Burlington, Ontario. The catchment topography, land use, hydrological characteristics, storm drainage and instrumentation are described and discussed. A number of precipitation-runoff events were monitored on the catchment in 1973, and some of these events were simulated with the Storm Water Management Model (SWMM) of the U.S. Environmental Protection Agency. A good fit between the simulation runoff hydrographs and the observed hydrographs was obtained. (WATDOC)
W77-09217

PREDICTING SNOW DEPTHS ON A MOUNTAIN WATERSHED,
Colorado State Univ., Fort Collins. Dept. of Fishing and Wildlife Biology.
For primary bibliographic entry see Field 2C.
W77-09257

LAND MANAGEMENT IN THE LAKE ONTARIO BASIN,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 6B.
W77-09275

PREDICTING STORMFLOW AND PEAKFLOW FROM SMALL BASINS IN HUMID AREAS BY THE R-INDEX METHOD,
Georgia Univ., Athens, School of Forest Resources.
For primary bibliographic entry see Field 4A.
W77-09334

SENSITIVITY OF SOME RUNOFF MODELS TO ERRORS IN RAINFALL EXCESS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W77-09339

NITRATE DYNAMICS IN FALL CREEK, NEW YORK,
Pennsylvania Univ., Philadelphia. Regional Planning Div.
For primary bibliographic entry see Field 5B.
W77-09431

5. WATER QUALITY MANAGEMENT AND PROTECTION

COLORADO RIVER WATER QUALITY IMPROVEMENT PROGRAM (FINAL ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-09527

5A. Identification Of Pollutants

A METHOD OF CONCENTRATING THE MAJOR IMPURITIES CONTAINED IN ICE BY ION EXCHANGE,
Grenoble-1 Univ. (France). Institut de Geographie Alpine.
For primary bibliographic entry see Field 2C.
W77-09122

PERSISTENCE OF PROPANIL, DCA, AND TCAB IN SOIL AND WATER UNDER FLOODED RICE CULTURE,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 5B.
W77-09128

HERBICIDES FROM CROPPED WATERSHEDS IN STREAM AND ESTUARINE SEDIMENTS IN HAWAII,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 5B.
W77-09129

COLORMETRIC DETERMINATION OF ZINC VIA RESORCINOL COMPLEX,
Auburn Univ., Ala. Dept. of Chemistry.
C. W. Tzeng.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 375, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, August 1974, 49 p, 11 tab, 14 fig. OWRT A-036-ALA(1).

Descriptors: Absorption, *Zinc, Oxygenation, Ammonium compounds, *Pollutant identification, *Spectrophotometry, *Colorimetry, Analytical techniques, Reactions, Metals.
Identifiers: Beer's Law, *Resorcinal complex.

A systematic study of the reaction between resorcinol and zinc ion was carried out. The blue color was formed at pH 10; the color forming reaction was reversible. An investigation was undertaken to study the complex spectrophotometrically. Formation of the blue-colored, water soluble complex between resorcinol and zinc was stable to wide temperature variation. The complex shows maximum absorbance at 610 nm where the absorbance by the reagent or the metal is small.
W77-09138

DATA COLLECTION FOR WATER QUALITY MODELING IN THE OCCOQUAN WATERSHED OF VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
T. J. Grizzard, C. W. Randall, and R. C. Hoehn.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 819-823, July 1976. 3 fig, 3 tab, 16 ref.

Descriptors: *Water quality, *Runoff, *Data collections, *Monitoring, *Programs, *Analytical techniques, Sampling, Methodology, Simulation analysis, Hydrologic data, Mathematical models, Equations, Systems analysis, Reservoirs, *Virginia, Forecasting.
Identifiers: *Pollutant washoff theory, Stream stage, *Occoquan watershed(Va).

The Occoquan Watershed Monitoring Lab has established a network of automatic water samplers at locations on tributaries to the Occoquan Reservoir. The large-scale water quality monitoring program has been instituted to provide runoff water quality data in sufficient detail to facilitate calibration of a predictive model using pollutant washoff theory. The sampling program involves the installation of automatic sampling stations, automated chemical analysis of collected samples, and use of the EPA STORET system as a data management tool. The samples are programmed to collect and store sequential discrete samples at increments of rising and falling stream stage during runoff. When combined with concurrent flow data, analysis of such samples allows the generation of pollutant loading graphs. Such loading data are invaluable in the precise calibration of most mathematical models used to simulate pollutant quantities in surface runoff. For calibration, the measured rates of constituent accumulation will be sequentially varied to achieve agreement in loadings between observed and simulated storms. (See also W77-09154) (Bell-Cornell)
W77-09211

EFFECTS OF IMPOUNDMENT ON WATE AND SEDIMENT IN THE ARKANSAS RIVE AT PUEBLO RESERVOIR,
University of Southern Colorado, Pueblo.
For primary bibliographic entry see Field 5B.
W77-09224

AEROSOL OVER THE HIGH PLAINS OF TH UNITED STATES,
Washington Univ., Seattle. Dept. of Atmospheri Sciences.
P. V. Hobbs, D. A. Bowdle, and F. Radke.
Available from the National Technical Informa tion Service, Operations Division, Springfiel Virginia 22161. Bureau of Reclamation, Denve Colorado, Division of Atmospheric Wat Resources Management. Research Report XI February 1977. 148 p, 30 fig, 7 tab, 42 ref. 14 - 06 D7664.

Descriptors: *Aerosols, *Air pollution effect Remote sensing, Dusts, *Dust storms, *Gre Plains, Cloud seeding, Weather modification, C matology, Measurement, *Air masses, Weath patterns, Air circulation.
Identifiers: *HIPLEX PROJECT, *Hig Plains(US), *Aerosol sinks.

As part of the assessment of the potential for i creasing precipitation by artificially seedi summer cumulus clouds in the High Plains (t HIPLEX Project), a detailed airborne study is u derway of the nature of the aerosol in this regio Results are presented, based on measuremen made in the summer of 1975. The patterns of vari tion of aerosol concentrations within the mixi layer over the High Plains depend on the type air mass, the proximity of the aerosol sources a sinks, and the size and type of aerosol. Volu and surface area distributions of aerosol, fro 0.01 to 100 micro-m in diameter, were distinctly modal over a wide range of meterological con tions. Most of the aerosol surface area was co tained in particles between 0.1 and 1.0 micro-m diameter, and most of the volume in particles fro 10-20 micro-m in diameter. Background concentr tions of cloud condensation nuclei active betwe 0.2 and 1.5% supersaturation, and aerosol betwe 0.1 and 10 micro-m in diameter, varied with mass age on a synoptic scale. Concentrations these aerosol were highest in 'aged' air masses a they were lowest near regions of precipitation. I nuclei active between -12 and -20C, and aero smaller than 0.1 micro-m or larger than 10 micro in diameter, varied on the mesoscale (a) ne aerosol sources, and (b) near aerosol sinks. S particles up to 10 micro-m in diameter were fou only in strong southern flows. Deliquescent s and pollen particles (probably coated w sulfates) were found only in weaker southe flows and in continental air masses. The conce trations of deliquescent particles appeared to va on the cumulus scale. High concentrations of nuclei and aerosol near 5 micro-m in diameter, well as high frequencies of detection deliquescent particles, were observed immediat downwind of a dust storm and in the remnants o dust storm 24 hours downwind. Particle loading the fringes of the dust storm reached values high as 625 micro-g m-3. (Bur Reclam).
W77-09225

THE ENVIRONMENTAL QUALITY MONITO ING REPORT.
National Oceanic and Atmospheric Administ tion, Washington, D.C. Outer Continental Sh Task Force.
For primary bibliographic entry see Field 5G.
W77-09231

THE EVALUATION OF THE TE PROCEDURE FOR HAZARDOUS BINA COMBINATIONS OF MATERIALS IN MARI TRANSPORTATION,
Coast Guard Academy, New London, Conn.
For primary bibliographic entry see Field 5G.

7-09236

ACE METALS IN MANGROVE SEEDLINGS
OM POLLUTED AND UNPOLLUTED BAYS
PUERTO RICO,
rto Rico Nuclear Center, Mayaguez. Marine
logy Div.
O. Banus.
5). 22 p, 1 fig, 5 tab, 9 ref.

criptors: *Puerto Rico, *Mangrove swamps,
ater pollution, *Environmental effects,
tals, *Pollutant identification, Wetlands,
s, Coasts, Seeds.
ntifiers: *Trace metals, Rhizophora mangle.

mangroves (Rhizophora mangle) propagate by
pping ripe viviparous seedlings into the water
ounding their roots. Nine batches of thirty ripe
llings, picked from trees in six locations in
rto Rico where there are increasing amounts of
nical pollution, were analyzed for the trace
als Fe, Mn, Cu, Zn, Ni and Cd. The leafing
) and rooting (bottom) ends of each seedling
e oven-dried and analyzed by wet-ashing and
nic absorption spectrophotometry. The mean
centration of tops and bottoms of the thirty
llings in each batch and between batches were
pared using 't' statistics at the 98% level. The
concentration of seedlings from unpolluted
s is 2.5 ppm with no difference between top
bottom. The concentration increases to 5-7
in locations subjected to pollution. The Fe
centration is 12 ppm for bottom and 13-15 ppm
op seedlings from polluted areas. From unpol-
d estuarine mangroves, Mn was 10-11 ppm in
oms and 30 ppm in tops. The top vs. bottom
of Mn was 3-4 for all seedlings. Seedlings
n an off-shore coral island have 3.7 ppm Mn
om and 10.3 ppm top. Accurate Zn levels were
possible due to contamination but are esti-
ed to be 20-30 ppm. Pb, Cd and Ni were below
ction limits. Florida red mangrove seedlings
much higher levels of Cu (2X), Fe (10X) and
500X). (Sinha-OEIS)
7-09240

HEMICAL MONITORING PROGRAM OF
EXPLOSION PRODUCTS IN UN-
WATER EXPLOSION TESTS,
al Surface Weapons Center, White Oak Lab.,
er Spring, Md.
primary bibliographic entry see Field 5G.
7-09242

Y 1974 BASELINE INVESTIGATION OF
EPWATER DUMPSITE 106.
onal Oceanic and Atmospheric Administra-
Washington, D.C.; and Environmental Pro-
on Agency, Washington, D.C.
primary bibliographic entry see Field 5B.
7-09243

SICAL OCEANOGRAPHY HISTORICAL
A FOR DEEPWATER DUMPSITE 106,
onal Marine Fisheries Service, Narragansett,
Atlantic Environmental Group.
primary bibliographic entry see Field 5B.
7-09248

SICAL OCEANOGRAPHIC OBSERVA-
NS AT DEEPWATER DUMPSITE 106 --
Y 1974,
onal Marine Fisheries Service, Narragansett,
Atlantic Environmental Group.
primary bibliographic entry see Field 5B.
7-09249

RONUTRIENT ANALYSIS OF SEAWATER
PLES TAKEN AT DEEPWATER
MPSITE 106--MAY 1974,
onal Marine Fisheries Service, Narragansett,
MARMAP Field Group.

H. Petersen.
In: NOAA Dumpsite Evaluation Report 75-1, p 189-201, December 1975. 1 tab.

Descriptors: *Nutrients, *Water sampling, *Waste disposal, *Baseline studies, Water resources, *Pollutant identification, Sampling, Monitoring, Sea water, Water analysis.
Identifiers: *Outer Continental Shelf, Ocean dumping, Dumpsites, *Sea water analysis, *Micronutrient analysis.

Seawater samples were collected at Deepwater Dumpsite 106 by the NOAA vessel Albatross IV during May 10-23, 1974. Samples were collected and stored aboard. Samples were obtained without filtration from STD (salinity-temperature-density) and hydrographic casts and stored in 250-ml screwcap polycarbonate and polypropylene bottles in the vessel's freezer. Upon completion of the cruise, samples were transferred to a shoreside freezer and maintained at -20C except for analysis. Repeat analyses of several samples confirmed suspicions that some of the micronutrient concentrations vary with time. These results indicate the need to complete analyses in a real-time frame if at all possible when using unfiltered samples. (See also W77-09243) (Sinha-OEIS)
W77-09250

ANALYTICAL RESULTS FOR WATER-COLUMN SAMPLES COLLECTED AT DEEPWATER DUMPSITE 106--MAY 1974,
Environmental Protection Agency, Edison, N.J. Technical Support Group.
F. T. Brezenski.
In: NOAA Dumpsite Evaluation Report 75-1, p 203-215, December 1975. 3 tab.

Descriptors: *Baseline studies, *Waste disposal, *Heavy metals, *Bacteria, *Water sampling, *Water analysis, *Pollutant identification, Analytical techniques.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Dumpsites.

The NOAA vessel Albatross IV collected water-column samples at 23 stations during the May 1974 survey of Deepwater Dumpsite 106. These samples were analyzed for total coliform bacteria, fecal coliform bacteria, heterotrophic marine bacteria, total Kjeldahl nitrogen (TKN), nitrate-nitrogen, total phosphorus, mercury, cadmium, zinc, copper, manganese, and lead. Methodology for developing the data and the results obtained are presented. (See also W77-09243) (Sinha-OEIS)
W77-09251

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 1.
Office of Water Research and Technology, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 427, Price codes: A19 in paper copy, A01 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 77-201, May 1977. 438 p.

Descriptors: *Heavy metals, *Bibliographies, *Pollutant identification, *Analytical techniques, Cadmium, Chromium, Cobalt, Copper, *Industrial wastes, Iron, Lead, Manganese, Molybdenum, Nickel, Toxicity, Trace elements, Waste water treatment, Zinc.

This report, containing 499 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 104,878 abstracts covering SWRA through February 1977 (Volume 10, Number 4). Author and subject indexes are included. (See also W77-092600 thru W77-09263)
W77-09259

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 2,
Office of Water Research and Technology, Washington, D. C.
Water Resources Scientific Information Center, Report OWRT/WRSIC 77-205, May 1977. 479 p.

Descriptors: *Heavy metals, *Bibliographies, *Pollutant identification, *Analytical techniques, Cadmium, Chromium, Cobalt, Copper, *Industrial wastes, Iron, Lead, Manganese, Molybdenum, Nickel, Toxicity, Trace elements, Waste water treatment, Zinc.

This report, containing 500 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 104,878 abstracts covering SWRA through February 1977 (Volume 10, Number 4). Author and subject indexes are included. (See also W77-09259)
W77-09260

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 3.
Office of Water Research and Technology, Washington, D. C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 429, Price codes: A17 in paper copy, A01 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 77-206, May 1977. 371 p.

Descriptors: *Heavy metals, *Bibliographies, *Pollutant identification, *Analytical techniques, Cadmium, Chromium, Cobalt, Copper, *Industrial wastes, Iron, Lead, Manganese, Molybdenum, Nickel, Toxicity, Trace elements, Waste water treatment, Zinc.

This report, containing 419 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 104,878 abstracts covering SWRA through February 1977 (Volume 10, Number 4). Author and subject indexes are included. (See also W77-09259)
W77-09261

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 4.
Office of Water Research and Technology, Washington, D. C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 430, Price codes: A12 in paper copy, A01 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 77-207, May 1977. 351 p.

Descriptors: *Heavy metals, *Bibliographies, *Pollutant identification, *Analytical techniques, Cadmium, Chromium, Cobalt, Copper, *Industrial wastes, Iron, Lead, Manganese, Molybdenum, Nickel, Toxicity, Trace elements, Waste water treatment, Zinc.

This report, containing 430 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 104,878 abstracts covering SWRA through February 1977 (Volume 10, Number 4). Author and subject indexes are included. (See also W77-09259.)
W77-09262

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 431, Price codes: A16 in paper copy, A01 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 77-208, May 1977. 361 p.

Descriptors: *Heavy metals, *Bibliographies, *Pollutant identification, *Analytical techniques, Cadmium, Chromium, Cobalt, Copper, *Industrial wastes, Iron, Lead, Manganese, Molybdenum, Nickel, Toxicity, Trace elements, Waste water treatment, Zinc.

This report, containing 419 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 104,878 abstracts covering SWRA through February 1977 (Volume 10, Number 4). Author and subject indexes are included. (See also W77-09259.)
W77-09263

RESPONSE OF THE SPOKANE RIVER DIATOM COMMUNITY TO PRIMARY SEWAGE EFFLUENT,
Eastern Washington State Coll., Cheney. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-09273

AMMONIA TRANSPORT IN WATER SATURATED POLYMERIC FILMS,
Missouri Univ.-Kansas City. Dept. of Chemistry.
M. L. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 629, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1973. 102 p, 21 fig, 19 tab, 14 ref. OWRT A-062-MO(2), 14-31-0001-3825.

Descriptors: Permeability, *Ammonia, Membranes, Ion exchange, Pollutant identification, Analytical techniques, Path of pollutants, Polymers, Waste water treatment, Computer program, Measurement, Films, Rubber, Industrial wastes.
Identifiers: *Ammonia in wastewater.

A technique was developed to measure the NH3 diffusivity in aqueous systems. A study was made of NH3 transport in water-saturated silicone rubber, mylar, saran, polythylene and 'Parafilm'. The study includes a derivation of a theoretical model of the electrode and a set of computer programs written to solve and plot the complex equations which are derived as the solution. A comparison was made of the experimental data with the shape of the theoretical curves to establish the validity of the technique employed to calculate diffusion coefficients. Agreement was satisfactory for sorption/desorption model, but seems less satisfactory for a diffusion cell technique. Results for all films studied showed that the diffusion coefficients are of the order of 10-7 to 10-8. Films containing many polar or hydrogen bonding sites (silicone rubber, mylar) exhibit the highest diffusivity, while aliphatic materials (Saran, polythylene, 'Parafilm') showed lower diffusivity and solubility of NH3.
W77-09274

EFFECT OF PH AND COMPLEX FORMATION ON MERCURY (II) ADSORPTION BY BENTONITE,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09281

BEHAVIOR OF CHROMIUM IN SOILS: II. HEXAVALENT FORMS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2G.
W77-09283

EFFECT OF DISSOLVED OXYGEN ON REDOX POTENTIAL AND NITRATE REMOVAL IN FLOODED SWAMP,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W77-09286

POTASSIUM STATUS OF SOME ALLUVIAL SOILS IN KENTUCKY,
Kentucky Univ., Lexington. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09290

CORRECTION OF 'TUBE CONTRIBUTION' INTERFERENCE IN THE DETERMINATION OF HEAVY METALS BY X-RAY SPECTROSCOPY USING THE 'ADDITIONS TECHNIQUE',
Maryland Agricultural Experiment Station, College Park. Dept. of Soil Science.
V. Z. Keramidas, and D. S. Fanning.
Soil Science Society of America Journal, Vol. 40, No. 6, p 857-860, November-December 1976. 2 fig, 1 tab, 7 ref.

Descriptors: *Heavy metals, Zinc, Copper, Nickel, Soil chemistry, Soil properties, Soil investigations, *X-ray spectroscopy, *Pollutant identification, Analytical techniques.
Identifiers: Heavy metal determination.

Cr and W X-ray tubes emitted not only the target characteristic lines but the lines of Fe, Zn, Cu, and Ni as well. Such extraneous radiation, which probably originates primarily from contamination of the tube target by the metals and is referred to as 'tube contribution,' may lead to erroneous qualitative interpretation of X-ray spectra because peaks of the elements may appear in the spectra when the element is not present in the sample. The additions (or spiking) technique allows matrix problems to be overcome in the quantitative measurement of Zn, Cu, and Ni in soils and other materials, but an accurate estimation of the background under the peak is essential. (Skogerboe-Colorado State)
W77-09292

A SEMIAUTOMATED PROCEDURE FOR TOTAL NITROGEN IN PLANT AND SOIL SAMPLES,
Florida Univ., Gainesville. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W77-09294

STUDY OF MERCURY INTOXICATION IN A TELEOST FISH, ANGUILLA ANGUILLA: I ACCUMULATION OF MERCURY IN THE ORGANS, (IN FRENCH),
Liege Univ. (Belgium). Labortoire de Biologie Generale.
For primary bibliographic entry see Field 5C.
W77-09320

STUDY OF MERCURY INTOXICATION IN A TELEOST FISH, ANGUILLA ANGUILLA: II. EFFECT ON THE REGULATION OF OSMOLARITY, (IN FRENCH),
Liege Univ. (Belgium). Laboratoire de Biologie Generale.
For primary bibliographic entry see Field 5C.
W77-09321

DISTRIBUTION OF NUTRIENTS IN LOUISIANA'S COASTAL WATERS INFLUENCED BY THE MISSISSIPPI RIVER,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science; and Louisiana Wildlife and Fisheries Commission, Baton Rouge. Seafood Div.
For primary bibliographic entry see Field 5B.
W77-09323

A BIOLOGICAL AND CHEMICAL COM PARISON OF VARIOUS AREAS OF A RESE VOIR,
Virginia Polytechnic Inst. and State Univ Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-09342

OXYGEN CONSUMPTION BY FRESHWATE SEDIMENTS,
Clemson Univ., S.C. Dept. of Environmen Systems Engineering; and Clemson Univ., S. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-09348

PRECIPITATION LOADING OF ACID AN HEAVY METALS TO A SMALL ACID LA NEAR SUDBURY (ONTARIO),
Fisheries and Marine Service, Nanaimo (Brit Columbia). Biological Station.
R. J. Beamish, and J. C. Van Loon.
Journal of the Fisheries Research Board Canada, Vol. 34, No. 5, p 649-658, May 1977. 4 f 7 tab, 14 ref.

Descriptors: *Lakes, *Acids, Precipi tion(Atmospheric), *Canada, Hydrogen ion co centration, Water pollution, Water polluti sources, *Heavy metals, Air pollution, Sampli On-site investigations, Acidic water, Runo Watersheds(Basins), Pollutants, Sulfates, Ma ganese, Zinc, Nickel, Lake sediments, *Pollut identification, *Air pollution effects
Identifiers: *Acid lakes, *Acid precipitati *Lumsden Lake(Ontario).

The pH of Lumsden Lake was closely related the measured amount of acid entering the l from bulk precipitation. In 1972 it was estima that an excess of 2135 kg of H2S04 was added the lake from the atmosphere. The predicted nual change in lake pH was from 5.2 to 4.8, and actual measured change was from 5.2 to 4.7. 1973 an estimated excess of 1271 kg of H2S04 added to the lake from the atmosphere. The p dicted annual pH change was from 4.8 to 4.7, there was no net change in the lake pH in 19 Lumsden Lake also had high concentrations sulfate, manganese, zinc, and nickel in co parison with remote or 'unpolluted' lakes. H concentrations of manganese and possibly so zinc in the lake appeared to result from increas mobilization from the lake sediments or watersh or both as the pH decreased. Atmospheric fall also contributed substantial quantities of nic and copper to the watershed, some of which peared to be retained in the lake water. The h concentrations of lead in the precipitation w not retained in the lake. (Sims-ISWS)
W77-09353

DISSOLVED AMINO ACIDS IN THE EQU TORIAL PACIFIC, THE SARGASSO SEA, A BISCAYNE BAY,
Scripps Institution of Oceanography, La Jo Calif.
C. Lee, and J. L. Bada.
Limnology and Oceanography, Vol 22, No. 3 502-510, May 1977. 4 fig, 2 tab, 35 ref. NSF G 40804, GB-25121.

Descriptors: *Amino acids, *Sea water, *Ocea *Pacific Ocean, Sampling, Chemical analy Analytical techniques, Marine biology, Bacte Marine bacteria, Organic acids, Peptid Proteins, Algae, Biology, Oceanography, Po tant identification, Water pollution sources.
Identifiers: *Biscayne Bay, *Sargasso Sea

water samples from several depths in the Sar-
so Sea and equatorial Pacific and from surface
ions in Biscayne Bay were analyzed for dis-
ed free amino acids and for dissolved com-
d amino acids by a ligand-exchange chro-
ography technique. Enantiomeric ratios of dis-
ed total amino acids from Atlantic and Pacific
ples also were determined. On the basis of the
ns, a bacterial source was postulated for the
in of the dissolved D-amino acids in seawater.
possible contributions from chemical
mization were compared to biological produc-
as a source for these D-amino acids. (Sims-
/S)
7-09356

HERMAL CONTROLLER FOR THE SHORT
D DETERMINATION,
icultural Research and Education Center,
e Alfred, Fla.
. Crandall, C. C. Niementowski, and P. E.
son.
nal of Food Science, Vol 42, No 3, p 839-842,
-June, 1977. 1 fig, 3 tab, 12 ref.

criptors: *Chemical oxygen demand, Analysis,
tomatic control, *Temperature control,
lustrial wastes, Equipment, Performance,
n(Field), Tomatoes, Biochemical oxygen de-
d, Instrumentation, Waste water treatment,
utant identification.
tifiers: *Food processing wastes, COD deter-
ation.

ermal controller was developed which can be
for food processing wastes to improve the
t COD analysis method. It has made the
ess faster, safer, and more precise due to au-
atic temperature and agitation control. This
ess modification minimized sample loss by
inating sample transfer from the heating flask
nother for titration. Errors from excessive
ple dilution were also avoided. Equipment
s nearly equaled that of the BOD and long
) methods. There was a 25-50% saving in time
chemicals over the longer COD method. Fluc-
ons in line voltage did not affect controller
ility; solid state switching reduced wear.
ty was improved because it is not necessary to
le hot flasks or acids. The researcher could be
ected from caustic fumes and accidental splat-
g by a hood with a sliding glass front. The
of a degree of technical competence was one
dvantage of this system. Lengthy titration
ods were not reduced. The precision of results
shown by the analysis of corn and tomato
essing wastes. Glucose solutions were found
ave a coefficient of variation of 1.4%, rather
20% (BOD method) or 8% (long COD
od). Tomato waste coefficient of variation
2.7%, and more reproducible results were ob-
d for the corn waste samples. (Collins-FIRL)
-09415

MICAL REDUCTION OF NITRATE BY
ROUS IRON,
h Dakota State Univ., Fargo. Dept. of Soils.
Buresh, and J. T. Moraghan.
nal of Environmental Quality, Vol. 5, No. 3, p
25, July-September 1976. 5 fig, 4 tab, 30 ref.

riptors: *Nitrates, *Denitrification,
rogen, Chemical reactions, Chemicals, Iron,
ollution, Pollutant identification.

wledge concerning the chemical reduction of
-) to gaseous products, a process of potential
ical significance as an antipollution device, is
e. The influence of pH on chemical reduction
O3(-)-N (approximate concentration 23 ppm)
e(2+) in the presence and absence of Cu(2+)
tudied over a pH range from 6 to 10. After 24-
s of controlled pH incubations under a helium
sphere NO3(-), N20, NO, N2, and NH4(+)
determined. The initial Fe(2+)/NO3(-) mole
was 8. Reduction of NO3(-) was negligible in the absence of Cu(2+), but was pronounced above pH 7 in the presence of approximately 5 ppm Cu(2+). Formation of NH4(+) increased with pH and was the dominant process at pH 9 and 10. Nitrous oxide and N2 accumulations were greatest in the pH range from 8 to 8.5 and negligible at pH 6 and 10. Nitrite formation was small except at pH 9 and 10. Trace quantities of NO accumulated during incubation if the pH was allowed to drop below 6. Levels of Cu(2+) and Fe(2+) influenced the extent and nature of NO3(-) reduction at pH 8. Maximum reduction of NO3(-) (93%) and maximum gas production, equivalent to 61% of the original NO3(-), occurred when the Fe(2+)/NO3(-) mole ratio was 12 and the Cu(2+) level was approximately 10 ppm. The N20/N2 mole ratio in the evolved gases decreased as the Cu(2+) level was increased from approximately 1 to 10 ppm and as the Fe(2+)/NO3(-) mole ratio was increased from 8 to 12. Nitrate was relatively stable at a Cu(2+) content of 0.1 ppm irrespective of the Fe(2+)/NO3(-) ratio. (Skogerboe-Colorado State)
W77-09426

PSEUDOMONAS AERUGINOSA-FECAL COLIFORM RELATIONSHIPS IN ESTUARINE AND FRESH RECREATIONAL WATERS,
National Marine Water Quality Lab., West Kingston, R.I.
V. J. Cabelli, H. Kennedy, and M. A. Levin.
Journal Water Pollution Control Federation, Vol 48, No 2, p 367-376, 1976. 5 fig, 3 tab, 17 ref.

Descriptors: *Beaches, *Pseudomonas, *Coliforms, *Water quality standards, Public health, Pathogenic bacteria, Diseases, *Bioindicators, Swimming, Regression analysis, Water sports, Pollutant identification.
Identifiers: *Pseudomonas aeruginosa.

The validity of total coliform densities as an index of fecal pollution is questioned as there is no conclusive evidence correlating fecal coliform densities to enteric diseases in swimmers. It is suggested that Pseudomonas aeruginosa has advantages over coliforms as a fecal pollution indicator because it is primarily associated with human feces and has better survival characteristics than the coliform groups. In a Rhode Island study of estuarine and freshwaters to determine the relationship of P. aeruginosa densities to fecal coliform levels at varying distances from known pollution sources, the ratios of P. aeruginosa:fecal coliform densities x 100 (PA:FC) were greatest at those stations furthest from the pollution sources. PA:FC ratios of less than 2.5 were associated with immediate pollution sources with the exception at one station where a high FC density was accompanied by a relatively high PA level, suggesting that the source of the organisms was not sanitary wastes and that the FC were not of fecal origin but rather associated with some other source. It is proposed that P. aeruginosa determinations, when used in conjunction with the assay of fecal coliforms or some other indicator organisms, could be valuable in developing standards for recreational waters and as a means of detecting low pollution levels arising from distant origins. (Auen-Wisconsin)
W77-09474

SURVEY OF INDUSTRIAL PROCESSING DATA. TASK I-HEXACHLOROBENZENE AND HEXACHLOROBUTADIENE POLLUTION FROM CHLOROCARBON PROCESSING,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W77-09475

MINERALOGICAL COMPOSITION OF SUBMERGED AQUATIC MACROPHYTES FROM CONNECTICUT,
U. M. Cowgill.
Verhandlungen Internationale Vereinigung Limnologie Vol 19, p. 2749-2757, 1975. 7 fig., 13 ref.

Descriptors: *Aquatic plants, *Mineralogy, Submerged plants, *Connecticut, Calcium compounds, Silica, Oxides, Quartz, X-ray analysis, Pollutant identification.
Identifiers: *Mineral properties, Ceratophyllum demersum, Potamogeton praelongus, Potamogeton crispus, *Linsley Pond(Conn).

Mineral properties of submerged aquatic plants (Certophyllum demersum, Potamogeton crispus, and P. praelongus) in Linsley Pond, Connecticut, were determined by X-ray diffraction and their functions and uptake mechanisms were studied. Whewhellite, calcium oxalata monohydrate, the dihydrate form of weddellite, calcium a low-cristobalite-tridymite opal, and very small amounts of quartz and hematite were found. Calcium carbonate is commonly found in a variety of plant tissues and is believed to be an extracellular substance. There is no general agreement as to the genesis or function of calcite production by plants. Younger plants in this study contained more calcite than older plants. The chemical nature of silica in higher plants has been identified as opal and quartz--one classified as a diatom type and the other identified as a low-cristoblaite-tridymite type. The analyses showed structures resembling both low-cristobalite and low tridymite. Neither their genesis not their function is apparent. Both weddellite and whewhellite, in varying quantities, were present in both species, though Potamogeton contained lesser quatities. There was no striking difference in the amount of the low-cristobalite-tridymite opal with age of the plants. It is assumed that this type of opal is external to the plant. The data suggest that these compounds are a method of removing unwanted calcium of oxalic acid from tissues, or possibly a means of adjusting to a polluted environment. (Auen-Wisconsin).
W77-09477

NITROGEN FIXATION IN AQUATIC ENVIRONMENTS--A CRITICAL STUDY OF ACETYLENE REDUCTION ASSAY,
R. J. Flett, R. D. Hamilton, and N. E. R. Campbell.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 2664-2668, 1975. 3 fig, 6 ref.

Descriptors: *Nitrogen fixation, Analytical techniques, *Assay, Measurement, Laboratory tests, Methodology, Bioassay, Pollutant identification.
Identifiers: *Acetylene reduction assay.

Some solutions are proposed for the lack of sensitivity of the currently-used acetylene reduction assay to determine nitrogen fixation in water. The present method assumes that ethylene is insoluble in water and therefore that all the ethylene produced is quickly transferred to the vapor phase. This assumption is incorrect as ethylene is quite soluble and the amount of ethylene that passes into the vapor phase is an equilibrated closed system depends upon the relative amounts of aqueous and vapor phase present. Assay sensitivity can be easily enhanced by increasing the relative proportion of aqueous phase in the incubation vessel rather than by concentrating the sample, and achieving equilibrium. A method proposed employs a London Luer 50 ml glass syringe as an incubation vessel, used as follows: A quantity of water is drawn into the syringe and appropriate amount of acetylene is injected above the sample. With the syringe sealed, agitation causes the acetylene to almost completely (ca, 95%) dissolve; essentially no vapor phase remains. After inculation, an appropriate quantity of air can be drawn in, the syringe sealed and agitated for a predetermined period. The equilibrated vapor phase can then be injected into a suitable serum stoppered storage vessel for later analysis. (Auen-Wisconsin)
W77-09490

Group 5A—Identification Of Pollutants

AQUATIC BASELINE SURVEY OF SELECTED TEST AREAS ON EGLIN AIR FORCE BASE RESERVATION, FLORIDA,
Air Force Armament Lab., Eglin AFB, Fla.
For primary bibliographic entry see Field 7C.
W77-09499

ASPECTS OF PHOSPHATE UTILIZATION BY BLUE-GREEN ALGAE,
Herbert H. Lehman Coll., Bronx, N.Y.
For primary bibliographic entry see Field 5C.
W77-09505

EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5C.
W77-09509

PROBLEMS WITH RADIOMETRIC COLIFORM ASSAYS,
Framingham State Coll., Mass. Dept. of Biology.
J. J. Previte, and C. T. Rosdey.
Final Report ARO-12845.1-R-L, April 1976. 23 p, 3 fig, 3 tab, 21 ref. DA HC04-75-G-0045.

Descriptors: *Analytical techniques, *Coliforms, *Radioactivity techniques, Enteric bacteria, Pathogenic bacteria, E. coli, Pserdomonas, Salmonella, Assay, Carbon radioisotopes, *Bioassay, *Pollutant identification.
Identifiers: *Radiometric coliform assays.

In research aimed at determining feasibility of adaptation of conventional media for coliform assays to rapid radiometric techniques, lack of specificity when using carbon radioisotopes in detecting coliform bacteria was investigated with Lauryl Triptose, British MacConkey, m-Endo-MF, Nutrient and Brilliant Green Bible broth media. The radioactive substrates included 1-14C lactose, 1-6 14C glucose and 14C formate. The time needed to detect a significant level of carbon-dioxide-14 with a Bactec model 301 varied inversely with the logarithm of the inoculum of several coliform species. When several strains of Escherichia coli were studied individually in addition to strains of Enterobacter agglomerans, Pserdomonas aeruginosar Proteus inconstants, P. morganii, and Salmonella St. Paul, noncoliform species produced carbon dioxide-14 in the media. Production of carbon dioxide-14 by non-coliforms was related to the contamination of the 14C substrate. Contamination was verified by paper chromatography of the 14C lactose solutions followed by washing out of designated loci for lactose and glucose. Scintillation counter analysis showed that 7.6% of the radioactivity was present as 14C glucose. The coliforms and non-coliforms produced carbon dioxide-14 within 24 hours or less in all media. None of the species produced dioxide-14, including E. coli and Enterobacter agglomerans, during incubation at 42C in Korsh's medium. All six species produced carbon dioxide-14 in less than 24 hours after re-inoculation with 0.1 ml of the respective cultures and incubation at 35C. (Auen-Wisconsin)
W77-09514

CLEAN AIR EQUALS DIRTY WATER,
Los Angeles Dept. of Public Works, Calif.
For primary bibliographic entry see Field 5G.
W77-09544

AN AUTOMATIC SYSTEM FOR RAPID DETECTION OF ACUTE HIGH CONCENTRATIONS OF TOXIC SUBSTANCES IN SURFACE WATER USING TROUT,
Netherlands Waterworks, Rijswijk. Testing and Research Inst.
C. L. M. Poels.
In: Biological Monitoring of Water and Effluent Quality, ASTM STP 607, J. Cairns, Jr., K. L. Dickson and G. F. Westlake, Eds., American Society for Testing and Materials, 1977, p. 85-95. 3 fig., 11 ref.

Descriptors: *Monitoring, *Analytical techniques, *Toxins, *Trout, *Water quality control, *Bioindicators, *Fish behavior, Surface waters, Design, *Electrical equipment, Water pollution effects, Fish physiology.
Identifiers: *Continuous biological monitoring systems, Flow through systems, Warning system, Rheotactic response.

Trout normally possess a positive rheotactic behavior, and this behavior is often lost in response to toxic conditions. A continuous automated monitoring system was developed incorporating photoelectric cells and mild electric shock. When a trout no longer displayed positive rheotaxis and moved downstream in the test tank, a series of photoelectric cells were interrupted. This, in turn, caused a mild electric shock to be applied to the downstream portion of the test tank. This electric irritation continued until the fish moved back upstream away from the photcells. A second series of photoelectric cells indicate when the fish remain in the downstream area regardless of the applied electrical impulse. An alarm switch will operate when at least two of the three fish in the same 15-min period pass the photoelectric cells more often than normal or when two fish remain in the extreme downstream portion of the monitoring tank for longer than 5 min. Practical experiences on Rhine water and experiments with toxic substances suggest that this flow-through system is suited for practical application. (Katz)
W77-09590

THE IMPORTANCE OF MONITORING CHANGE,
Academy of Natural Sciences of Philadelphia, Pa.
R. Patrick.
In: Biological Monitoring of Water and Effluent Quality, ASTM STP 607, J. Cairns, Jr., K.L. Dickson and G.F. Westlake, Eds., American Society for Testing and Materials, 1977, p 157-189. 1 tab, 28 fig.

Descriptors: *On-site data collections, *Monitoring, *Pollutant identification, Water quality control, *Biological communities, Rivers, Water quality, Fish, *Methodology, *Invertebrates, *Ecological distribution, Water pollution effects, Analytical techniques, Algae, Benthos, Farm wastes, Estuaries, Environmental effects, Ecosystems, *Dams, Georgia, Texas.
Identifiers: *Savannah River(Georgia), *Sabine River(Texas), *Species diversity, *Long-term monitoring.

This paper demonstrates how 25 years of more-or-less continuous monitoring of the Savannah River and of the Sabine River is able to show the effects of man's use of the river over time. The kinds of perturbation which are evident by such monitoring are the building of dams, the increase in organic pollution, and the effects of small amounts of toxic pollution. It demonstrates how this type of monitoring with stations located in various parts of the river can indicate the origin of pollution loads. Monitoring that is carried out continuously by the use diatometers and intermittently by the study of major groups of organisms living in a river or estuary produces the best combination of facts concerning river conditions and water quality. (Katz)
W77-09591

SOME DISSENTING REMARKS ON 'DELETERIOUS EFFECTS OF COREXIT 9527 ON FERTILIZATION AND DEVELOPMENT',
Exxon Research and Engineering Co., Florham Park, N.J.
For primary bibliographic entry see Field 5C.
W77-09593

METALS IN THE AQUEOUS EFFLUENTS FROM MUNICIPAL INCINERATORS AND AN INCINERATOR-RESIDUE PROCESSING PLANT,
Maryland Univ., College Park.
S. L. Law.
Ph D Thesis, 1976. 212 p.

Descriptors: *Analysis, *Incineration, *Metals, *Heavy metals, *Waste water treatment, Sewage treatment, Analytical techniques, Neutron activation analysis, Hydrogen ion concentration, Temperature, Cadmium, Lead, Zinc, Manganese, Plastics, Biological treatment, Municipal wastes, Pilot plant, Fuels.
Identifiers: Alexandria(Va), Incinerator-residue processing, Atomic absorption, Wet chemical analysis.

Dissolved and undissolved metals content was determined in the water systems of three incinerators and an incinerator-residue processing pilot plant. Techniques used for analysis were atomic absorption, neutron activation, and wet chemical analytical techniques. An Alexandria, Virginia, incinerator using recycled waters was used as a model for determining the maximum pollution potential of the use of municipal wastes as fuel supplements. In this incinerator, zinc concentrations harmful to biological treatment might occur in the recycled spray-chamber water. EPA drinking water standards are exceeded by a few metals in nonrecycled waters, but are continuously exceeded by cadmium, lead, zinc, manganese, and selenium in the recycled spray-chamber water. The effects of pH, CO3(2-), SO4(2-), and Cl(-) on total concentrations are estimated and compared with observed concentrations. It was noticed that pH varied with temperature. No specific time or geographic trends were established in the comparison of solids and dissolved metals in the incinerator and pilot plant effluents. The prediction of sources of metals incinerator effluents was thought possible with the use of an enrichment factor based on aluminum concentrations and crustal abundances of elements. Noncombustible components of urban refuse seemed to be a great contributor of several elements to incinerator effluents. Separation of combustibles prior to use as a fuel supplement was suggested. Plastics, cardboard, newspapers, kraft packaging and magazines produced less than half of the total metals in the combustile fraction. (Collins-FIRL)
W77-09600

5B. Sources Of Pollution

THE EFFECT OF LEACHATE FROM WESTERN RED CEDAR, THUJA PLICATA DONN, ON AQUATIC ORGANISMS,
Washington Univ., Seattle. Cooperative Fisheries Unit.
For primary bibliographic entry see Field 5C.
W77-09101

PERSISTENCE OF PROPANIL, DCA, AND TCAB IN SOIL AND WATER UNDER FLOODED RICE CULTURE,
Texas Agricultural Experiment Station, College Station.
L. E. Deuel, Jr., K. W. Brown, F. C. Turner, D. C. Westfall, and J. D. Price.
Journal of Environmental Quality, Vol 6, No 2, p 127-132, April-June 1977. 6 fig, 3 tab, 14 ref. EPA/S802008.

Descriptors: *Pesticides, *Herbicides, *Irrigation, *Rice, Pollutants, Agricultural chemicals, Analytical techniques, Pesticide residues, Spray, Leaching, Water pollution, Soil contamination, Water pollution sources, Pollutant identification, Water quality, Agronomy, Soil analysis, Water analysis.
Identifiers: *Propanil, *Pesticide persistence, Biological degradation, Beaumont clay soil

ield experiments were conducted to determine
ie residue levels of propanil (3', 4'-
chloropropionanilide), DCA (3, 4-
chloroaniline), and TCAB (3, 3', 4, 4'-
trachloroazobenzene) in the flood water and
eaumont clay soil under normal rice (Oryza sa-
ve L.) cultivation. Propanil applied as a foliar
ray at 3.4 and 6.8 kg/ha 24 hours before flooding
as dissipated from the flood water within 24
urs following the flood. The amount of propanil
ssipated corresponded to the DCA concentration
the flood water at 24 hours, indicative of biolog-
al quantities. Neither propanil nor its metabilites
ere detected in soil samples collected at 2.5-5.0
n and 17.5-20.0 cm below the surface 24 hours
llowing the application of the flood water.
Henley-ISWS)
77-09128

**ERBICIDES FROM CROPPED WATERSHEDS
STREAM AND ESTUARINE SEDIMENTS IN
AWAII,**
awaii Univ., Honolulu. Dept. of Agronomy and
il Science.
E. Green, K. P. Goswami, M. Mukhtar, and H.
Young.
urnal of Environmental Quality, Vol 6, No 2, p
5-154, April-June 1977. 1 fig, 7 tab, 34 ref.
NIHI-SEAGRANT-CR-74-05.

escriptors: *Pesticides, *Herbicides,
gricultural chemicals, *Pollutants, *Water
ality, *Hawaii, Water pollution, Soil contamina-
n, Agronomy, Soil analysis, Sugarcane, Sedi-
ents, Degradation(Decomposition), Runoff,
ytoplankton, Marine biology, Analytical
chniques, Path of pollutants.
entifiers: *Herbicide degradation, *Pesticide
rsistence, Atrazine, Ametryn, Diuron, Or-
nochlorine, Dissipation, Stream sediments,
tuarine sediments, Cropped watersheds, Drip
igations.

nalysis of sediments and soils associated with
o estuaries on Oahu was conducted to deter-
ine if herbicides used in plantation crops reach
astal waters. Analytical procedures were
veloped for simultaneous extraction of atrazine,
etryn, diuron, and DCA. Field soil and runoff
mples from two small monitored watersheds
ovided additional information on the dissipation
diuron in sugarcane and pineapple fields, and on
iron removal in runoff waters. Atrazine and
etryn dissipated rapidly in field soils, and
ither was found normally in stream and
tuarine sediments. Diuron, on the other hand,
as sufficiently persistent in soils and sediments
be found in nearly all sediment samples ob-
ned at 6-month intervals at several sites for each
tuary and its associated streams. Diuron in sedi-
ents was generally less than 500 ppb (oven-dry
sis), but occasionally much higher concentra-
ns were encountered at sites which were subject
localized contaminaion from spray equipment
ding areas. Diuron appears to be transported in
noff waters principally in the solution phase
her than adsorbed on suspended solids.
tuarine waters (West Loch) contained 0.1 to 1
b diuron, while concentrations i runoff waters
re seveal times higher. It is not known if the
ronic low levels adversely affect the ecological
lance of the estuary. (Henley-ISWS)
77-09129

**IOSPHATE AND TRIPOLYPHOSPHATE AD-
RPTION BY CLAY MINERALS AND
TUARINE SEDIMENTS,**
rginia Inst. of Marine Science, Gloucester Point.
r primary bibliographic entry see Field 5C.
77-09152

**IVIRONMENTAL MODELING AND SIMULA-
ON, PROCEEDINGS OF THE CONFERENCE
l.**
vironmental Protection Agency, Washington,
C. Office of Research and Development.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 142, Price codes: A06 in paper copy, A01 in microfiche. Report EPA 600/9-76-016, Held April 19- 22, 1976, Cincinnati, Ohio, EPA Office of Monitoring and Technical Suppor, July 1976. 847 p. Ott, W. R., Ed.

Descriptors: *Environmental engineering, *Mathematical models, *Systems analysis, *Water resources, *Simulation analysis, *Air quality, *Water quality control, Statistical methods, Computers, Sanitary engineering, Civil Engineering, *Economics, Radiation, Management, *Planning.
Identifiers: Econometrics, Noise, Environmental statistics.

This Conference brings together for the first time all the many varied and diverse environmental topics, where mathematicians, statisticians, operations research specialists, systems analysts, engineers, and others with quantitative backgrounds share a common interest. Mathematics and statistics form the foundation for a commmonality of approach among modelers. There is also a commonality of purpose. Most modelers attempt to simulate reality, models share many similarities in terms of applications and uses, and most models are based on or make use of environmental data in some form--particularly monitoring data. The Conference objectives were: 'To perform a state-of-the-art review of predictive modeling and simulation in the environmental decision making process; to share modeling expertise within and across various media; and to examine the adquacy of computer and other resources in the development and use of models.' The task was to create a common language that both modelers and decision makers could readily understand, enabling the modeler to convince more manager to use models in environmental decisions. The papers themselves are the results of considerable and extensive environmental modeling efforts in EPA, State and local governments, universities and private industry in the United States; some papers were contributed by modelers from Canada. The many diverse areas in which mathematical models and simulation have been discussed include air, water, pesticides, solid waste, noise, radiation, health, energy, ecology, planning, management, economics, and others. Out of the 167 papers, more than half deal with water. (Bell-Cornell) (See W77-09155 thru W77-09213)
W77-09154

A REVIEW OF EPA'S GREAT LAKES MODELING PROGRAM,
Environmental Research Lab.-Duluth, Gross Ile, Mich. Large Lakes Research Station.
W. L. Richardson, and N. A. Thomas.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 20-25, July 1976. 8 fig, 10 ref.

Descriptors: *Great Lakes, *Mathematical models, *Water pollution control, Pollutants, Water policy, Decision making, Management, Monitoring, Lake Huron, Lake Erie, Computers, Systems analysis.
Identifiers: Transport models.

The Large Lakes Research Station at Grosse Ile, Michigan, is responsible for implementing the EPA, Office of Research and Development's research program for the Great Lakes. The objective is to be able to describe the transport and fate of pollutants. Mathematical models provide the researcher with the necessary tools for accomplishing this task and, once calibrated and verified, they can be used by water quality managers confronted with making policy decisions. Several levels of modeling research have been initiated which address water quality issues ranging from lake-side to near-shore effects, and from eutrophication to hazardous materials. Concurrent surveillance and experimentation programs are being conducted for model calibration and verification. An overview of the EPA Great Lakes modeling program is presented including results from some specific models. After discussing Great Lakes Modeling in general, the Lake Huron, Lake Erie, Saginaw Bay, and transport modeling efforts are considered. It is concluded that the structuring and calibrating of a model derives benefits long before a final verified model is obtained. Most of the effort in the modeling process is involved with data reduction. (See also W77-09154) (Bell-Cornell)
W77-09157

PLANNING IMPLICATIONS OF DISSOLVED OXXYGEN DEPLETION IN THE WILLAMETTE RIVER, OREGON,
Geological Survey, Portland, Oreg.
D. A. Rickert, W. G. Hines, and S. W. McKenzie.
In: Proceedings of The EPA Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 62-68, July 1976. 8 fig, 2 tab, 7 ref.

Descriptors: *Water pollution control, *Dissolved oxygen, *Planning, *Simulation analysis, *River basins, Mathematical models, Hydrology, Summer, Reservoir storage, Standards, Low-flow augmentation, Systems analysis, Channel morphology, Temperature, Nitrification, *Oregon.
Identifiers: *Willamette River(Oregon).

Basinwide secondary treatment of municipal and industrial wastewaters has resulted in a dramatic increase of summertime dissolved-oxygen (DO) concentrations in the Willamette River. Rates of carbonaceous decay are very low (0.03 to 0.06/day), and point-source BOD loading now accounts for less than one-third of the satisfied oxygen demand. Nitrification is now the dominant DO sink. DO concentrations met the state standards in all reaches of the Willamette during the low-flow period of 1974. Mathematical modeling shows that low-flow augmentation from storage reservoirs was largely responsible for the standards being met. Future achievement of DO standards will require continued low-flow augmentation in addition to pollution control. Summertime flows above 6000 cu ft/s will be needed even with increased treatment removals of oxygen depleting materials. The greatest immediate incremental improvement in DO can be made through reduction in point-source ammonia loading. The pros and cons of upgrading treatment efficiencies for BOD removal would best be determined after ammonia loadings have been reduced to reasonable levels and the possibility of controlling a benthal-oxygen demand in Portland Harbor has been fully assessed. (See also W77-09154) (Bell-Cornell)
W77-09160

URBANIZATION AND FLOODING - AN EXAMPLE,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 4C.
W77-09161

PLANNING MODELS FOR NON-POINT RUNOFF ASSESSMENT,
Environmental Protection Agency, Athens, Ga. Ambient Monitoring Section.
H. A. True.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 74-76, July 1976.

Descriptors: *Water resources, *Planning, *Water quality control, *Computer models, *Runoff, *Simulation analysis, Assessment, Rainfall-runoff relationships, Erosion, Sediment, Probability, Systems analysis, Bodies of water.
Identifiers: *Non-point runoff.

The main objective in assessing nonpoint runoff is to estimate constituent loads for some representative time period for a defined drainage area. No absolutely accurate answers appear economically feasible now or in the future, and getting a grip on the many facets of the problem is very difficult. Presented are several computer-based planning models; they are generalized tools designed for initial gross assessments with refinement capabilities for decision making. Major benefits can be derived by using these modeling processes to calculate relative numerical measures of effects resulting from changes in treatment level percentages, land use allocation percentages, population densities, loading rates, and rainfall event intensities. The models are not costly to run and are not excessively complex; all computer programming is in the FORTRAN-4 language. The individual models discussed herein are: (1) 'Urban, Commercial, and Industrial Runoff;' (2) 'Erosion, Sedimentation, and Rural Runoff;' and (3) 'Total Loadings from Point and Non-Point Sources to Waterbodies.' The accuracy of these models is directly related to the quality of the input data supplied by the user. (See also W77-09154) (Bell-Cornell)
W77-09162

A MATHEMATICAL MODEL OF DISSOLVED OXYGEN IN THE LOWER CUYAHOGA RIVER,
Cleveland State Univ., Ohio.
A. E. Ramm.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, US Environmental Protection Agency, Washington, D.C., p 101-105, July 1976. 3 fig, 3 tab, 7 ref.

Descriptors: *Computer models, *Water quality control, *Dissolved oxygen, *Rivers, *Simulation analysis, Flow, Biochemical oxygen demand, Navigation, Channels, Oxygen sag, Industrial wastes, Municipal wastes, Systems analysis, *Ohio.
Identifiers: Sensitivity analysis, *Lower Cuyahoga River(Ohio).

A computer model was developed to rapidly simulate dissolved oxygen content in the Cuyahoga River under varying conditions of flow and biochemical oxygen demand. The model, which has been used to simulate present and projected dissolved oxygen levels for the navigation channel of the Cuyahoga River, shows that despite the fact that industrial and municipal discharges may be completely eliminated, other factors are significant enough to cause a severe oxygen sag in the navigation channel. (See also W77-09154) (Bell-Cornell)
W77-09163

A WATER RESIDUALS INVENTORY FOR NATIONAL POLICY ANALYSIS,
National Academy of Sciences, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-09164

A MULTI-PARAMETER ESTUARY MODEL,
Tetra Tech., Inc., Lafayette, Calif.
M. W. Lorenzen.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 111-114, July 1976. 9 fig, 8 ref. 6 EPA 8-01-1807.

Descriptors: *Water resources development, *Water quality control, *Estuaries, *Harbors, *Computer models, *Simulation analysis, Planning, Rivers, Tides, Evaluation, Dissolved oxygen, Biochemical oxygen demand, Hydrodynamics, Monitoring, Systems analysis, *Washington.
Identifiers: *Grays Harbor(Wash), Sensitivity analysis, Benthic oxygen demand.

To obtain information needed in the development of a water quality plan for Grays Harbor, in Washington State, the mathematical water quality model EXPLORE has been modified for application to the harbor and the lower Chehalis River. This report describes the model selection criteria and the procedures used in applying the model to a tidally-influenced estuary and river. Results show that model calculations and observed data correlate well, confirming that the model is a valuable tool for evaluating the effects of various waste discharge schemes on the quality of a water body and thus for helping to select a plan for managing water resources. The study also indicates that further information about rates of benthic oxygen demand and the oxygen content of incoming seawater would improve the accuracy of the model calculations. (See also W77-09154) (Bell-Cornell)
W77-09165

MATHEMATICAL MODEL OF A GREAT LAKES ESTUARY,
Environmental Protection Agency, Chicago, Ill.
C. G. Delos.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 115-119, July 1976. 6 fig, 15 ref.

Descriptors: *Great Lakes, *Estuaries, *Lake Erie, *Water quality control, *Simulation analysis, Rivers, Flow, Thermal pollution, Dissolved oxygen, Hydraulics, Mathematical models, Systems analysis, Velocity, *Ohio.
Identifiers: *Black River estuary(Ohio).

A one-dimensional steady-state finite section estuary model was applied successfully to the lower 11 miles of the Black River in Ohio to simulate water quality behavior. The approach used was necessitated by the fact that water quality in the lower portion of the river is strongly influenced by Lake Erie waters. The one-dimensional estuary model represents a compromise between conventional stream models, which are fundamentally inadequate to simulate this type of system, and multi-dimensional models, which require considerably greater resources in order to be applied successfully. The approach used is likely to be applicable to the lower reaches of nearly all rivers tributary to the Great Lakes. (See also W77-09154) (Bell-Cornell)
W77-09166

COST-EFFECTIVE ANALYSIS OF WASTE LOAD ALLOCATIONS,
Environmental Protection Agency, Washington, D.C.
J. Kingscott.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 120-125, July 1976. 8 fig, 1 tab, 10 ref.

Descriptors: *Cost analysis, *Wastewater treatment, *Water pollution control, *Standards, *Streams, Effects, *Simulation analysis, *Dissolved oxygen, Effluents, Streamflow, Investment, Biochemical oxygen demand, Optimization, Equations, Systems analysis.
Identifiers: *Cost effectiveness, *Waste load allocation, *Deterministic models.

This paper considers the relative consequences of some procedures used in the application of deterministic models, particularly in the choice of design conditions and the seasonal application of waste load allocations. It was desired that the analysis be general and applicable to a number of situations and issues. It was also necessary that it address real situations, as opposed to being hypothetical. The resulting analysis considers the costs of advanced waste treatment and the effects in terms of a risk for the violation of dissolved oxygen stream standards. An effluent analysis was undertaken to define an empirical procedure for generating effluent loading factors. The waste treatment costs were considered by combining flow dependent unit processes to form viable treatment systems. Five water quality limited segments were analyzed using historical U.S. Geological Survey streamflow records. Cost-effective curves were generated to define feasible treatment options for nitrogenous and carbonaceous BOD removal. The optimal investment strategy for levels of treatment higher than secondary was then used to study issues related to waste load allocations. (See also W77-09154) (Bell-Cornell)
W77-09167

WASTE ALLOCATIONS IN THE BUFFALO (NEW YORK) RIVER BASIN,
Versar, Inc., Springfield, Va.
D. H. Sargent.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, US Environmental Protection Agency, Washington, D.C., p 126-128, July 1976. 1 tab, 1 ref.

Descriptors: *River basins, *Water quality control, *Simulation analysis, *Industrial wastes, Hydraulics, Combined sewers, Overflow, Thermal pollution, Computer models, Systems analysis, *New York.
Identifiers: *Buffalo River basin(NY), *Waste load allocation, Plug-flow model, Completely mixed model.

A water quality simulation model, VERWAQ, was developed for the complex hydraulic and waste load characteristics of the Buffalo River. These characteristics include very low water velocities, oscillating flow, upstream flow, inter-basin transfer of water, many critical conservative and non-conservative water quality parameters, thermal pollution, and important non-point as well as point sources of wastes. The developed and verified model was used to project water quality and to allocate waste loads. Projected water quality data for both the average summer time and critical flow are listed. Results show that the projected water quality at critical flow conditions marginally came within the standards for temperature and dissolved oxygen. However, more stringent waste allocations were recommended for iron. (See also W77-09154) (Bell-Cornell)
W77-09168

STREAM MODELING AND WASTE LOAD ALLOCATION,
Indiana State Board of Health, Indianapolis. Div. of Water Pollution Control.
J. Y. Hung, A. Hossain, and T. P. Chang.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 129-132, July 1976. 10 ref.

Descriptors: *Water pollution control, *Streams, *Indiana, *Computer models, Dissolved oxygen, Biochemical oxygen demand, Ammonia, *Simulation analysis, Wastes, Evaluation, Methodology, Climatic data, Standards, Equations, Systems analysis.
Identifiers: *Waste load allocation, Streeter-Phelps equation, Cost effectiveness, Cost minimization.

The Indiana Stream Pollution Control Board conducted an intensive stream modeling program on Indiana's major rivers during the past three years. These stream models were used primarily for the purpose of waste load allocation. This paper describes the stream self-purification system models for BOD, DO and ammonia. In addition to the analysis of model components, problems in evaluating system parameters are examined. The formulation of the waste load allocati

ethodology and the issues in allocation imple-
entations are reviewed. Proposed are the cost ef-
ctiveness approach and the equity approach.
mputer modeling of stream self-purification
stems is a useful tool for water quality manage-
ent, especially in a dynamic program like waste
d allocation. However, one must be aware of its
nitations which can cause difficulties in model
rification. (See also W77-09154) (Bell-Cornell)
77-09169

**ATUXENT RIVER BASIN MODEL RATES
UDY,**
vironmental Protection Agency, Annapolis,
d. Annapolis Field Office.
H. Pheiffer, L. J. Clark, and N. L. Lovelace.
Proceedings of the Conference on Environ-
ental Modeling and Simulation, April 19-22,
76, Cincinnati, Ohio. Report EPA 600/9-76-016,
S. Environmental Protection Agency, Washing-
n, D.C., p 133-138. 6 fig, 4 ref.

escriptors: *Water quality control, *Surveys,
omputer models, *Simulation analysis, River
sins, Effluents, Treatment facilities, Summer,
aste water treatment, Biochemical oxygen de-
nd, Streams, Systems analysis, *Maryland.
entifiers: *Patuxent River basin(Maryland),
Vater quality data.

uring the summer seasons of 1973 and 1975, in-
nsive water quality surveys were carried out in
Patuxent River Basin for the purposes of
thematical model calibration and validation. In
summer of 1973, the Patuxent was receiving
condary effluent from eight major municipal
atment plants. No significant industrial waste
charges are present in the Patuxent system. A
ady state water quality model was calibrated
validated using the data collected from the
73 field surveys. During 1975, a major treatment
nt was upgraded to include high BOD removal
nitrification; new field surveys were con-
cted and the model was recalibrated and
idated to reflect changes in the instream reac-
n rates as a result of the changed effluent stu-
s, data results, model application procedures
, perhaps most importantly, how the
ocedures that were used could be improved.
e also W77-09154) (bell-Cornell)
77-09170

**FICIENT STORAGE OF URBAN STORM
ATER RUNOFF,**
vironmental Protection Agency, Denver, Colo.
primary bibliographic entry see Field 5D.
7-09171

**INT USE OF SWMM AND STORM MODELS
R PLANNING URBAN SEWER SYSTEMS,**
nton Bogert Associates, Fort Lee, N.J.
primary bibliographic entry see Field 5D.
7-09172

MULATION OF AGRICULTURAL RUNOFF,
drocomp, Inc., Palo Alto, Calif.
S. Donigian, Jr., and N. H. Crawford.
Proceedings of the Conference on Environ-
ntal Modeling and Simulation, April 19-22,
6, Cincinnati, Ohio. Report EPA 600/9-76-016,
Environmental Protection Agency, Washing-
, D.C., p 151-155, July 1976. 7 fig, 15 ref.

scriptors: *Watersheds(Basins), *Agricultural
off, *Simulation analysis, *Water quality, Ef-
s, Management, Computer models, Al-
ithms, Hydrology, Sediments, Pesticides,
rients, Systems analysis.

Agricultural Runoff Management (ARM)
del described in this paper simulated runoff,
w accumulation and melt, sediment loss, pesti-
-soil interactions, and soil nutrient transforma-
s on small agricultural watersheds. The results of Model testing for simulation of runoff, sediment, and pesticide loss are presented to demonstrate possible uses of the ARM Model as a tool for evaluating the water quality impact of agricultural practices. Testing of the Model has indicated that the hydrology and sediment simulations reasonably represent the observed data while the pesticide simulations can show considerable deviation from recorded values. The effects of tillage operations and management practices need to be further evaluated for hydrology and sediment production. There is a need for further investigation of the processes of pesticide degradation and pesticide-soil interactions. (See also W77-09154) (Bell-Cornell)
W77-09173

MODELING THE EFFECT OF PESTICIDE LOADING ON RIVERINE ECOSYSTEMS,
Southeast Environmental Research Lab., Athens, Ga.
J. W. Falco, and L. A. Mulkey.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 156-160, July 1976. 5 fig, 2 tab, 14 ref.

Descriptors: *Rivers, Effects, *Pesticides, *Simulation analysis, *Water quality control, *Fish, Computer models, Reach(Streams), Watersheds(Basins), Pollutants, Evaluation, Systems analysis, Equations, *Forecasting.
Identifiers: *Malathion, *Non-point source problems.

A mathematical model for predicting the fate and transport of malathion in riverine ecosystems has been developed. The model predicts the concentration of malathion down the length of a river reach as a function of time and non-point source loading. Model simulations predict that standing crops of various fish species and other organisms decrease with increasing malathion concentration. Mass die-offs have been predicted at critical malathion loadings and concentrations. (See also W77-09154) (Bell-Cornell)
W77-09174

RADIONUCLIDE TRANSPORT IN THE GREAT LAKES,
Office of Radiation Programs, Washington, D.C.
R. E. Sullivan, and W. H. Ellett.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 161-165, July 1976. 1 fig, 2 tab, 12 ref.

Descriptors: *Water pollution control, *Great Lakes, *Nuclear wastes, United States, Canada, Computer programs, Equations, *Mathematical models, Systems analysis, *Simulation analysis, *Forecasting, Radioisotopes.
Identifiers: *Radionuclide levels, Power stations, Dose rates.

A mathematical model has been developed to predict radionuclide levels in the Great Lakes due to nuclear power generation in the United States and Canada. The calculations have been used to verify the feasibility of proposed International water quality objectives for radioactivity in the Lakes. Dose rates and doses to reference-man from the ingestion to Lake waters are predicted based on expected future power generation in this region. Results show that by far the largest cumulative dose is due to the concentration of tritium in Lake waters. (See also W77-09154) (Bell-Cornell)
W77-09175

FEDBAK03 - A COMPUTER PROGRAM FOR THE MODELLING OF FIRST ORDER CONSECUTIVE REACTIONS WITH FEEDBACK UNDER A STEADY STATE MULTIDIMENSIONAL NATURAL AQUATIC SYSTEM,
Environmental Protection Agency, New York. Data Systems Branch.
G. A. Nossa.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 166-170, July 1976. 5 fig, 8 ref.

Descriptors: *Computer models, *Computer programs, *Aquatic environment, *Water quality, Kinetics, Dissolved oxygen, Equations, Estuaries, Nitrification, Nitrogen cycle, Systems analysis.
Identifiers: Nitrogenous species.

Described is a computer model used to compute the steady-state distribution of water quality variables undergoing consecutive reactions with feedback and following first order kinetics. The program has been developed in a general form by is specifically applicable to the reactions observed by nitrogenous species and the associated dissolved oxygen uptake in the natural environment. The basis for this model is the theory of conservation of mass. The approach used to solve the equations is a finite difference scheme developed by Thomann, which has been shown to be a very effective tool in the field of water quality management. (See also W77-09154) (Bell-Cornell)
W77-09176

MODELING THE HYDRODYNAMIC EFFECTS OF LARGE MAN-MADE MODIFICATION TO LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
J. F. Paul.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 171-175, July 1976. 9 fig, 4 ref.

Descriptors: *Lakes, *Hydrodynamics, Effects, *Lake Erie, *Simulation analysis, Numerical analysis, Project feasibility, Summer, Water temperature, Wind velocity, Islands, Hypolimnion, Epilimnion, Isotherms, Systems analysis, *Forecasting, Ohio.

The real value of numerical models is in their predictive capability. A three-dimensional hydrodynamic model is described which can be used as a predictive tool for assessing the possible effects of large man-made modifications to lakes. As part of a feasibility study for a proposed lake jetport in the vicinity of Cleveland, Ohio, the numerical model describing the hydrodynamics of the Lake Erie area near that city was developed to help determine the possible effects of such a jetport on the summer temperature structure in the lake. The results presented are qualitative. (See also W77-09154) (Bell-Cornell)
W77-09177

AN EMPIRICAL MODEL FOR NUTRIENT RATES IN LAKE ONTARIO,
Environmental Protection Agency, Rochester, New York. Rochester Field Office.
For primary bibliographic entry see Field 5C.
W77-09178

AN ENVIRONMENTAL RESIDUAL ALLOCATION MODEL,
Energy Resources Co. Inc., Cambridge, Mass.
M. Allen, and F. Lambie.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 236-240, July 1976. 1 fig, 1 tab, 8 ref.

Descriptors: *Environmental control, *Model studies, *Water utilization, Effects, Regional analysis, *Energy, Pollutants, Assessment, Control, Technology, Water quality, Systems analysis, Forecasting, Water allocation(Policy).
Identifiers: *Residuals allocation model, *Air quality model.

An environmental residuals technique has been developed to quantitatively evaluate the environmental implications of Project Independence. Three models are discussed that compare the regional impacts of different scenarios of energy development: a Residual Allocation Model to predict the quantity and distribution of 15 energy-associated pollutant loadings; a Water Use Model to assess the compatibility of water available and water required for projected energy use; and an Air Quality Model to compare the impacts of the scenarios on ambient air quality. The approach is useful for scenario comparison, but it is limited in degree of detail and absolute accuracy. It is concluded that the level of control technology achieved is more critical environmentally than the choice of scenarios. Further work should include a refinement and extension of the residuals studies and a more detailed sensitivity analysis, especially with respect to control technology and facility siting assumptions. (See also W77-09154) (Bell-Cornell)
W77-09179

RADIONUCLIDE REMOVAL BY THE PH ADJUSTMENT OF PHOSPHATE MILL EFFLUENT WATER,
Eastern Environmental Radiation Facility, Montgomery, Ala.
For primary bibliographic entry see Field 5D.
W77-09180

WATER QUALITY MODELING IN TEXAS,
Texas Water Quality Board, Austin. Engineering Analysis and Modeling Section.
J. J. Beal, A. P. Covar, and D. W. White.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 326-329, July 1976.

Descriptors: *Water quality control, *Mathematical models, *Texas, *Legislation, Evaluation, Wastes, Planning, River basins, Computer models, Management, Systems analysis, Decision making, Water policy.

The State of Texas, acting through the Texas Water Quality Board, has been intensely interested in Water quality modeling for the past three years. Previously, this effort dealt mainly with the waste load evaluation program, made necessary for the allocation of point source waste discharges by Public Law 92-500. A considerable amount of water quality modeling will be required for the evaluation of treatment alternatives which will be developed under Section 208 of the same law. This modeling effort will consider the effects of point and nonpoint waste sources on receiving water quality, both under steady-state and time variable conditions. This paper shows how applied models are used in planning problems and water quality management decisions in the State of Texas. The various types of models currently in use are discussed along with the State's future need for models. (See also W77-09154) (Bell-Cornell)
W77-09181

A DYNAMIC WATER QUALITY SIMULATION MODEL FOR THE THAMES RIVER,
Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch.
D. G. Weatherbe.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 330-334, July 1976. 4 fig, 1 tab, 6 ref.

Descriptors: *Water quality control, *Simulation analysis, *River basins, *Evaluation, *Alternative planning, Management, Drainage systems, Computer models, Streamflow, Sewage treatment, Probability, Channel flow, Temperature, Dissolved oxygen, Reservoirs, Equations, Systems analysis, *Canada.
Identifiers: *Thames River(Ontario Canada), Waste loading.

The Thames River basin in Ontario, Canada is experiencing problems of water quality and flooding, heightened by intensive agricultural use and an expanding urban population. A stucy was initiated to provide solutions to these problems as well as to problems of erosion, unsatisfied recreational demand, and conflicts in reservoir use. In order to provide a suitable tool for the analysis and projection of the water quality problem, a dynamic water quality simulation model was developed and applied to the major growth center, the City of London. This paper describes the major objectives of the water quality modeling, the model structure and processes, and the model input and out summaries. Application of the model to evaluate various water quality management options is described. (See also W77-09154) (Bell-Cornell)
W77-09182

DISPERSION MODEL FOR AN INSTANTANEOUS SOURCE OF POLLUTION IN NATURAL STREAMS AND ITS APPLICABILITY TO THE BIG BLUE RIVER (NEBRASKA),
Nebraska Natural Resources Commission, Lincoln.
M. K. Bansal.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 335-339, July 1976. 4 fig, 1 tab, 9 ref.

Descriptors: *Dispersion, *Natural streams, *Water pollution control, *Simulation analysis, Behavior, Equations, Pollutants, Mathematical models, Systems analysis, Sampling, *Nebraska.
Identifiers: *Big Blue River(Neb), Continuous plane source, Constituent concentration.

Dispersion behavior in natural streams depends upon dispersion rates, channel configuration, turbulent flow characteristics, and biochemical changes taking place in the stream environment. This is true for an instantaneous source of pollution for during transition periods when mixing is not complete in the reach. Therefore, the prediction of turbulent dispersion coefficients is important in the determination of water quality constituent concentration in natural streams. However, the longitudinal dispersion rates predicted by the QUAL model are low, which results in higher concentration peaks of short durations. In steady-state conditions, for a continuous plane source of pollution, the dispersion behavior in natural streams does not depend upon the dispersion rates. Under these conditions, an exact solution of the dispersion equation is available, and as such, a finite-difference approximation technique should not be used. One- and three-dimensional mathematical models of dispersion are presented herein. The turbulent dispersion coefficients calculated were tested for the Big Blue River in Nebraska. The dispersion model developed is not dependent on channel size or regional location of the stream. (See also W77-09154) (Bell-Cornell)
W77-09183

SELECTING THE PROPER REAERATION COEFFICIENT FOR USE IN WATER QUALITY MODELS,
Texas Water Quality Board, Austin. Administrative Operations.
For primary bibliographic entry see Field 5G.
W77-09184

RECEIV-II, A GENERALIZED DYNAMI PLANNING MODEL FOR WATER QUALIT MANAGEMENT,
Raytheon Co., Portsmouth, R.I. Oceanographi and Environmental Services.
C. V. Beckers, P. E. Parker, R. N. Marshall, and S G. Chamberlain.
In: Proceedings of the Conference on Enviro mental Modeling and Simulation, April 19-2 1976, Cincinnati, Ohio. Report EPA 600/9-76-01 U.S. Environmental Protection Agency, Washin ton, D.C., p 344-349, July 1976. 1 tab, 11 ref.

Descriptors: *Water quality control, *Model st dies, *Simulation analysis, *Streamflow forecas ing, *River basins, Estuaries, Planning, Co straints, Computer models, Computer program Dissolved oxygen, Biochemical oxygen deman Equations, Systems analysis, *Rhode Islan *Connecticut.
Identifiers: *Pawtuxet River(Rhode Island), No walk Harbor(Connecticut), Critical period, Da requirements.

Under funding by the U.S. Environmental Prote tion Agency, Raytheon has developed t RECEIV-II Water Quality Model. This pap discusses the background of the model develo ment work and describes the model in some deta The model is intended for use in forecasting wat quality on a basin-wide scale, under alternati conditions of point and non-point discharg streamflow and desired waterway usage. T emphasis is on forecasting the far-field effects an individual discharge or assembly of discharge Examples include the installation of addition treatment capacity at a municipal or industri discharge and development of a new industri site. To illustrate model applications, results a presented from its use on the Pawtuxet River Rhode Island and Norwalk Harbor in Connecticu Preliminary results of the load allocation work the Pawtuxet River illustrate the importance nitrogenous oxygen demand in achieving wat quality standards for rivers. With respect to t total treatment plant-river system, winter cond tions may turn out to be the 'critical period' f maintenance of the water quality standards; similar conclusion is reached for Norwalk Harb but for different reasons. The paper conclud with a brief discussion of some of the appare limitations of the model and area in which i provements have already been made by Raytheo (See also W77-09154) (Bell-Cornell)
W77-09185

MODIFICATIONS TO QUAL - II TO EVAL ATE WASTEWATER STORAGE,
Environmental Protection Agency, Atlanta, G Technical Support Branch.
For primary bibliographic entry see Field 5D.
W77-09186

WATER POLLUTION MODELING IN TH DETROIT METROPOLITAN AREA,
Detroit Water and Sewerage Dept.Mich.; a Wayne State Univ. Detroit, Mich. Coll. of E gineering.
M. Selak, R. Skrentner, C. Harlow, and J. Anderson.
In: Proceedings of the Conference on Enviro mental Modeling and Simulation, April 19-2 1976, Cincinnati, Ohio. Report EPA 600/9-76-01 U.S. Environmental Protection Agency, Washi ton, D.C., p 353-357, July 1976. 6 fig, 7 ref.

Descriptors: *Water pollution contr *Simulation analysis, *Computer models, Wa water(Pollution), Flow, Treatment facilitie Storm water, Runoff, Evaluation, Combin sewers, Algorithms, Operations researc *Michigan.
Identifiers: *Detroit(Mich).

he EPA Storm Water Management Model SWMM) has been used to simulate waste water ow in the Oakwood Sewer District of Detroit. his District is a 1,500-acre residential/industrial rea with combined sewers from which flow is umped to the Detroit waste water treatment plant nd/or to the Rouge River during periods of high ainfall. After several minor modifications to the WMM, the simulation results from the Runoff nd Transport blocks of SWMM compared avorably with observations by the computerized onitoring system of the Detroit Water and ewerage Department. Output from the SWMM ransport block is routed to a computer simulation f the Detroit waste water treatment plant, STP-IM. This model enables the user to evaluate the ffect of storm flow on plant performance and to ompare various strategies for treating the stored aste water. The simulated results from STPSIM ppear to be quite representative of the actual eatment plant performance. However, model alibration has been difficult due to a shortage of al-time data from the plant. All of the water pol-tion simulation models operate on Wayne State niversity's 360/67 computer system in time shar-g or batch mode through an executive program, e Detroit Water Quality Information System WQIS). In addition to the above models, WQIS contains census and local climatological ata for the Detroit area which was used to pro-de some of the necessary input for the SWMM. ee also W77-09154) (Bell-Cornell)
77-09187

ENERALIZED METHOD FOR EVALUATING RBAN STORM WATER QUALITY MANAGE-IENT STORAGE/TREATMENT ALTERNA-IVES,
lorida Univ., Gainesville. Dept. of Environmen-l Engineering Sciences.
or primary bibliographic entry see Field 5D.
77-09188

ODELING HYDROLOGIC LAND-USE IN-ERACTIONS IN FLORIDA,
ice Univ., Houston, Tex. Dept. of Environmen-l Science and Engineering.
P. Bedient, W. C. Huber, and J. P. Heaney.
: Proceedings of the Conference on Environ-ental Modeling and Simulation, April, 19-22, 76, Cincinnati, Ohio. Report EPA 600/9-76-016, .S. Environmental Protection Agency, Washing-n, D.C., p 362-366, July 1976. 5 fig, 12 ref.

escriptors: *Hydrology, *Land use, *Simulation alysis, *River basins, *Florida, Surface runoff, ater quality, Drainage patterns(Geologic), atersheds(Basins), Water balance, Flood plains, quations, Flood routing, Storage, Treatment, onitoring, Pollutants, Lake basins, Equations, athematical models, Systems analysis.
entifiers: *Kissimmee River Basin(Fla), Marsh eas, Soil storage, Nutrient loading rates, Linear uskingum method.

technique is developed to describe and quantify rious hydrologic-land use interactions within a orida river basin. Surface runoff quantity and ality are estimated as a function of land use and ainage patterns at several levels of resolution in-uding the river basin, tributary watersheds, lake sins, and marsh areas. A hydrologic-land use odel based on a daily water balance is applied to ch soil-land use complex in the watershed to timate soil storage and total runoff. The overall sin response seems to be more sensitive to the nd drainage pattern than to the condition of the rrow river flood plain. Potential nutrient loading tes are calculated using measured concentra-ns of total P and predicted runoff volumes. The ainage density index correlates with observed ncentrations and loading rates for the tributary tersheds. The detention time parameter for rious hydrologic components in the basin in-cates the potential for control of runoff quantity d quality through on-site storage in marsh, pond, and lake areas. Excessive drainage activities have led to higher nutrient loads and decreased detention times in the river basin. (See also W77-09154) (Bell-Cornell)
W77-09189

MODELING URBAN RUNOFF FROM A PLANNED COMMUNITY,
Espey, Huston and Associates, Inc., Austin, Tex.
E. V. Diniz, D. E. Holloway, and W. G. Characklis.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 367-371, July 1976. 6 fig, 4 tab, 6 ref.

Descriptors: *Water management(Applied), *Urban runoff, *Water utilization, Computer models, Storm water, Community development, Watersheds(Basins), Drainage, Rainfall, Computer programs, Water quality, Texas, Systems analysis, Simulation analysis.
Identifiers: *EPA storm water management model, Data sampling, Pollutant loading.

A management strategy for utilization of water resources in the planned community of The Woodlands, near Houston, Texas, is being developed by modification and Application of the EPA Storm Water Management Model (SWMM). Selected sites on Panther Branch, which flows through The Woodlands, and on Hunting Bayou, a completely developed watershed within the city limits of Houston were modeled for testing and verification of the modifications to the SWMM. The capacity of the SWMM to model urban runoff quantity has een improved to include the 'natural' drainage concepts of The Woodlands and the infiltration computation model in the SWMM is now capable of operting with a rainfall record which includes periods of zero rainfall. Three subroutines have been written to operate in conjunction with the SWMM. The three subroutines generate normalized area-discharge curves for natural sections, model baseflow conditions, and model the operation of porous pavements, respectively. Verification of the SWMM with regard to suspended solids and BOD was attempted, and modifications to predict COD, Kjeldahl nitrogen, nitrates and phosphates were performed. (See also W77-09154) (Bell-Cornell)
W77-09190

EVALUATION AND SELECTION OF WATER QUALITY MODELS: A PLANNER'S GUIDE,
Systems Control, Inc., Palo Alto, Calif.
E. J. Finnemore, and G. P. Grimsrud.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April, 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 391-395, July 1976. 4 tab, 2 ref.

Descriptors: *Water quality control, *Mathematical models, *Planning, *Evaluation, *Simulation analysis, Management, Constraints, Costs, Behavior, Estuaries, Streams, Lakes, Economics, Systems analysis.
Identifiers: *Cost-effectiveness, Resource needs.

As part of a management guide for planners, Systems Control, Inc., recently developed for the Environmental Protection Agency systematic procedures for evaluating and selecting receiving water quality models. Using these procedures, each model is evaluated on the basis of many considerations, which include both the technical principles and capabilities of the models and such resource needs and constraints as additional labor, specialized technical expertise, time and funds, and computer limitations. All these considerations are combined into a single performance index. A procedure is also prescribed for combining the various component costs of applying the model into a single overall cost. A comparison of this overall application cost with the model's performance index may then be used as a guide to model selection. The selection procedure is organized into phases of increasing level of detail, each of which may or may not be required, depending upon the nature of the planning problem being confronted. (See also W77-09154) (Bell-Cornell)
W77-09191

A RESOURCE ALLOCATION MODEL FOR THE EVALUATION OF ALTERNATIVES IN SECTION 208 PLANNING CONSIDERING ENVIRONMENTAL, SOCIAL AND ECONOMIC EFFECTS,
Grumman Ecosystems Corp., Bethpage, N.Y.
For primary bibliographic entry see Field 5G.
W77-09192

REGIONAL RESIDUALS-ENVIRONMENTAL QUALITY MANAGEMENT MODELS: APPLICATION TO EPA'S REGIONAL MANAGEMENT PROGRAMS,
Resources for the Future, Washington, D. C. Quality of the Environment Program.
For primary bibliographic entry see Field 5G.
W77-09193

A COMPUTER MODELING STUDY TO ASSESS THE EFFECTS OF A PROPOSED MARINA ON A COASTAL LAGOON,
Connell/Metcalf and Eddy, Coral Gables, Fla.
For primary bibliographic entry see Field 5C.
W77-09194

COMPUTER SIMULATION OF LONG-TERM SECONDARY IMPACTS OF WATER AND WASTEWATER PROJECTS,
Boyle Engineering Corp., Newport Beach, Calif. Environmental Studies.
G. A. Guter, J. F. Westermeier, and T. C. Ryan.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 424-428, July 1976. 3 fig, 4 tab, 3 ref.

Descriptors: *Computer models, *Simulation analysis, *Water resources, *Waste water(Pollution), *Projects, Environment, Planning, Decision making, Regions, Systems analysis, California, Water supply, Irrigation, Arizona.
Identifiers: Environmental policy, Natural sciences, Social sciences, Environmental studies, Environmental design arts, *Environmental impacts.

Applications of the KSIM technique were made in the course of environmental studies for water and wastewater projects. The National Environmental Policy Act mandates a systematic interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decision making which will have an impact on man's environment. KSIM is being employed as a part of this interdisciplinary approach. This application of KSIM requires modification of published techniques for water resource planning and adaptation to the cases discussed. The computer simulation, as applied to three water and wastewater projects, is discussed herein. These projects include an Area-wide Facilities Plan for the Las Virgenes Municipal Water District in Los Angeles and Ventura Counties, California: a Master Plan of Water and Reclamation Facilities for Los Alisos Water District, Orange County, California; and an irrigation project on the Colorado River Indian Researvation in western Arizona. In considering the application of KSIM to the above projects, major advantages, acceptability to reviewers and agencies, types of projects to which KSIM appears applicable, and futher research on the methods are discussed. (See also W77-09154) (Bell-Cornell)
W77-09195

ENVIRONMENTAL, FISCAL AND SOCIO-ECONOMIC IMPACT OF LAND USE POLICIES: TOWARD AN INTERACTIVE ANALYSIS,
Meta Systems Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6B.
W77-09196

ECONOMIC FORECASTING FOR VIRGINIA'S WATER RESOURCE PROGRAMS,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 6B.
W77-09197

A RIVER BASIN PLANNING METHODOLOGY FOR STREAMS WITH DISSOLVED OXYGEN AND EUTROPHICATION CONSTRAINTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
T. M. Walski, and R. G. Curran.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 532-536, July 1976. 3 fig, 5 ref.

Descriptors: *River basins, *Planning, *Methodology, *Water quality control, *Linear programming, *Waste water treatment, *Pollutants, Optimization, Economic efficiency, Dissolved oxygen, Standards, Simulation analysis, Eutrophication, Constraints, Computer models, Computer programs, Streams, Effluents, Algorithms, Programs, Equations, Systems analysis, Mathematical models.
Identifiers: *Cost minimization, Sensitivity.

Optimal Waste Load Allocation Program 2 (OWLAP2) is a user-oriented optimization model which selects wastewater treatment levels to meet water quality constraints at least cost. This program solves the problem faced by river basin planners, who by merely insuring that each wastewater discharge meets effluent standards, will still be unable to meet water quality standards. The program selects the minimum cost combination of additional treatment alternatives in the basin which will insure that water quality standards will be met. OWLAP2 first simulates water quality in the river reaches; it then perturbs the initial conditions to determine the sensitivity of water quality to changes in effluent. It uses these sensitivities as inputs to an algorithm for linearizing nonlinear systems so that they can be optimized utilizing linear programming. (See also W77-09154) (Bell-Cornell)
W77-09198

APPLICATION OF STORM AND SWMM FOR ASSESSMENT OF URBAN DRAINAGE ALTERNATIVES IN CANADA,
MacLaren (James F.) Ltd., Willowdale (Ontario).
P. E. Wisner, A. F. Roake, and A. F. Ashamalla.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 563-567, July 1976. 1 fig, 3 tab, 18 ref, append.

Descriptors: *Urban runoff, *Urban drainage, *Model studies, *Simulation analysis, *Computer models, *Flood control, *Water pollution control, *Alternative planning, Research, Decision making, Assessment, *Canada, Watersheds(Basins), Methodology, Hydrologic data, Sewers, Systems analysis.
Identifiers: *Screening models.

A limited program of research and several applications of urban runoff models indicate that there is no unique pattern for model application in drainage and pollution control studies. Use of the simplest model compatible with the requirements of planners and decision makers helps to minimize unnecessary data collection and avoid communication problems. More sophisticated models will be required as a study progresses from screening and initial planning phases to the final planning and design phases. STORM is considered primarily as a screening model for comparison of alternatives, identification of critical events, and problem definition. For predominately urban areas, a lumped SWMM and a recently developed Generalized Quality Model are considered as planning models for the analysis of critical events. A detailed SWMM and the WREM are considered as tools for final planning and design work. A computerized unit hydrograph approach is preferred for planning in areas with low percentage imperviousness, while the comprehensive analysis of Stanford-type models is recognized as necessary for major projects in large watersheds. (See also W77-09154) (Bell-Cornell)
W77-09199

SIMULATION AND MATHEMATICAL MODELING OF WATER SUPPLY SYSTEMS - STATE-OF-THE-ART,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 4A.
W77-09200

CAPACITY EXPANSION FOR MUNICIPAL WATER AND WASTEWATER SERVICES: INCORPORATION OF UNCERTAINTY,
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W77-09201

ADAPTIVE SHORT-TERM WATER DEMAND FORECASTING,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6D.
W77-09202

HYDROLOGIC IMPACT STUDIES OF ALTERNATIVES TO MEET WATER NEEDS IN SOUTH CENTRAL PENNSYLVANIA,
Resource Analysis Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6D.
W77-09203

THE OPERATIONAL WATER QUANTITY MODEL,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
For primary bibliographic entry see Field 4A.
W77-09204

NEW MODELS FOR OPTIMAL SEWER SYSTEM DESIGN,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-09205

SWAN, A SEWER ANALYSIS AND MODELING SYSTEM,
Erdman Anthony, Associates. Rochester, N.Y.
For primary bibliographic entry see Field 5D.
W77-09206

ON-LINE MODELS FOR COMPUTERIZED CONTROL OF COMBINED SEWERS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-09207

MATHEMATICAL MODELS FOR CALCULATING PERFORMANCE AND COST OF WASTE WATER TREATMENT SYSTEMS,
Municipal Environmental Research Lab., Cincinnati, Ohio. Systems and Economic Analysis Section.
For primary bibliographic entry see Field 5D.
W77-09208

THE COST OF WATER SUPPLY UTILITY MANAGEMENT,
Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
For primary bibliographic entry see Field 6B.
W77-09209

MATHEMATICAL MODELING OF DUAL WATER SUPPLY SYSTEMS,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 6D.
W77-09210

DATA COLLECTION FOR WATER QUALITY MODELING IN THE OCCOQUAN WATERSHED OF VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W77-09211

WATER SUPPLY SYSTEMS PLANNING MANAGEMENT AND COMMUNICATION THROUGH AN INTERACTIVE RIVER BASIN SIMULATION MODEL,
Ohio River Div. Labs., Mariemont.
For primary bibliographic entry see Field 6B.
W77-09212

FUTURE DIRECTIONS IN URBAN WATER MODELING,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5D.
W77-09213

MALVERN URBAN TEST CATCHMENT, VOLUME I,
Canada Centre for Inland Water, Burlington (Ontario).
For primary bibliographic entry see Field 4D.
W77-09217

ENVIRONMENTAL CONTAMINANTS INVENTORY STUDY NO. 3, THE PRODUCTION, USE AND DISTRIBUTION OF LEAD IN CANADA,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
T. D. Leah
Report Series No 41, 1976, 94 p, 6 fig, 28 tab, 1 ref, 3 append, 3 graphs, 6 maps.

Descriptors: *Lead, *Environmental effects, Watersheds(Basins), *Human diseases, Evaluation, Analysis, Industrial production, Distribution, Pollution, Soils, Vegetation, Aquatic populations, Mammals, Mining, Atmosphere, Fallout, Gasoline, *Canada, *Path of pollutants, Recycling, Air pollution, Industrial wastes, Water pollution effects.

This study is the third in the Environmental Contaminants Inventory Series, and the first to present data in terms of watershed basins. A literature review is included on lead in the environment and the effects of lead on human health. The flow of lead through the Canadian economy is analyzed, focussing on the production of lead and the use of lead in manufacturing. Lead releases to the atmosphere resulting from these activities and the consumption of leaded gasoline are estima

in terms of aggregated watershed basins. Background information is provided outlining the occurrence, physical and chemical properties, production processes, global economic significance, major uses of lead and future demand for lead. Lists of industries reporting lead consumption to Statistics Canada in 1972 and major Canadian producers of recycled lead are included. (WATDOC)
W77-09221

EFFECTS OF IMPOUNDMENT ON WATER AND SEDIMENT IN THE ARKANSAS RIVER AT PUEBLO RESERVOIR,
University of Southern Colorado, Pueblo.
S. J. Hermann, and K. I. Mahan.
Bureau of Reclamation, Denver, Colorado, Engineering and Research Center, Report REC-ERC-76-19, May 1977. 159 p, 24 fig, 4 tab, 22 ref, 4 append. 14-06-700-7716.

Descriptors: *Water quality, Water analysis, *Limnology, *Trace elements, Heavy metals, Suspended solids, Pre-impoundment, Post-impoundment, Multiple purpose reservoirs, Sediments, Chemical wastes, Water pollution effects, Sediment load, *Colorado, Pollutant identification, Water pollution sources, Reservoirs.
Identifiers: *Pueblo Reservoir, CO, *Arkansas River.

The water quality of Pueblo River was studied from June 1974 to March 1976. General limnological parameters included dissolved oxygen, conductivity, pH turbidity, alkalinity, sulfate, temperature, hardness, chloride, total dissolved solids, and total suspended matter. Concentrations of the following elements were also monitored monthly in both the dissolved and suspended water fractions: Ag, Cu, Fe, Mn, Zn, Co, Pb, Cd, Hg, Li, Na, K, As, Ni, Mg, and Ca. Pre- and post-impoundment water quality conditions were compared. Pre- and post-impoundment sediments were also analyzed for K, Na, Ca, Mg, Li, Cu, Cd, Pb, Fe, Mn, Zn, and Mo, and compared. Seasonal, surface, spatial, and depth trends were observed for most parameters. The most frequent seasonal trend for chemical parameters was that of classic high winter values (low discharge) and low summer values (high discharge). Trends for Fe, Mn, and Zn did not follow classical expectations. The data tend to support the inference that the inlet sediments especially are being enriched with a number of trace metals (Fe, Mn, Zn, and perhaps Mg, Cu, Cd, and Pb). (Bur Reclam)
W77-09224

OIL TRANSPORTATION BY TANKERS: AN ANALYSIS OF MARINE POLLUTION AND SAFETY MEASURES.
Office of Technology Assessment, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-09238

MAY 1974 BASELINE INVESTIGATION OF DEEPWATER DUMPSITE 106.
National Oceanic and Atmospheric Administration, Washington, D.C.; and Environmental Protection Agency, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 657, Price codes: A17 in paper copy, A01 in microfiche. NOAA Dumpsite Evaluation Report 75-1, December 1975. 395 p.

Descriptors: *Baseline studies, Water resources, Resources development, *Waste disposal, Heavy metals, *Radioactive waste disposal, Water pollution, New York, New Jersey, Nutrients, Aquatic life, Monitoring, Pollutant identification, Water pollution sources.
Identifiers: *Outer Continental Shelf, *Ocean dumping, *Dumpsites, *New York Bight.

The National Oceanic and Atmospheric Administration (NOAA) has basic responsibility to conduct programs of monitoring and research to determine the effects of ocean dumping. In May, 1974, NOAA conducted an environmental baseline investigation in the Deepwater Dumpsite (DWD-106) and its vicinity, located 90-miles east of Cape Henlopen, Delaware, in which large amounts of industrial wastes from the New York/New Jersey metropolitan area are dumped. This document presents the reports by the individual principal investigators, including a summary chapter containing major findings. (See W77-09244 thru W77-09255) (Sinha-OEIS)
W77-09243

NOAA SHIP ALBATROSS IV CRUISE 74-5 REPORT OF MAY 9-24, 1974 SURVEY OF DEEPWATER DUMPSITE 106,
NOAA National Marine Fisheries Service, Narragansett, R.I. Atlantic Environmental Group.
M. C. Ingham.
In: NOAA Dumpsite Evaluation Report 75-1, p 7-12, December 1975. 2 fig, 3 tab.

Descriptors: *Baseline studies, *Environmental effects, Water resources, Bottom sediments, *Sampling, *Surveys, *Monitoring, Waste disposal, Pollutant identification, Water pollution sources.
Identifiers: *Outer Continental Shelf, Ocean dumping, Dumpsites.

Cruise 74-5 by NOAA ship Albatross IV, and cruise 74-2 by NOAA ship Delaware II, were part of a joint effort during the May 1974 field investigation of Deepwater Dumpsite 106. This report describes the sampling operations of the Albatross IV during the period May 9 through 24, 1974, in and near Deepwater Dumpsite 106. Twenty-three stations of the established survey grid of 33 stations were occupied in and near the dumpsite. The pattern of stations occupied yields three sections from shelf to deep water passing through the dumpsite. The data collected on the cruise is summarized in a table. (See also W77-09243) (Sinha-OEIS)
W77-09244

NOAA SHIP DELAWARE II CRUISE 74-2 REPORT OF MAY 13-21, 1974, SURVEY OF DEEPWATER DUMPSITE 106,
National Marine Fisheries Service, Highlands, N.J. Middle Atlantic Coastal Fisheries Center.
J. P. Thomas, and J. B. Pearce.
In: NOAA Dumpsite Evaluation Report 75-1, p 13-19, December 1975. 4 tab.

Descriptors: *Baseline studies, *Environmental effects, Water resources, Bottom sediments, Sampling, Surveys, Chemistry, Biology, Geology, Monitoring, Pollutant identification, Water pollution sources.
Identifiers: *Outer Continental Shelf, Ocean dumping, Dumpsites, Environmental impact.

Cruise 74-2 by NOAA ship Delaware II, and cruise 74-5 by NOAA ship Albatross IV, were part of a joint effort during the May 1974 field investigation of Deepwater Dumpsite 106. Objectives of the cruise were to study the chemical, biological, and geological characteristics of Deepwater Dumpsite 106, particularly during the spring season, and to use the data in preparing an environmental impact statement. These data are being analyzed to assess the distribution and abundance of benthic biota, the distribution and concentration of heavy metals in benthis biota and sediments, the grain-size characteristics and distribution of sediments, the fate of containerized radioactive wastes disposed of at 38 degrees 30 minutes N, 72 degrees 6 minutes W, and the seasonal temperature structure of the water column and movements of the deepscattering layer. (See also W77-09243) (Sinha-OEIS)
W77-09245

INVESTIGATION OF RADIOACTIVE WASTE DISPOSAL AT DEEPWATER DUMPSITE 106--SAMPLING PROGRAM MAY 1974,
Office of Radiation Programs, Washington, D.C.
R. Dyer.
In: NOAA Dumpsite Evaluation Report 75-1, p 21-25, December 1975. 3 tab.

Descriptors: *Baseline studies, *Biota, *Radioactive waste disposal, Bottom sediments, *Sampling, Resource development, Monitoring, Pollutant identification, Water pollution sources.
Identifiers: *Outer Continental Shelf, Ocean dumping, Dumpsites.

The sediment and biota sampling program to determine the fate of radioactive wastes at Deepwater Dumpsite 106 during the May 1974 field investigations is described. The primary objective was to investigate a deepwater radioactive waste disposal site approximately 10 miles square. Deepwater trawl biological samples and sediment grab samples taken by the Delaware II in adjacent areas were to provide background or control levels of radioactivity attributable to naturally occurring and fallout radionuclides. (See also W77-09243) (Sinha-OEIS)
W77-09246

PHOTOGRAPHIC RECONNAISSANCE OF CONTINENTAL SLOPE AND UPPER CONTINENTAL RISE,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
B. C. Heezen.
In: NOAA Dumpsite Evaluation Report 75-1, p 27-103, December 1975. 40 fig, 2 tab, 38 ref. NOAA-01-5-022-591.

Descriptors: *Baseline studies, *Photography, *Bottom sediments, Continental slope, Sediment, Waste disposal, Geology, Water pollution.
Identifiers: *Outer Continental Shelf, *Ocean dumping, *Dumpsites, Reconnaissance, Continental rise.

In May 1974 a series of 11 camera stations were made from Albatross IV on the continental slope and supper continental rise. The upper continental rise appears to be a remarkably tranquil area of deposition. This environment has prevailed for more than 20 million years and it seems likely that it will continue to be tranquil in the dumpsite area during the immediate geological future. The lower continental rise is an area of shifting deposition whereas the transition zone between the two provinces is an area of erosion. Evidence of erosion and slumping is found at the base of the continental slope. Here the echogram hyperbolae suggest a pattern related to contour current action. This could be significant for the fate of material placed on the sea floor in this environment. The assembled data in this report are intended as background material for the manned dive series to investigate the area of the deepwater dumpsite. (See also W77-09243) (Sinha-OEIS)
W77-09247

PHYSICAL OCEANOGRAPHY HISTORICAL DATA FOR DEEPWATER DUMPSITE 106,
National Marine Fisheries Service, Narragansett, R.I. Atlantic Environmental Group.
C. E. Warsh.
In: NOAA Dumpsite Evaluation Report 75-1, p 105-140, December 1975. 21 fig, 43 ref.

Descriptors: *Baseline studies, Water quality, *Waste disposal, Data collections, Water pollution sources.
Identifiers: *Outer Continental Shelf, Ocean dumping, Dumpsites.

Deepwater Dumpsite 106 covers 480 sq. nmi. and is located between latitudes 38 degrees 40 minutes N and 39 degrees 00 minutes N and longitudes 72 degrees 00 minutes W and 72 degrees 20 minutes

W in 2700 m of water. It is the purpose of this paper to characterize the water column above and adjacent to the site on the basis of historical and field data. This characterization is necessary to help plan at-sea surveys and to provide a data base for use in assessing the feasibility of continued use of the dumpsite. (See also W77-09243) (Sinha-OEIS)
W77-09248

PHYSICAL OCEANOGRAPHIC OBSERVATIONS AT DEEPWATER DUMPSITE 106 -- MAY 1974,
National Marine Fisheries Service, Narragansett, R. I. Atlantic Environmental Group.
C. E. Warsh.
In: NOAA Dumpsite Evaluation Report 75-1, p 141-187, December 1975. 34 fig, 6 ref, append.

Descriptors: *Water resources, Water quality, *Water pollution sources, *Baseline studies, *Sampling, Oceanography, Pollutant identification, Monitoring.
Identifiers: *Outer Continental Shelf, *Ocean dumping, *Dumpsites, Oceanographic data.

A cruise to study the water in and near Deepwater Dumpsite 106 was made by the NOAA ship Albatross IV from May 9 through May 24, 1974. Physical, chemical, and biological sampling were completed. This discussion is concerned with only the physical data and some chemical data. Twenty-three stations were occupied during the cruise. Physical and chemical data were collected at all stations except No. 3. A total of 99 expendable bathythermographs (XBTs) were dropped to depths of 1800 m. XBT drops were made at the start and finish of each station and between stations. At each station a 9040 STD (salinity, temperature, depth recorder) was lowered to depths of 1500 m to record temperature and salinity. A rosette sampler was attached to the STD to obtain supporting chemical data. Where depths exceeded 1500 m, hydrocasts were made from 1300 m to near the bottom to collect temperature, salinity, oxygen, and nutrient data. Temperature was measured by reversing thermometers, salinity on board by an inductive salinometer, and oxygen by the Winkler method. (See also W77-09243) (Sinha-OEIS)
W77-09249

MICRONUTRIENT ANALYSIS OF SEAWATER SAMPLES TAKEN AT DEEPWATER DUMPSITE 106--MAY 1974,
National Marine Fisheries Service, Narragansett, R.I. MARMAP Field Group.
For primary bibliographic entry see Field 5A.
W77-09250

ANALYTICAL RESULTS FOR WATER-COLUMN SAMPLES COLLECTED AT DEEPWATER DUMPSITE 106--MAY 1974,
Environmental Protection Agency, Edison, N.J. Technical Support Group.
For primary bibliographic entry see Field 5A.
W77-09251

PRELIMINARY INVESTIGATION OF BENTHIC RESOURCES AT DEEPWATER DUMPSITE 106,
National Marine Fisheries Service, Highlands, N.J. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-09252

ARCHIBENTHIC AND ABYSSOBENTHIC FISHES OF DEEPWATER DUMPSITE 106 AND THE ADJACENT AREA,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W77-09253

AN ANALYSIS OF PLANKTON FROM DEEPWATER DUMPSITE 106,
New York Ocean Science Lab., Montauk. Dept. of Fisheries Oceanography.
For primary bibliographic entry see Field 5C.
W77-09254

SYSTEMATIC ANALYSIS OF MIDWATER FISHES OBTAINED AT DEEPWATER DUMPSITE 106 MAY 1974,
Rhode Island Univ., Kingston. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-09255

INFLUENCE OF VEGETATION MANAGEMENT ON YIELD AND QUALITY OF SURFACE RUNOFF,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 4C.
W77-09266

URBAN WATER RUNOFF AND WATER QUALITY CONTROL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
J. T. Wildrick, K. Kuhn, and W. R. Kerns.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 411, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, December 1976. 37 p, 12 fig, 1 tab, 44 ref. OWRT T-0001(No. 6700)(1).

Descriptors: *Urban runoff, *Water quality control, Management, Planning, *Pollution abatement, Surveys, *Storm drains, *Detention reservoirs, *Erosion control, *Storm runoff, Water pollution sources.
Identifiers: Control methods, *Non-point pollution sources, Planning guidelines, Integrated strategy.

The 1972 Amendments to FWPCA specifically require that non-point sources of water pollution be considered in the development of water quality management plans for both local and areawide planning. Urban runoff often accounts for a major portion of the non-point pollution load. The purpose of this manual is to explore the possibilities available to urban areas for reducing levels of pollution from urban runoff. The manual contains an assessment of the seriousness of urban non-point pollution, a survey of the control methods available for combating non-point urban pollution, and some planning guidelines for developing an integrated strategy of controls. It is not a technical manual but rather was designed as a general knowledge brochure.
W77-09267

AMMONIA TRANSPORT IN WATER SATURATED POLYMERIC FILMS,
Missouri Univ.-Kansas City. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-09274

INFLUENCE OF CROP MANAGEMENT PRACTICES ON NUTRIENT MOVEMENT BELOW THE ROOT ZONE IN NEBRASKA SOILS,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
For primary bibliographic entry see Field 2G.
W77-09279

NITROGEN BALANCE IN THE SOUTHERN SAN JOAQUIN VALLEY,
California Univ., Davis. Water Science and Engineering Section.
R. J. Miller, and R. B. Smith.
Journal of Environmental Quality, Vol 5, No 3, p 274-278, July-September 1976. 2 fig, 5 tab, 21 ref.

Descriptors: *Nitrate, *Nitrogen, *California, Nitrogen cycle, Analytical techniques, Methodology, Soil analysis.
Identifiers: *Nitrogen balance, *San Joaquin Valley(Calif).

A nitrogen balance for the southern San Joaquin Valley of California has been calculated using techniques and methodology developed for the Upper Santa Ana River Basin of southern California. The two areas differed considerably in both size (the latter being much smaller) and agricultural function. Data were compiled in N inputs, use, and outputs for many sources within the study area. Such data enabled construction of a flow diagram depicting best estimates of N pools and fluxes within the San Joaquin Valley Basin. Results show N inputs into the study area from various sources were somewhat greater than output to the atmosphere and by plant removal. Inputs to the soil N pool were about 9 kg/ha more in 1971 than in 1961. Since the soil N pool was estimated to be about 11 metric tons/ha, this represented an increase of about 0.1%. However, since the increases of N are not evenly distributed over the study area, high N concentrations can develop in some local areas. (Skogerboe-Colorado State)
W77-09284

EFFECT OF MICROORGANISMS ON THE SORPTION AND FATE OF SULFUR DIOXIDE AND NITROGEN DIOXIDE IN SOIL,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept. of Agronomy.
W. C. Ghiorse, and M. Alexander.
Journal of Environmental Quality, Vol. 5, No. 3, p 227-230, July-September, 1976. 3 fig, 4 tab, 22 ref.

Descriptors: *Sorption, *Nitrification, *Microorganisms, Sulfur compounds, Soils, Soil analysis, Path of pollutants, *Oxides, Water pollution sources.
Identifiers: *Sulfur dioxide, *Nitrogen dioxide.

Sulfur dioxide was rapidly removed from the gas phase in contact with both nonsterile and sterile soil so that viable microorganisms are not directly involved in removal of this pollutant from the atmosphere. Sulfate was formed from the SO2 in nonsterile and sterile soil. About one-fourth of the sulfur from the SO2 introduced was not recovered in organic form, but the recovery was quantitative if the soil was first ignited to destroy organic matter. Nitroglen dioxide was also readily lost from the gas phase in contact with nonsterile and sterile soil, and both nitrite and nitrate were generated. The role of microorganisms in the fate of this pollutant is in the conversion of the nitrite to nitrate. (Skogerboe-Colorado State)
W77-09285

RESIDUES OF DICHLOBENIL IN IRRIGATION WATER,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Irrigation Research Lab.
K. H. Bowmer, E. M. O'Loughlin, K. Shaw, and G. R. Sainty.
Journal of Environmental Quality, Vol. 5, No. 3, p 315-319, July-September 1976. 3 fig, 4 tab, 15 ref.

Descriptors: *Herbicides, *Irrigation canals, Irrigation effects, Irrigation water, Aquatic weeds, Crop production, Path of pollutants, Water pollution sources, Pesticide residues.

Field trials were made on two unlined irrigation channels to measure the extent of water contamination due to residues of dichlobenil which had been applied to the empty channel the previous winter. Ten weeks after application, the herbicide remaining in the soil was about 6% of the initial application. About 4 months after application, water was passed through the channels and was into drains. The maximum herbicide concentra

this flushing water was 0.18 ppm and was judged present no potential hazard to crops. The need r prolonged channel flushing is questioned. An ernative procedure, displacing the static water the channel following by a period of ponding, is ggested as a means of avoiding high herbicide sidues in irrigation water. (Skogerboe-Colorado ate)
77-09287

HE EFFECT OF TEMPERATURE AND SOIL ATER ON CONVERSION OF DDT TO DDE IN OIL,
gricultural Research Service, Fort Collins, Colo.
. D. Guenzi, and W. E. Beard.
urnal of Environmental Quality, Vol. 5, No. 3, p 3-246, July-September 1976. 2 fig, 2 tab, 13 ref.

escriptors: *Pesticides, *Insecticides, *Chemical gradation, *Persistence, *Microbial degradan, Soil water, Soil investigations, Temperature, DT, *DDE.

laboratory study was conducted to determine e rates of DDT degradation and DDE formation soil. Degradation rates increased with higher nperatures and in the presence of water. Of the DT mixed with Raber silty clay loam, 82.1, 74.5, 2, and 38.3% was recovered as DDT and 6.7, 5, 21.6, and 34.8% as DDE after 140 days incution at 30, 40, 50, and 60C, respectively. A comrison of DDE formation in sterile and nonsterile l showed that 84% of the conversion was due to hemical process at 30C, and at 91% at 60C. In rile systems at 30C, rates of DDE formation re similar in submerged soil and soil at 1/3 bar ction, and both were much higher than in air-ed soil. (Skogerboe-Colorado State)
77-09289

ALCIUM RETENTION IN RESPONSE TO OSPHATE SORPTION BY SOILS,
assey Univ., Palmerston North (New Zealand). pt. of Soil Science.
r primary bibliographic entry see Field 2G.
77-09291

E OF UNDISTURBED CORES OF SURFACE OIL FOR INVESTIGATING LEACHING OSSES OF SULPHUR AND PHOSPHORUS,
ctoria Dept. of Agriculture, Melbourne ustralia). Div. of Agricultural Chemistry.
r primary bibliographic entry see Field 2G.
77-09309

STRIBUTION OF NUTRIENTS IN LOUIANA'S COASTAL WATERS INFLUENCED BY E MISSISSIPPI RIVER,
uisiana State Univ., Baton Rouge. Dept. of rine Science; and Louisiana Wildlife and Fishe- Commission, Baton Rouge. Seafood Div.
L. Ho, and B. B. Barrett.
uisiana State University Center for Wetland sources, Reprint No. LSU-R-77-002. Reprinted m: Estuarine and Coastal Marine Science, Vol 173-195, 1977. 15 fig, 9 tab, 21 ref.

scriptors: *Gulf of Mexico, *Louisiana, utrients, Water resources, *Estuaries, *Organic tter, Coasts, *Mississippi River, Marshes, Disution patterns, Water sampling, Water analy- Pollutant identification, Water pollution rces.

e volume of freshwater introduced into Louia's coastal zone during 1973, by rainfall and er discharge, was the highest in the past 35 rs. Water samples were taken from inshore arine areas as well as in the open Gulf of Mex- during 1973. Analysis of the water samples wed that the nutrient content of the water hin the zone of the Mississippi River influence irectly related to the volume discharged to the f by the river. Drainage water from the marshes into the upper regions of Bartaria and Caminada Bays was characterized by high levels of NH+4-N and organic-N, but low values of NO-3+ NO-2-N as compared to waters influenced by the Mississippi River. Coastal waters adjacent the river mouth were dominated by low nutrient seawater. However, inorganic nutrients and organic-N in the bays and their adjacent nearshore waters were higher than at the river mouth during low river discharge. The primary source of nutrients and organic matter to the bays is the surrounding marshes. The high fishery productivity of the water adjacent the river mouth is a result of nutrient contribution by the Mississippi River. (NOAA)
W77-09323

PROCEEDINGS OF THE EIGHTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
For primary bibliographic entry see Field 2L.
W77-09325

FINE-GRAINED SEDIMENT AND INDUSTRIAL WASTE DISTRIBUTION AND DISPERSAL IN NEW BEDFORD HARBOR AND WESTERN BUZZARDS BAY, MASSACHUSETTS,
Woods Hole Oceanographic Institution, Mass. Dept. of Geology and Geophysics.
C. P. Summerhayes, J. P. Ellis, P. R. Briggs, and M. G. Fitzgerald.
Technical Report No. WHOI-76-115, April 1977. 46 fig, 11 tab, 73 ref. SG-04-6-158-44016, SG-04-6-158-44106.

Descriptors: *Estuaries, *Sedimentation, *Water pollution, Harbors, Metals, Barriers, Waste disposal, Industrial wastes, Domestic wastes, *Massachusetts, Path of pollutants.
Identifiers: *New Bedford Harbor(MA), *Western Buzzards Bay(MA).

The findings of a two-year study designed to establish and explain the past and the present patterns of movement and accumulation of fine-grained sediment, human waste, and industrial waste in New Bedford Harbor and its approaches are presented. The major findings of this study are: (1) the construction of a hurricane barrier has caused a significant increase in the sedimentation rate in New Bedford Harbor; (2) the harbor acts as an imperfect trap for materials that are introduced into it, thereby allowing the transfer of industrial contamination to Buzzards Bay; and (3) the surface and near surface sediments of New Bedford Harbor are highly enriched in metals, these metals having been derived locally.
W77-09326

SEWAGE DISCHARGES FROM SHIPS TRANSITING COASTAL SALT WATERS,
David W. Taylor Naval Ship Research and Development Center, Annapolis, Md. Pollution Abatement Div.
W. van Hees.
Water Resources Bulletin, Vol.13, No 2, p 215-229, April 1977. 4 fig, 1 tab, 25 ref.

Descriptors: *Path of pollutants, Water pollution, *Ships, *Sewage, Coasts, Harbors, Estuaries, Rivers, Sewage disposal, Sewage effluents, Sewage treatment, Bacteria, Viruses, Coliforms, Pollutants, On-site investigations, Water quaity, *Water pollution sources.
Identifiers: *Ship's discharges, Seawater quality, Sewage dispersion.

A number of aspects of the discharging of non-oily wastewaters by transiting ships were treated in this overview paper. Options to discharging (the use of holding tank, on board treatment) and the impact of changing regulations were discussed. Assessment of the effects of sewage discharges on coastal waters required that data, at first not available, be generated. An account was given of the characterization of Navy shipboard wastewaters and of experiments involving sewage discharges at sea, measurements of water quality before, during and after an amphibious operation, and fore and aft of transiting Navy ships. A better understanding of sewage dilution after discharge led to the verification of a method for controlled discharging of sewage (and other wastewaters). This method permits limiting the coliform bacteria count in the ship's wake to values below acceptable limits. The paper contained information on long-range effects of ships' sewage discharges, obtained in studies by the U.S. Navy and others, as well as public health considerations. (Sims-ISWS)
W77-09333

USE OF LARGE SUBMERGED CHAMBERS TO MEASURE SEDIMENT-WATER INTERACTIONS,
Great Lakes Basin Commission, Ann Arbor, Mich.
W. C. Sonzogni, D. P. Larsen, K. W. Malueg, and M. D. Schuldt.
Water Research, Vol. 11, No. 5, p 461-464, May 1977. 3 fig, 2 tab, 15 ref.

Descriptors: *Sediment-water interfaces, *Phosphorus compounds, *Eutrophication, *Sediments, *Interfaces, Phosphates, Instrumentation, Water pollution sources, Nutrient removal, Phosphorus, Chemical analysis, Water quality, Analytical techniques, Dissolved oxygen, Oxygen demand, On-site tests, Lake sediments, *Minnesota.
Identifiers: *Submerged chambers, *Phosphorus release rates, *Oxygen consumption rates, *Shagawa Lake(Minn), *Lake renewal efforts, Nutrient sources, Particulate phosphorus, Oxygen sinks, Phosphorus interchange, Sediment oxygen demand.

Submerged chambers were designed and constructed primarily to study in situ sediment phosphorus release in Shagawa Lake, Minnesota. Initial experiments indicated anoxic phosphorus release rates of 7 mg/sq m/day. Oxygen consumption rates within the chambers also were measured; an average consumption rate of 0.17g/sq m/day was obtained. (Henley-ISWS)
W77-09343

STUDIES OF THE MIXING OF COASTAL WATERS IN LIVERPOOL BAY USING DISSOLVED SILICATE AS A TRACER,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 2L.
W77-09347

PRECIPITATION LOADING OF ACID AND HEAVY METALS TO A SMALL ACID LAKE NEAR SUDBURY (ONTARIO),
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
For primary bibliographic entry see Field 5A.
W77-09353

DISSOLVED AMINO ACIDS IN THE EQUATORIAL PACIFIC, THE SARGASSO SEA, AND BISCAYNE BAY,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W77-09356

SATELLITE AND CURRENT DROGUE STUDIES OF OCEAN-DISPOSED WASTE DRIFT,
Delaware Univ., Newark. Center for Remote Sensing.
V. Klemas, G. R. Davis, and R. D. Henry.
Journal Water Pollution Control Federation, Vol. 49, No. 5, p 757-763, May 1977. 3 fig, 1 tab, 13 ref.
NASA NAS5-20983.

Descriptors: *Currents(Water), *Ocean currents, *Waste disposal, *Remote sensing, *Atlantic Ocean, Satellites(Artificial), Circulation, Water circulation, Ocean circulation, Aircraft, Dye releases, Tracers, Coasts, Continental shelf, Monitoring, Water pollution, *Path of pollutants, Oceans.
Identifiers: Current drogues.

The mounting interest in extracting oil and other resources from the continental shelf and continuing use of shelf waters for waste disposal is creating a need for cost-effective, synoptic means of determining currents and monitoring pollutants in the shelf regions. A satellite-aircraft-drogue approach was developed which employs remotely tracked expendable drogues together with satellite and aircraft observations of waste plumes and current tracers, such as dyes or suspended sediment. Tests conducted on the continental shelf and in Delaware Bay indicated that the system provides a cost-effective means of studying current circulation, oil slick movement, and ocean waste dispersion under a wide range of environmental conditions. (Sims-ISWS)
W77-09358

CONTROL OF WATER POLLUTION FROM CROPLAND: VOLUME II--AN OVERVIEW.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-09390

DESIGN PARAMETERS FOR ANIMAL WASTE TREATMENT SYSTEMS - NITROGEN CONTROL,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-09393

SURVIVAL OF PATHOGENS IN ANIMAL MANURE DISPOSAL,
Minnesota Univ., St. Paul. Coll. of Veterinary Medicine.
S. L. Diesch, B. S. Pomeroy, and E. R. Allred.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 005, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency Report No. EPA 670/2 73 051, August 1973. 135 p. R 802205.

Descriptors: *Pathogenic bacteria, *Waste disposal, *Model studies, Slurries, Sludge, Temperature, Cattle, *Minnesota, *Oxidation lagoons, Waste treatment, *Farm wastes, *Water pollution sources.
Identifiers: Oxidation ditch, *Survival(Pathogens), *Leptospira pomona, *Salmonella typhimurium.

A laboratory model (1:10 scale) of an operational field oxidation ditch used in beef cattle production was utilized in survival and detection studies of Leptospira pomons and Salmoella typhimurium. Minnesota summer (20C) and winter (2C) temperatures, pH, and dissolved oxygen of field ditch manure slurry were simulated in laboratory model studies of manure slurry, effluent, and sludge. Maximum leptospiral survival times of 138 days (summer) and 18 days (winter) in the slurry were measured. Salmoella survival of 47 days in slurry and 87 days in sludge (winter), and 17 days in slurry (summer) were measured. Adequate laboratory cultural detection and isolation techniques were developed to measure survival. Findings from simulated studies in a second laboratory model were used to separate materials for recycling. (East Central)
W77-09402

THE RELEASE OF METAL IONS TO GROUND WATER BY SOILS,
Tuskegee Inst., Ala. Dept. of Plant and Soil Science.
N. C. Patel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 759, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, August 2, 1974, 96 p, 25 fig, 32 tab, 63 ref, append. OWRT B-028-ALA(6), 14-31-0001-3053.

Descriptors: Metals, *Adsorption, Retention, *Organic matter, Groundwater, Leaching, Ions, Soil types, *Cation exchange, Hydrogen ion concentration, *Calcium, *Barium, *Chromium, *Soil chemistry, Path of pollutants, Water pollution.
Identifiers: *Metal ions.

Muck, Hoytville, Nebraska, Norfolk, and Troup soils which differ in genesis, organic matter content, pH, and cation exchange status were used to study the adsorption of calcium, barium, and chromium. The study was conducted by metal equilibration treatments to isolate observable fractions of complexed metals: exchangeable, chelated, and non-displaceable. The total adsorption of calcium ions in these soils was observed to be in order of Muck>Norfolk>Hoytville>Nebraska>Troup soil. The order of total adsorbed barium was Muck>Hoytville>Nebraska>Troup>Norfolk. The order of total adsorbed chromium was the same as for barium. The Muck soil indicates a higher tenacity to adsorbed metallic cations than the other four soils, because it contains a higher percent of organic matter; it is more acidic and has a higher cation exchange capacity than the other four soils. The magnitude of the average stability constants for the soil-metal complexes are in the order of Muck>Hoytville>Nebraska>Norfolk>Troup soil. This indicates that relative stability of resulting soil-metal complexes increases with increase in organic matter. The results of these studies may be used to explain the high leachability of metal ions from certain soils or to predict which of the metal ions would be adsorbed to the least extent by a given soil. These results indicate that, if soils of high organic matter content, high acidity, and high cation exchange capacity are equilibrated with cations of high electronegativity and high valences, the values of the stability constants will be high for these soils.
W77-09405

THE EFFECTS OF THERMAL DISCHARGE AND ARTIFICIAL AERATION ON STREAM WATER QUALITY,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5G.
W77-09407

NITRATE-NITROGEN MOVEMENT THROUGH SOIL AS AFFECTED BY SOIL PROFILE CHARACTERISTICS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
D. Devitt, J. Letey, L. J. Lund, and J. W. Blair.
Journal of Environmental Quality, Vol. 5, No. 3, p 283-288, July-September 1976. 4 fig, 2 tab, 14 ref.

Descriptors: *Nitrogen, Soil investigations, Manganese, Chlorides, Denitrification, Leaching, Irrigation practices, Eutrophication, Oxidation-reduction potential, Nitrates, *Soil water movement, *Path of pollutants, Agricultural runoff.
Identifiers: *Nitrate-Nitrogen.

The contribution of agricultural practices to pollution of ground and surface waters by nitrogen is not completely known. Six tile systems installed on commercial farms with differing soil profile characteristics were selected for investigation. Soil solution samples were extracted from 61-, 91-, 122-, and 183 cm depths and analyzed for nitrate-nitrogen managanese, and chloride concentrations, and electrical conductivity. Redox potentia measurements were made at 91- and 183-cm depths. Tensiometers were installed at 61-, 91- and 122-cm depths to measure hydraulic gradients Tile effluent samples were also collected an analyzed. Data on redox potential, manganese concentrations, and nitrate-nitrogen concentratio and movement were dependent on water move ment and amounts of nitrate available for leaching Irrigation management to provide low leachin fraction resulted in relatively higher nitrate nitrogen concentration in the tile effluent bu smaller amounts of total nitrate lost as compare to irrigation management for high leaching frac tions. Redox potentials and the chloride to nitrate nitrogen ratios indicated that subsurface layers o high clay content promote denitrification. Wit one exception, a smaller fraction of the applie nitrogen was lost in the tile effluent from profile containing layers of high clay content as compare to the coarse-textured profiles. (Skogerboe Colorado State)
W77-09427

NITRATE LEAKAGE FROM SOILS DIFFERIN IN TEXTURE AND NITROGEN LOAD,
Technion - Israel Inst. of Tech., Haifa. Lab. of So Science.
For primary bibliographic entry see Field 2G.
W77-09428

SOIL NITRATES FOLLOWING FOUR YEAR CONTINUOUS CORN AND AS SURVEYED I IRRIGATED FARM FIELDS OF CENTRAL AN EASTERN COLORADO,
Colorado State Univ., Fort Collins. Dept. Agronomy.
A. E. Ludwick, J. O. Reuss, and E. J. Langin.
Journal of Environmental Quality, Vol. 5, No. 1, 82-86, January-March 1976. 4 fig, 3 tab, 18 ref.

Descriptors: *Fertilizers, *Nitroge *Groundwater, Pollutants, Corn(Field), Irrigatio effects, *Colorado, Fertilization, Nutrients, So texture, Beans.
Identifiers: Nitrate pollution, Irrigation manag ment.

High rates of fertilizer N used in many intensi farm management systems have been cited as potential hazard to surface and ground waters. T purpose of this study was to evaluate soil NO3 accumulations following 4 years continuous co grown with different nitrogen and irrigatio regimes, and to compare these results to prese NO3(-) concentrations found in irrigated far fields of central and eastern Colorado. Soil NO3 content in the 300-cm sampled profile was signi cantly influenced by both fertilizer N and irrig tion treatments; the greater accumulations we associated with the two higher fertilizer N rat and two lower irrigation rates. Nitrate increas linearly in relation to fertilizer N between 67 a 269 kg N/ha and could be described by two simp regression equations separating the irrigati treatments into two groups (1-2 and 1-3, low rate 1-4 and 1-5, high rates). Coefficients of determin tion for the two groups were 0.981 and 0.97 respectively. (Skogerboe-Colorado State)
W77-09429

NITRATE DYNAMICS IN FALL CREEK, NE YORK,
Pennsylvania Univ., Philadelphia. Regio Planning Div.
A. H. Johnson, D. R. Bouldin, E. A. Goyette, an A. M. Hedges.
Journal of Environmental Quality, Vol 5, No 4, 386-391, October-December 1976. 5 fig, 3 tab, ref.

Descriptors: *Watersheds(Basins), *New Yo Leaching, Water quality, Farm wastes, Agric ture, *Nitrates, *Path of pollutants, Monitoring Identifiers: Growing season, Nitrate loss, Drin ing water, Nonpoint sources, *Fall Creek(NY).

trate loss from a 330 sq km rural watershed in ntral New York was monitored over a 31-month riod. Seasonal N03-N patterns were well fined with highest levels in the winter and west levels in the summer resulting from accu-ulation of N03-N in the soil profile during the owing season and leaching during the winter onths. Stream water at the outlet of the tershed studied is used as a source of drinking ter for some20,000 people. Nitrate-N concen-tions at the drinking water intake currently do t exceed 3 mg/liter. Human activities affected 03-N levels, with dairying and sewage being the or contributors. If agriculture is expanded to its ximum acreage, keeping the present ratio of n/hay/pasture/people, N03-N levels at the nking water intake will not exceed present stan-rds for drinking water. (Skogerboe-Colorado ate).
77-09431

EHAVIOR OF CHROMIUM IN SOILS: I. RIVALENT FORMS,
rmont Univ., Burlington. Dept. of Plant and il Science.
r primary bibliographic entry see Field 2G.
77-09432

IE INFLUENCE OF APPLIED PHOSPHORUS, ANURE, OR LIME ON UPTAKE OF LEAD OM SOIL,
lorado State Univ., Fort Collins. Dept. of tany and Plant Pathology.
L. Zimdahl, and J. M. Foster.
urnal of Environmental Quality, Vol. 5, No. 1, p 34, January-March 1976. 3 tab, 17 ref.

scriptors: *Lead, *Corn(Field), *Phosphorus, ime, Heavy metals, Soil investigations, Trans-ation, Soils, Farm wastes.
entifiers: Lead pollution.

udies of the uptake of lead from soil by corn ve shown that soil applications of phosphorus a(H2P04)2 H2O) decrease uptake, but translocа-n was affected and at higher lead levels. Lead take decreased when cow manure was added to ain a total organic content of 6%, but there was effect of additional manure. Liming did not ve a consistent effect on uptake, but lead trans-ation appeared to decrease with liming. The ad-ion of phosphorus was not an agronomically sible way to reduce the effects of lead con-nination, but additions of manure and lime of-ed promise of reducing lead uptake. ogerboe-Colorado State)
77-09435

TE OF FERTILIZER NITROGEN IN A OODED RICE SOIL,
uisiana State Univ., Baton Rouge. Lab. of ooded Soils and Sediments; and Louisiana State iv., Baton Rouge. Dept. of Agronomy.
r primary bibliographic entry see Field 2G.
77-09438

SORPTION OF SELENITE AND OSPHATE ON AN ALLOPHANE CLAY,
akura Agricultural Research Center, Hamilton ew Zealand). Soil Chemistry Group.
r primary bibliographic entry see Field 2G.
77-09439

TEROVALENT CATION EXCHANGE UILIBRIA IN SOILS WITH VARIABLE AND TEROGENEOUS CHARGE,
ifornia Univ., Davis. Dept. of Soil Science.
r primary bibliographic entry see Field 2G.
7-09440

PHOSPHORUS FERTILIZATION WITH DRIP IRRIGATION,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 3F.
W77-09443

CONCENTRATION AND DISTRIBUTION OF ELEMENTS IN PLANTS AND SOILS NEAR PHOSPHATE PROCESSING FACTORIES, POCATELLO, IDAHO,
Geological Survey, Denver, Colo.
R. C. Severson, and L. P. Gough.
Journal of Environmental Quality, Vol 5, No 4, p 476-482, October-December 1976. 5 fig, 4 tab, 19 ref.

Descriptors: *Idaho, *Phosphates, *Shales, Soils, *Sagebrush, Sediments, Nickel, Trace elements, Water pollution sources, Vegetation.
Identifiers: Phosphate processing factories, Selium, Pocatello(Idaho).

The processing of phosphatic shale near Pocatello, Idaho has a direct influence on the element content of local vegetation and soil. Samples of big sagebrush and cheatgrass show important negative relations between the concentration of certain elements (Cd, Cr, F, Ni, P, Se, U, V, and Zn) and distance from phosphate processing factories. Plant tissues within 3 km of the processing factories contain unusually high amounts of these elements except Ni and Se. Important negative relations with distance were also found for certain element (Be, F, Fe, K, Li, Pb, Rb, Th, and Zn) in A-horizon soil. Amounts of seven elements (Be, F, Li, Pb, Rb, Th, and Zn) being contributed to the upper 5 cm of the soil by phosphate processing, as well as two additional elements (U and V) suspected as being contributed to soil, were estimated, with F showing the greatest increase (about 300 kg/ha) added to soils as far as 4 km downwind from the factories. The greatest number of important relations for both plants and soils was found downwind (northeast) of the processing factories. (Skogerboe-Colorado State)
W77-09444

INFLUENCE OF PESTICIDES ON DENITRIFICATION IN SOIL AND WITH AN ISOLATED BACTERIUM,
Pennsylvania State Univ., University Park. Dept. of Soil Microbiology.
J.-M. Bollag, and N. M. Henninger.
Journal of Environmental Quality, Vol 5, No 1, p 15-18, January-March 1976. 2 fig, 3 tab, 8 ref.

Descriptors: *Pesticides, *Denitrification, Insecticides, Inhibition, Fungicides, Herbicides, Anaerobic conditions, Soils.
Identifiers: Bacterium, *Denitrifying bacterium, Nitrate reduction.

Various pesticides were tested for their influence on the denitrification process in soil and on an isolated denitrifying bacterium. In soil the denitrifying activity was essentially inhibited by the fungicides captan, maneb, and nabam, and to a lesser extent by the herbicide 2,4-D. In pure culture studies with a bacterium whose end product in denitrification was nitrous oxide, the fungicides also caused strong inhibition of the respiratory nitrate reduction process; the insecticide carbaryl, the phenylurea herbicides, 2,4-D and propham (isopropyl carbanilate) also functioned as inhibitors, but to a lesser extent. The inhibition by certain pesticides influenced the formation rate of nitrite and sometimes prevented the reduction of accumulated nitrite during incubation under anaerobic conditions. (Skogerboe-Colorado State)
W77-09445

SIMPLIFIED LONG TERM CONCEPT FOR EVALUATING LEACHING OF NITROGEN FROM AGRICULTURAL LAND,
Joint FAO/IAEA Div. of Atomic Energy in Agriculture, Vienna (Austria).
M. Fried, K. K. Tanji, and R. M. Van De Pol.
Journal of Environmental Quality, Vol 5, No 2, p 197-200, April-June 1976. 5 fig, 1 tab, 17 ref.

Descriptors: *Leaching, *Nitrogen, *Crop production, *Groundwater, Water quality, Pollutants, Fertilizers, Nutrients, Evaluation, *Path of pollutants, Water pollution.

A rather simple concept is proposed for predicting the contribution of crop production practices to groundwater N pollution. It is a steady state long term concept. One of the consequences is that the myriad reactions that take place in the soil body itself need not be evaluated. Application of this concept indicates that, in general, the most important practice under man's control that affects potential pollution is fertilizer use efficiency. As long as yield response is obtained to N fertilizer additions, fertilizer should contribute lesser amounts of N to the groundwater providing fertilizer use efficiency is maintained at a high level. (Skogerboe-Colorado State)
W77-09446

METHYLATION OF MERCURY IN AGRICULTURAL SOILS,
Environmental Protection Agency, Las Vegas, Nev. Office of Research and Development.
For primary bibliographic entry see Field 2G.
W77-09447

POTENTIAL ENVIRONMENTAL IMPACTS FROM THE PRODUCTION OF SYNTHETIC FUELS FROM COAL.
Organization for Economic Co-Operation and Development, Paris (France).
Environment Directorate 32091, 1977. 54 p, 7 tab, 11 ref, 2 append.

Descriptors: *Water pollution sources, *Coals, *Environmental effects, Industrial wastes, International commissions, Fuels, Air pollution, Solid wastes, Pollutants.
Identifiers: *Coal gasification, *Coal liquifaction, Synthetic fuels, Organization for Economic Cooperation and Development.

As part of a study to provide member governments of the Organization for Economic Cooperation and Development with policy options or guidelines to prevent or minimize environmental conflicts, impacts of coal conversion to liquid or gas form are reviewed. Discussed are the different technologies needed to convert coal to oil and coal to gas, the resources needed to switch to coal conversion, the economics of the conversion processes, potential environmental impacts that must be controlled at conversion plants, the current state of control technology involved in the processes, and the method of measuring tradeoffs among residuals for evaluation purposes and for site selection. Appendices include flow sheets for the major coal conversion processes and descriptions of the following coal gasification processes: (1) Lurgi low-calorific processes; (2) Koppers-Totzek process; (3) Lurgi high-calorific value process; (4) HYGAS process; (5) BI-GAS process; (6) Synthane process; (7) Bureau of Mines stirred fixed-bed process; and (8) carbon dioxide acceptor process. Five coal liquifaction processes are also described: (1) Synthoil process; (2) H-Coal process; (3) Solent refined process; (4) COED process; and (5) Fischer-Tropsch process. Specific environmental impact tradeoffs, however, are not given for the individual conversion processes. (Harris-Wisconsin)
W77-09458

TECHNICAL AND MICROECONOMIC ANALYSIS: ARSENIC AND ITS COMPOUNDS,
Versar, Inc., Springfield, Va.
R. P. Burruss, and D. H. Sargent.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 980, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA 560/6-76-016, April 1976. 240 p, 8 fig, 46 tab, 159 ref. 68-01-2926.

Descriptors: *Arsenic compounds, *Pollutant identification, Arsenicals(Pesticides), Water pollution sources, Toxicity, Air pollution, Industrial production, Industrial wastes, Effluents, Water pollution effects, Public health, Soils, Sediments, Freshwater, Oceans, Phosphates, Air pollution effects, Economic impact, Costs, Feasibility, Estimated costs.
Identifiers: Arsenic pollution.

The role of arsenic and its compounds in the environment as well as in the U.S. economy was studied to evaluate the need for and the projected effect of controlling its production, use, dissipation, and emission. Arsenic occurrence, chemistry, and toxicology are reviewed; its prevalence as an impurity in commercial raw materials, processes, and products is documented; the commercial flow of arsenical products is quantified; the sources of pollution are identified and characterized; and its health hazards are evaluated. Except for arsenic in phosphate detergents, and a small loss via copper smelter wastewaters, the waterborne effluents of arsenic were found to be virtually zero. Arsenic ingested through food, even in high concentrations in some sea foods, does not constitute an identifiable health threat, nor does arsenic in water. Municipal waste treatment plants effectively reduce the arsenic content of raw water, arsenic in fresh waters becomes locked into highly insoluble soil or sediment complexes, or it moves to the oceans, and very few public water supplies exceed the recommended standard. Present controls were felt to be adequate in these areas. Serious problems were found to exist, however, from arsenic emissions to the air, particularly from high-temperature processes. (Luedtke-Wisconsin)
W77-09465

EVALUATION OF PETROLEUM-DEGRADING POTENTIAL OF BACTERIA FROM WATER AND SEDIMENT,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, R. R. Colwell, and L. Petrakis.
Applied Microbiology, Vol 30, No 6, p 1036-1039, 1975. 2 fig, 2 tab, 9 ref.

Descriptors: *Oil spills, *Oil pollution, *Microbial degradation, *Bacteria, Aquatic bacteria, Soil bacteria, Biodegradation, *Maryland, Pseudomonas, Oxidation, Evaluation.
Identifiers: Colgate Creek(Md), Baltimore Harbor(Md), Acinetobacter, South Louisiana crude oil.

The relative efficiency of oil degradation by Pseudomonas and Acinetobacter bacteria in soil and in water was tested with South Louisiana crude oil and Colgate Creek water in Baltimore Harbor, which is continuously exposed to accidental oil spills and where oil also reaches the sediment in the shallows. The results indicated that bacteria in the water column possess a greater degradation capacity than sediment bacteria. Resins and asphaltenes increased to a greater extent as a result of the water bacteria degradation than from sediment bacteria. Although sediment bacteria removed greater quantities of saturated hydrocarbons than occurred by weathering, water bacteria removed significantly more 2-, 3-, 4-, 5-, and 6-ring cycloalkanes than the sediment bacteria. Cycloalkanes were degraded to a lesser extent as the ring number increased from 1 to 4 but as the ring number increased from 4 to 6, they were more susceptible to degradation. Weathering did not remove any of the aromatics but the water bacteria were more effective than sediment bacteria in degrading them. Sulfur added to an aromatic hydrocarbon reduced its degradation potential by the water bacteria. Addition of an alicyclic ring(s) to an aromatic ring and the position of an alicyclic ring between two aromatic rings (fluorenes) alters its biodegradability. Several conjectures are offered as to why sediment bacteria are less effective in degrading crude oil hydrocarbons than water bacteria. (Auen-Wisconsin)
W77-09472

SURVEY OF INDUSTRIAL PROCESSING DATA. TASK I-HEXACHLOROBENZENE AND HEXACHLOROBUTADIENE POLLUTION FROM CHLOROCARBON PROCESSING,
Midwest Research Inst., Kansas City, Mo.
C. E. Mumma, and E. W. Lawless.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 641, Price codes: A09 in paper copy, A01 in microfiche. Report No EPA 560/3-75-003, June 1975. 186 p. 28 fig, 26 tab, 50 ref, 3 append. EPA 68-01-2105.

Descriptors: *Chemicals, *Water pollution sources, *Chemical wastes, *Industrial wastes, Chlorides, Chemical industry, Industrial production, Toxins, Toxicity, Poisons, Waste disposal, Monitoring, Chlorinated hydracarbon pesticides, Byproducts.
Identifiers: *Hexachlorobenzene, *Hexachlorobutadiene, Perchlorobenzene, Hydracarbons.

An evaluation of the potential for environmental contamination by hexachlorobenzene (HCB) and hexachlorobutadiene (HCBD) recommends that on-site monitoring be conducted at 10 specific industrial plants in the United States where production and processing of perchloroethylene, trichloroethylene and carbon tetrachloride are included in the manufacturing processes; these chlorocarbons account for an estimated 89% of the HCB and 99% of the HCBD produced in this country. HCB is a stable and potentially hazardous environmental pollutant highly resistant to chemical, biological and physical degradation. Single-dose acute toxicity is very low, but subacute or chronic toxicity can be significant. HCBD is also a stable environmental pollutant, and has greater acute toxicity than HCB. One of the most effective and safest methods for disposing of wastes containing HCB and HCBD involves use of a specially-designed high temperature incineration system. Some deep-well injection and landfill disposal methods are still being used, but these are not preferred. The study also included evaluations of 21 additional domestically-produced chemicals which were known sources of HCB and/or HCBD or were theoretically capable of generating these substances as by-products, waste materials or impurities in a commercial product. (Harris-Wisconsin)
W77-09475

MINERALOGICAL COMPOSITION OF SUBMERGED AQUATIC MACROPHYTES FROM CONNECTICUT,
For primary bibliographic entry see Field 5A.
W77-09477

COLUMBIA RIVER NUTRIENT STUDY-1972,
Environmental Protection Agency, Seattle, Washington. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5C.
W77-09504

DEGRADATION OF PARATHION IN SEAWATER,
Institut fuer Meeresforschung, Bremerhaven (West Germany).
K. Weber.
Water Research, Vol. 10, No. 3, p 237-241, 1976. 4 fig, 2 tab, 9 ref.

Descriptors: *Organophosphorus pesticides, *Degradation(Decomposition), *Sea water, Chemical degradation, Biodegradation, Pesticide residues, By-products, Mode of action, Microbial degradation.
Identifiers: *Parathion.

Decomposition of the organophosphate parathion in seawater was investigated by measuring the degradation time and detection of degradation products. After one year at room temperature in seawater, an average 20% of the initial amount of parathion had not been degraded. The degradation process is mainly accomplished by two ways: chemical hydrolysis and biological decomposition. After 95% decomposition of parathion neither the oxidation product, paraoxon nor the isomeration product, isoparathion, could be detected. The chemical hydrolysis proceeds, first, via dearylation with loss of p-nitrophenol, then through dealkylation leading to a secondary ester of phosphoric acid which still contains the p-nitrophenol moiety, i.e., deethylparathion. Deethylparathion saponified in aqueous solutions of potassium hydroxide to yield p-nitrophenolate. Hydrolysis to p-nitrophenol is favored through high hydrogen ions and hydroxide anion-activity, whereas the second hydrolyic pathway is mainly observed in neutral media. Slowly growing amounts of p-nitrophenol after complete degradation prove that primary hydrolysis products are further hydrolyzed. The reaction rate is strongly dependent on water temperature. Parathion is degraded mainly through chemical means as biodegradation is restricted by the pesticide's damage to aquatic organisms. Its degradation product, p-nitrophenol is reduced by microorganisms and further chemically changed to not yet identified substances. The second hydrolytic product, deethylparathion, is resistent to biodegradation or to chemical hydrolysis; its toxicity is unknown. (Auen-Wisconsin)
W77-09506

NEW MEDIUM FOR ISOLATING IRON-OXIDIZING AND HETEROTROPHIC ACIDOPHILIC BACTERIA FROM ACID MINE DRAINAGE,
Environmental Monitoring and Support Lab., Cincinnati, Ohio.
H. L. Manning.
Applied Microbiology, Vol. 30, No. 6, p 1010-1016, 1975. 7 fig, 1 tab, 6 ref.

Descriptors: *Acid bacteria, *Iron bacteria, Cultures, Laboratory tests, *Mine drainage, Water pollution control.
Identifiers: Iron bacteria medium.

A newly-developed medium which combines ferric sulfate, basal salts and Purified Agar L28, for growing iron and acid mine water bacteria, is described. Purified agar produces a firm gel at low concentrations (0.7%) and allows good growth of iron-oxidizing cells. To obtain gellation of the medium, the agar must be autoclaved in distilled water separately from the acid (pH 3.0) salts solution. The basic salts solution of the medium does not contain potassium phosphate as that prevents growth of iron colonies. Apparently the purified agar supplies enough phosphorus to support growth of the cells. The ferric sulfate solution contains the oxidizable energy source of ferrous iron. Details for preparation of the medium are given. Examination of acid mine water from five sites revealed several kinds of colonies of iron-oxidizing bacteria, including (1) smooth, (2) smooth with secondary growth sectors or branching, (3) spindle-shaped, (4) radiating lobe, and (5) flat-rough. Most acid mine drainage samples yielded whitish colonies that could not use ferrous iron, sulfur, hydrogen, nor could they grow on nutrient agar, brain heart infusion agar, or Trypticase soy agar. Glucose and sucrose supported growth if the sugar-salts medium was at pH 3.0. This new iron bacteria medium is easy to prepare, induces rapid growth and larger colonies, and allows differentiation of colony morphology and detection of acidophilic bacteria. (Auen-Wisconsin)
W77-09511

SER'S MANUAL FOR THE M.I.T. RANSIENT WATER QUALITY NETWORK IODEL--INCLUDING NITROGEN-CYCLE YNAMICS FOR RIVERS AND ESTUARIES,
lassachusetts Inst. of Tech., Cambridge. Dept. of ivil Engineering.
. R. F. Harleman, J. E. Dailey, M. L. Thatcher, . O. Najarian, and D. N. Brocard.
vailable from the National Technical Informa- on Service, Springfield, VA 22161 as PB-264 925, rice codes: A12 in paper copy, A01 in microfiche. eport No. EPA-600/3-77-010, January 1977. 253 30 fig, 15 tab, 12 ref, 3 append. 1BA608, EPA 800429.

escriptors: *Nitrogen cycle, *Estuaries, *Rivers, Computer models, Eutrophication, River basins, lodel studies, Computer programs, Aerobic con- tions, Nutrient requirements, Mass transfer, ispersion, Cycling nutrients, Mathematical odels, Hydrodynamics.
lentifiers: Mass transport.

he development and application of a real-time ater quality model for estuarine ecosystems is escribed, in which a solution is provided for the he dimensional continuity and momentum equa- ons to generate the temporal and spatial varia- ons in the tidal discharges and elevations. The in- rmation is used in the solution of the conserva- n of mass equations for a large number of water ality parameters. The structure of the model is a osed-matter flow loop for nitrogen and is eveloped under the assumption that the dominant tivity in the estuarine ecosystem is aerobic and at nitrogen alone limits the growth of organisms. he ecosystem model is coupled with a real-time drodynamic transport system as opposed to a lal average or slack-tide approximation. The anual contains a review of the theoretical ckground of the model, a detailed discussion of e computer program including a complete al- rithm an example of an application to hypotheti- l estuarine and river systems. The model's iqueness lies in its application to properly speci- mass transport due to changes in magnitude and rection of flow with time in tidal systems. It is in- nded for use in engineering decisions regarding e degree of eutrophication due to distributed and oint-source loadings in estuaries. (Harris- isconsin).
77-09519

HERMAL CONDUCTIVITY OF ORGANIC EDIMENTS FROM TWO WISCONSIN LAKES,
old Regions Research and Engineering Lab., anover, N.H. Earth Sciences Branch.
or primary bibliographic entry see Field 2J.
77-09521

ODEGRADATION OF CELLULOSIC SUB- RATES,
ouisiana State Univ., Baton Rouge.
P. Meyers.
vailable from the National Technical Informa- n Service, Springfield, VA 22161 as AD/A-026 1, Price codes: A02 in paper copy, A01 in crofiche. Report to Office of Naval Research, ne 1976. 14 p. NR 306-087. N0014-69-A-0211- 06.

scriptors: *Waste disposal, *Cellulose, iodegradation, *Fibers(Plant), Mass wasting, gradation(Decomposition), Oceans, Estuaries, ips, Marine microorganisms, Oil, lychlorinated biphenyls, Microbial degradation. ntifiers: Accelerated cellulolysis, Marine pollu- n.

vestigations seeking ways to accelerate degradation of cellulosics (Kraft paper, card- ard, and other highly processed fibers) in rela- n to disposal of shipboard wastes in the marine vironment developed methodologies to enu- rate cellulolytic bacteria, to characterize cellu- e breakdown, and to analyze optimal pretreat- ment of cellulosics to hasten degradation. Cellu- lose biotransformation rates were determined, along with analyses of these rates in pristine and hydrocarbon-polluted waters. Cellulolytic activi- ties of specific molds and yeasts, with emphasis on beta-glucosidase systems, and their role in cellular breakdown were analyzed. PCB levels in various cellulosics were established with analyses of con- centration and removal methodology correlated to cellulose biodegradation. The effect of hydrocar- bon levels on microbial processes was examined with particular attention given to rates of cellulose turnover in the environment and the effect on microbial diversity in stressed environments. Cel- lulose pretreatments that appeared most promising include an alkali treatment of pre-shredded cellu- lose as well as a nitrite photochemical treatment (a combination of sodium nitrite solution and ul- traviolet irradiation). The latter process may be especially suitable for shipboard usage in that nitrite levels probably are already high in deter- gent-loaded waste waters. (Auen-Wisconsin)
W77-09522

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN.
Environmental Protection Agency, Washington, D.C. Water Quality Office.
For primary bibliographic entry see Field 5G.
W77-09528

POLLUTION OF THE INTERSTATE AND IN- TRASTATE WATERS OF THE UPPER MISSIS- SIPPI RIVER AND ITS TRIBUTARIES.
For primary bibliographic entry see Field 5G.
W77-09529

5C. Effects Of Pollution

THE EFFECT OF LEACHATE FROM WESTERN RED CEDAR, THUJA PLICATA DONN, ON AQUATIC ORGANISMS,
Washington Univ., Seattle. Cooperative Fisheries Unit.
G. B. Peters.
Available from the National Technical Informa- tion Service, Springfield, VA 22161 as PB-269 503, Price codes: A09 in paper copy, A01 in microfiche. M.S. Thesis, 1974. 170 p, 33 fig, 13 tab, 57 ref, 2 append. OWRT C-5336(No. 4223)(1), 14-31-0001- 4223.

Descriptors: *Acid streams, *Salmonids, *Water pollution sources, Clear-cutting, Reforestation, Organic acids, Decomposing organic matter, Aquatic insects, Aquatic productivity, Drainage effects, Soil chemistry, Path of pollutants, Acidic soils, Lysimeter, Wood wastes, *Leachate, *Washington, Lethal limit, Toxicity, Water pollu- tion effects, Chromatography.
Identifiers: *Gel permeation chromatography, *Cedar leachates, *Quinault Indian Reserva- tion(Wash), High water tables.

The toxicities of cedar extractives originating from heartwood, bark, and foliage to various aquatic or- ganisms have been determined in laboratory bioas- says. The interactions of various modifying fac- tors were also investigated with tropolones, the most toxic cedar compounds. Temperature, iron concentration, and degree of prior exposure of test organisms have a large effect on the toxicity of tropolones, while variations in genetic stock and pH of the water had no effect. Tropolones have never been identified within stream samples at concentrations that have been acutely toxic in the laboratory bioassays. The TOC of stream samples also indicates that other cedar extractives are un- likely to be in sufficient quantities to be toxic. The most acute condition identified on the Quinault Reservation has been the high acidity of most of the streams. Lethal conditions were recorded within the tributaries of several reservation streams for periods in excess of six months. Seasonal changes in rainfall have a direct in- fluence on the toxic conditions that exist in these tributaries and the great depression in pH that characteristically occurs within the major streams. The extensive logging on the reservation is be- lieved to be at least partially responsible for the high acidity of the streams. The exact contribution that logging has made will be more accurately as- sessed after more knowledge on the origin of stream acidity has been gained.
W77-09101

CHANGES IN THE HABITAT CONDITIONS OF ANIMALS IN THE VOLGA DELTA AS- SOCIATED WITH THE IMPLEMENTATION OF THE VOLGOGRAD HYDROELECTRIC STA- TION, (IN RUSSIAN),
For primary bibliographic entry see Field 6G.
W77-09102

HYDROOPTICAL AND HYDROBIOLOGICAL INVESTIGATIONS OF THE CENTRAL PARTS OF THE RESERVOIR OF THE KRASNOYARSK HYDROELECTRIC STATION, (IN RUSSIAN),
Akademiya Nauk USSR, Krasnoyarsk. Inst. of Agrochemistry and Soil Sciences.
F. Ya. Sid'Ko, L. A. Shchur, N. A. Frank, and A. D. Aponasenko.
IZV Sib Otd Adad Nauk Sssr Ser Biol Nauk 1, p 45-49, 1976.

Descriptors: *Reservoirs, *Chlorophyll, *Phytoplankton, *Light penetration, Hydrobiolo- gy, Density, Biomass, Opacity.
Identifiers: Hydrooptics, Krasnoyarsk, USSR(Krasnoyarsk reservoir), Spectra.

Studies were carried out on horizontal and vertical chlorophyll distribution, number, biomass and specific composition of phytoplankton in the mid- dle parts of the Krasnoyarsk reservoir (Russian SFSR, USSR). Spectra of the (light) attenuation in these regions were obtained.--Copyright 1977, Biological Abstracts, Inc.
W77-09136

THE EFFECTS OF THREE HERBICIDES ON LARVAE OF THE PHANTOM MIDGE, CHAOBORUS PUNCTIPENNIS (SAY),
Tennessee Univ., Knoxville. Dept. of Zoology.
G. K. Eddlemon.
Available from the National Technical Informa- tion Service, Springfield, VA 22161 as PB-269 343, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, June 1974, 61 p, 5 fig, 11 tab, 41 ref. OWRT A-028-TENN(2).

Descriptors: *Larvae, *Herbicides, Water pollu- tion effects, Plankton, *2-4-D, *Midges, Aquatic insects, *Aminotriazole, *Diptera, *Tennessee, *Toxicity, Mortality, Reservoirs, Amino acids.
Identifiers: *Chaoborus punctipennis, 2,4-D amine no. 4, Ortho brush killer A, Amino triazole weed- killer, *Lake Loudoun(Tenn).

The third and fourth instar larvae of Chaoborus punctipennis, planktonic dipterans important both as predators and prey in lakes and reservoirs, were subjected to static tests of various concentrations of three commercial herbicides: Chipmans 2,4-D Amine No.; Ortho Brush Killer A, and Amino Triazole Weedkiller. Larvae and dilution water were collected from Lake Loudoun Reservoir, Knox County, Tennessee. Observations of larval response (immobilization) were conducted every six hours for the first 48 hours of each test and every 12 hours for at least the next 48 hours. A toxicity curve was constructed for each test by plotting time to 50 percent response against con- centration. The 96 hour (100 hour) IC50 values for 2,4-D and ammonium sulfamate herbicides at 15 C were 890 ppm and 3430 ppm, respectively--con- centrations far higher than likely to be encoun- tered in natural environment. The toxicity of am- monium sulfamate appeared to interact signifi-

cantly with temperature, however, as IC50 values at 20 C generally ran about half those at 15 C. Although computer analysis of data from amitrole tests produced no significant regressions of response on concentration, this herbicide is considered potentially the most hazardous of the three herbicides to Chaoborus populations. Larval response to test solutions as low as 5.6 ppm was always much greater than response in control. Furthermore, an adult emergence-suppression threshold seemed to exist between 18 and 56 ppm.
W77-09139

THE ACUTE TOXICITY OF FOUR HERBICIDES TO 0-4 HOUR NAUPLII OF THE COPEPOD CYCLOPS VERNALIS FISHER,
Tennessee Univ., Knoxville. Dept. of Zoology.
E. B. Robertson, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 495, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, March 1975. 70 p, 10 fig, 11 tab, 42 ref, 2 append. OWRT A-028-TENN(3).

Descriptors: *Herbicides, *Toxicity, *Copepods, Water pollution effects, *Mortality, *2-4-D, *Aminotriazole, *Lethal limit, Amino acids, Microscopy.
Identifiers: *Nauplii, Alkanoamine, Seriology, *Acute toxicity.

Nauplii (0-4 hours old) of the copepod Cyclops vernalis Fisher were exposed to a series of doses of amitrole, amitrole-T, 2,4-D (free acid), and the alkanolamine salt of 2,4-D in a standard test medium. The tests had a duration of 96 hours with observations at 12-hour intervals. Mortality was determined by failure of the animals to respond to tactile stimulation. Time to 50 percent mortality and the 48- and 96-hour LD50's were calculated by computer using a program of probit analysis. The nauplii were much more susceptible to amitrole-T than to amitrole. The incipient lethal levels for amitrole and amitrole-T were 22.1 and 2.32 ppm respectively. The free acid of 2,4-D was more toxic to the nauplii than was the alkanolamine salt. The incipient lethal level was 8.72 ppm for the free acid and 142.0 ppm for the salt. Seriological microtiter plates were adapted for use as test containers to allow microscopic examination of the nauplii. The plates were quite satisfactory containers as control survival exceeded 96 percent for all control animals used.
W77-09142

A BACTERIAL WATER QUALITY INVESTIGATION OF CANYON LAKE, ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
W. F. Horak.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 360, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, 1974. 54 p, 9 fig, 3 tab, 34 ref. OWRT A-053-ARIZ(1), 14-31-0001-5003.

Descriptors: Water quality, Recreation, *Arizona, Lakes, *Bacteria, Bacteriology, Water pollution, *Coliforms, Regression analysis, Pollution abatement, Sites.
Identifiers: *Recreational waters, *Bacteriological pollution, Prediction models, Central Arizona, *Canyon Lake(Ariz).

A study was made on Canyon Lake to determine the source of fecal contamination and to learn how best to control the contributing sources. Of all the water samples taken from the Acacia swimming area, 5.5% exceeded the recommended standard of 200 fecal coliforms per 100 ml water. Bacterial levels determined for 24 sediment samples from the Acacia area were mostly in the thousands per 100 ml range. Fecal coliform-fecal streptococci ratios for both the water and sediment samples were predominately in the range where animal waste is the presumed source. A hypothesis is presented which implicates sediment-stored bacteria as the major immediate source of water pollution with human users and dogs as the ultimate sources. Bacterial survival data are presented showing how the fecal coliform-fecal streptococci ratio will shift with storage until, after one week, a ratio typical of human pollution will decrease to one indicative of contamination by animal wastes. Multiple regression analysis was employed to define the relationships between bacterial levels and site conditions and area use. User load index (car count) and/or turbidity were significantly correlated with fecal coliform count in most of the various regressions. This correlation over all data was about 50 percent.
W77-09150

PHOSPHATE AND TRIPOLYPHOSPHATE ADSORPTION BY CLAY MINERALS AND ESTUARINE SEDIMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
C. A. Lake, and W. G. MacIntyre.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 318, Price codes: A04 in paper copy, A01 in microfiche. Va. Water Resources Research, Blacksburg Bulletin 109, June 1977. 58 p, 4 fig, 23 tab, 56 ref OWRT A-072-VA(1).

Descriptors: *Phosphates, Clays, Sediments, Nutrients, *Estuarine environment, *Adsorption, *Clay minerals, *Virginia, Estuaries, Salinity, Temperature, Hydrogen ion concentration, Water pollution effects.
Identifiers: Clay sediments, Factorial analysis, *Orthophosphates, *Tripolyphosphates.

This investigation sought to provide additional needed information on overenrichment of estuarine areas by examining the extent to which phosphate nutrients are taken up by clay sediments in estuarine and marine environments. Examined specifically was the adsorption of orthophosphate and tripolyphosphate by the four clay minerals most commonly found in Virginia estuaries. A factorial analysis was applied to the design of the experiments in order to examine statistically the effect of pH, salinity, temperature, and initial phosphate concentration on orthophosphate adsorption. The main effects of pH and initial phosphate concentration were statistically important to orthophosphate adsorption. The amount of orthophosphate adsorbed by each of the clays increased in the following order: montmorillonite < kaolinite < illite < chlorite. The orthophosphate adsorption by synthetic clay demonstrated the generality of the adsorption experiments, for similar amounts were adsorbed by both synthetic and natural clays. When the source of phosphorus was tripolyphosphate rather than orthoposphate, each clay absorbed more phosphorus under similar reaction conditions.
W77-09152

COMPARISON OF EUTROPHICATION MODELS,
Environmental Protection Agency, Atlanta, Ga. Technical Support Branch.
J. S. Tapp.
In: Proceedings of the EPA Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 50-56, July 1976. 17 fig, 4 tab, 9 ref.

Descriptors: *Water quality control, *Eutrophication, *Simulation analysis, *Decision making, *Mathematical models, Aquatic environment, Lakes, Reservoirs, Data collections, Management, Georgia, Alabama, Dissolved oxygen, Systems analysis.
Identifiers: Comparison, Lake Harding.

A complex mathematical model for simulating an aquatic ecosystem has been compared with less complex models of the type developed by Vollenweider to determine whether or not utilizing the sophisticated mathematical approach adds to the decision making ability in contrast to the less complex models. The complex reservoir model (EPAECO) and the Vollenweider approach are compared using Lake Harding on the Chattahoochee River in Georgia and Alabama. Data collected by the EPA National Eutrophication Survey on 66 Southeastern water bodies have been used to test the Vollenweider-type models. Results indicate that for Lake Harding either approach would give comparable results in terms of the decision to limit point source phosphorus to the reservoir. (See also W77-09154) (Bell-Cornell)
W77-09159

MODELING THE EFFECT OF PESTICIDE LOADING ON RIVERINE ECOSYSTEMS,
Southeast Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5B.
W77-09174

MODELING THE HYDRODYNAMIC EFFECTS OF LARGE MAN-MADE MODIFICATION TO LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W77-09177

AN EMPIRICAL MODEL FOR NUTRIENT RATES IN LAKE ONTARIO,
Environmental Protection Agency, Rochester, New York. Rochester Field Office.
P. A. A. Clark, J. P. Sandwick, D. J. Casey, and A. Solpietro.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 176-181, July 1976. 6 fig, 9 tab, 13 ref.

Descriptors: *Water quality control, *Lake Ontario, *Nutrients, *Mathematical models, *Simulation analysis, Nitrites, Nitrates, Ammonia, Seasonal, Sulfates, Data collections, Computer programs, Computer models, Equations, Systems analysis.
Identifiers: *Accumulation rates, Total organic carbon.

Based on the chemical concentration data collected during the International Field Year for the Great Lakes--May 1972 through June 197 monthly average rates of chemical accumulation have been determined for total phosphate, nitrite nitrate, ammonia, total Kjeldahl nitrogen, total organic carbon, and SO4. The accumulation rates are the consequence of such processes as biochemical transformation processes, sediment exchange, etc. The model presented relates the accumulation rate of a particular substance with the rate of exchange of the total mass of that substance in the lake and with the total net loading rate to the lake. The total masses of each chemical substance for each of the 11 cruises have been calculated using the computer program SPLOTCH with the input of concentration measurements which were collected from about 75 stations on the lake from depths of 1 to 150 meters and at the lake bottom. This study is described together with the U.S. tributary loading rates and the direct onlake precipitation loading rates. Included Canadian tributary loading rates for the same period. The mass balance equation relating these quantities and the accumulation rate is derived herein. All quantities in the equation can be evaluated directly on the basis of measured lake concentrations and loading rates so that the equation can be solved for the accumulation rate in each case. Analysis of the equation will provide a means for the assessment of certain assumptions which are commonly made in large lake limnology. (See also W77-09179) (Bell-Cornell)
W77-09178

A COMPUTER MODELING STUDY TO ASSESS THE EFFECTS OF A PROPOSED MARINA ON A COASTAL LAGOON,
Connell/Metcalf and Eddy, Coral Gables, Fla.
K-M. Lo, T. G. King, and A. S. Cooper.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 414-418, July 1976. 2 fig, 1 tab, 10 ref.

Descriptors: *Computer models, *Simulation analysis, *Effects, *Marinas, *Coasts, *Lagoons, Water quality, Hydrography, Florida, Pollutants, Estimating boats, Equations, Systems analysis, Forecasting.
Identifiers: Flushing characteristics, Field surveys.

A water quality and hydrographic study was conducted to determine the effects of a proposed marina on the water quality of Old Pass Lagoon, located on the northwest coast of Florida. Utilizing field data, the flushing characteristics of the lagoon were determined using two methods. An estimate of pollutants discharged from engines of boats using the marina was made based on information in the literature. Based on the flushing characteristics and the estimate of pollutants, the postconstruction water quality was predicted using a steady state water quality model. (See also W77-09154) (Bell-Cornell)
W77-09194

RIVER BASIN PLANNING METHODOLOGY FOR STREAMS WITH DISSOLVED OXYGEN AND EUTROPHICATION CONSTRAINTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5B.
W77-09198

ENVIRONMENTAL CONTAMINANTS INVENTORY STUDY NO. 3, THE PRODUCTION, USE AND DISTRIBUTION OF LEAD IN CANADA,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
For primary bibliographic entry see Field 5B.
W77-09221

AN ASSESSMENT OF KRAFT BLEACHERY EFFLUENT TOXICITY REDUCTION USING ACTIVATED SLUDGE,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W77-09223

METHANE PRODUCTION AND CONSUMPTION IN ANOXIC MARINE SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
D. Barnes, and E. D. Goldberg.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 , Price codes: A02 in paper copy, A01 in microfiche. Reprinted from: Geology, Vol 4 p 297-, May 1976. 1 fig, 27 ref. N00014-75-C-0152.

Descriptors: *Methane, *Water pollution, Sediments, Diagenesis, *California, Sulfates, Bacteria, Sulfur bacteria, Methane bacteria.
Identifiers: *Sulfate reduction, *Anoxic sediments(Marine), Desulfovibrio, Sulfur reducing bacteria, Methanogenic bacteria, *Santa Barbara Basin(Calif).

The production of methane in anoxic environments can lead to significant accumulations of this gas in appropriate marine sediments. However, the uniformly low methane concentrations in marine, anoxic, sulfate-reducing sea water and sediments represents a balance between production by methanogenic bacteria and consumption by sulfate-reducing bacteria. The primary sink for anaerobically generated methane in marine sediments is sulfate reduction, not aerobic oxidation. (Sinha-OEIS)
W77-09230

VULNERABILITY MODEL: A SIMULATION SYSTEM FOR ASSESSING DAMAGE RESULTING FROM MARINE SPILLS,
Enviro Control, Inc., Rockville, Md.
N. A. Eisenberg, C. J. Lynch, and R. J. Breeding.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 245, Price codes: A16 in paper copy, A01 in microfiche. U.S. Coast Guard Office of Research and Development, Washington, D.C., Report No. CG-D-136-75, June 1975. 370 p.

Descriptors: *Oil spills, *Damages, *Water pollution effects, Computer models, *Simulation analysis, Model studies, Comprehensive planning, Decision making.
Identifiers: *Hazardous materials, *Vulnerability models.

The Vulnerability Model (VM) is a computerized simulation system for assessing damage that results from marine spills of hazardous materials; the final report, summarized here, describes the research background, computation techniques, and preliminary test results associated with the first stage of development of the VM. This first stage of model development consisted of the design and implementation of an operational computer simulation, thereby demonstrating the feasibility of the philosophy, concepts, and approaches pertaining to the VM. Certain aspects of the modeling, as now operational, are subject to enhancement by augmentation, increase in precision, or both. Ultimately, the model is intended to be a comprehensive tool for assessing damage resulting from marine spills. (Sinha-OEIS)
W77-09239

PRELIMINARY INVESTIGATION OF BENTHIC RESOURCES AT DEEPWATER DUMPSITE 106,
National Marine Fisheries Service, Highlands, N.J. Middle Atlantic Coastal Fisheries Center.
J. B. Pearce, J. Thomas, and R. Greig.
In: NOAA Dumpsite Evaluation Report 75-1, p 217-228, December 1975. 1 fig, 4 tab, 13 ref.

Descriptors: *Baseline studies, Water resources, *Benthos, *Heavy metals, Metals, Aquatic life, Sediment, Surveys.
Identifiers: *Outer Continental Shelf, Ocean dumping, Dumpsites.

A baseline benthic survey was conducted at Site 106 and at several stations in the surrounding area. The principal objectives of the survey included: (1) the determination of the distribution, abundance, and diversity of the benthic infauna--in particular to relate findings to those previously obtained by other investigators working in the Middle Atlantic Bight at similar water depths; (2) the establishment of the variation in the infauna in samples collected at Site 106 and surrounding area or in similar water depths; (3) the determination of the relationship between the benthic infauna and physical sediment types found at stations in different water depths; (4) the measurement of the quantities of heavy metals in sediments at Site 106 and other stations in similar depths; and (5) the measurement of the body burdens of heavy metals in organisms collected in the general vicinity of Site 106 and at other stations in similar water depths. (See also W77-09243) (Sinha-OEIS)
W77-09252

ARCHIBENTHIC AND ABYSSOBENTHIC FISHES OF DEEPWATER DUMPSITE 106 AND THE ADJACENT AREA,
Virginia Inst. of Marine Science, Gloucester Point.
J. A. Musick, C. A. Wenner, and G. R. Sedberry.
In: NOAA Dumpsite Evaluation Report 75-1, p 229-269, December 1975. 2 fig, 8 tab, 75 ref, append. Also as V.I.M.S. Contribution No. 722. Sea Grant 04-4-158-31.

Descriptors: *Baseline studies, *Benthos, *Waste disposal, *Radioactive waste disposal, Water resources, Ecology.
Identifiers: *Outer Continental Shelf, Ocean dumping, Dumpsites.

Deepwater Dumpsite 106 is located 145 km off the coast of New Jersey and is bounded by the latitudes of 38 degrees 40 minutes and 39 degrees 00 minutes N and longitudes 72 degrees oo minutes and 72 degrees 30 minutes W. The depth varies from about 1300 m in the northwest corner to 2700 m in the southeast. Most depth varies from about 1300 m in the northwest corner to 2700 m in the southeast. Most of the site is deeper than 2000 m. Within DWD 106 is a smaller dumpsite that has been in use for many years for industrial wastes and munitions. Due south of DWD 106 is an additional dumpsite at which the Atomic Energy Commission reported dumping radioactive wastes (rad site). The purpose of this report is to describe the fish fauna in the area of DWD 106 and to provide information on the ecology of dominant species. It is recommended that consideration be given to move the locality of the dumpsite south to about the vicinity of the rad dumpsite. Such a move would place the site entirely on the continental rise away from the influence of Tom's Canyon and the diverse slope ichthyofauna. Diversity and biomass of fishes are lower on the rise and the bottom is well below the mesopelagic zone. In addition, the chance of encountering pelagic eggs and larvae of commercially important species spawned on the continental shelf will be reduced. (See also W77-09243) (Sinha-OEIS)
W77-09253

AN ANALYSIS OF PLANKTON FROM DEEPWATER DUMPSITE 106,
New York Ocean Science Lab., Montauk. Dept. of Fisheries Oceanography.
H. M. Austin.
In: NOAA Dumpsite Evaluation Report 75-1, p 271-357, December 1975. 42 fig, 12 tab, 22 ref, append. Also NYSOL Contribution No. 58.

Descriptors: *Plankton, *Baseline studies, *Waste disposal, Water resources, New York.
Identifiers: *Outer Continental Shelf, Ocean dumping, Dumpsites.

Deepwater Dumpsite 106 is an area beyond the continental shelf off New York. During May 1-23, 1974, the National Marine Fisheries Service vessel Albatross IV conducted a survey of DWD 106 and adjacent areas to characterize the region and provide the necessary data to determine the advisability of continued dumping. This report of the field investigation describes the biological populations of the area and several biological/watermass relationships. It includes: (1) description of displacement volume and dry weight for each sample; (2) fish eggs, fish larvae, and invertebrate plankton abundance (identified to species level for more abundant forms); and (3) a discussion of their distribution and abundance relative to significant oceanographic features. (See also W77-09243) (Sinha-OEIS)
W77-09254

SYSTEMATIC ANALYSIS OF MIDWATER FISHES OBTAINED AT DEEPWATER DUMPSITE 106 MAY 1974,
Rhode Island Univ., Kingston. Dept. of Zoology.
W. H. Krueger, M. J. Keene, and A. A. Keller.

Descriptors: *Baseline studies, *Aquatic life, *Resources development, Water resources, Fishes.
Identifiers: *Outer Continental Shelf, Ocean dumping, Dumpsites, Dumpsite biota, Systematic analysis.

Ten oblique tows of a 10-foot Isaacs-Kidd midwater trawl at Deepwater Dumpsite 106 produced 4,029 specimens having a total volume of 2,523 ml. These represent 114 species in 30 families. Analyses of the catch data suggest that these fishes have clumped distributions, and that they are stratified in the water column according to size. Thirty-three species are considered particularly important: four eel leptocephali, and 29 mesopelagic species (mostly gonostomatids and myctophids) that appear to spawn in the study area. These 33 species account for 92% of all the specimens taken and 70% of the total biomass. Because of the diversity of distributional patterns in midwater fishes, future monitoring of the study area should include discrete-depth sampling throughout the water column at all seasons of the year, and comparisons with a different area of the slope water. (See also W77-09243) (Sinha-OEIS)
W77-09255

MICROBIOLOGICAL STUDY OF FAUNAL RESPONSE TO SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT,
Pennsylvania State Univ., University Park. Dept. of Veterinary Science.
R. Kozlowski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 515, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, August 1974. 94 p, 14 tab, 1 fig, 42 ref, append. OWRT B-059-PA(3), 14-31-0001-3932.

Descriptors: *Irrigation, *Song birds, *Animal populations, *Sewage effluent, *Waste water disposal, Coliforms, E. coli, Wildlife, Deer.
Identifiers: *Effluent spraying, *Chlorinated sewage effluent, *Microbiological effect, *White-tailed deer, *Cottontail rabbit, Serotype, Salmonella sp, Klebsiella sp, Sludge-injected effluent, Fecal streptococci, Fecal coliform, Total coliform.

The microbiological effect was investigated of chlorinated sewage effluent on the environment and related animal populations from June 1972 through August 1973. The chlorinated effluent was sprayed on sections of Pennsylvania State Gamelands 176. Samples of the effluent and ponds in the area, and fecal samples of white-tailed deer, cottontail rabbits, and songbirds were obtained and analyzed. The total coliform, and fecal streptococci counts of the effluent and sludge-injected effluent clearly illustrated that these bacterial agents are being introduced into the environment. These results further demonstrated that the sludge-injected effluent spray contributed higher levels of contamination to the environment than the spraying of effluent alone. Future work is needed to determine the serological identity of the resident coliflora of wildlife and also of those serotypes that could possibly be pathogenic for wildlife. (Sink-Penn State)
W77-09270

RESPONSE OF THE SPOKANE RIVER DIATOM COMMUNITY TO PRIMARY SEWAGE EFFLUENT,
Eastern Washington State Coll., Cheney. Dept. of Biology.
P. H. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 532, Price codes: A03 in paper copy, A01 in microfiche. MS Thesis, Spring 1975. 38 p, 9 fig, 8 tab, 33 ref. OWRT A-058-WASH(4), 143-34-10E-3996-5501.

Descriptors: *Diatoms, *Sewage effluents, *Washington, Outfall sewers, Sampling, Biomass, Phosphates, Nitrogen, Bioassay, Water pollution.
Identifiers: *Spokane River(Wash), *Achnanthes sp, Algal growth.

This study examined the effects of the primary sewage effluent from the City of Spokane, Washington on the diatom community in the Spokane River. Both natural and artificial substrates were used at each of three sampling stations, one above and two below the sewage outfall, to determine the impact of the effluent on species composition, species diversity, and autotrophic index. Water chemistry samples were taken concurrently with diatom collections and composited for use in determining the algal growth potential of the water. A total of 51 species in 18 genera of diatoms were identified. The flora was dominated by Achnanthes spp. with this genus accounting for 63.6 percent of the cells observed. Nine of the ten most abundant diatom taxa showed statistically significant changes in abundance below the sewage discharge. In each of these ten species there was a significant correlation between their numbers and orthophosphate or ammonia nitrogen concentrations. Mean autotrophic index values of 203 above and 1005 below the sewage outfall indicate the effluent promoted an increase in heterotrophic biomass. Results from algal assays using Selenastrum capricornutum Printz as a test organism suggest that total algal growth above the discharge may have been limited by phosphorus concentration while below the effluent heavy metal inhibition seemed to predominate. In terms of individual species abundance, mean diversity indices, floristic similarities between sampling stations, and mean autotrophic indices, the diatom community at the last downstream station had begun to recover from the effects of organic pollution introduced via the sewage.
W77-09273

LEAD EFFECTS ON SEVERAL ENZYMES AND NITROGENOUS COMPOUNDS IN SOYBEAN LEAF,
Taiwan Provincial Chung-Hsing Univ., Taichung.
K. C. Lee, B. A. Cunningham, K. H. Chung, G. M. Paulsen, and G. H. Liang.
Journal of Environmental Quality, Vol. 5, No. 4, p 357-359, October-December 1976. 3 tab, 24 ref.

Descriptors: *Enzymes, *Lead, *Heavy metals, *Soybeans, Ammonia, Proteins, Calcium, Phosphorus, Leaves, Respiration, *Nitrogen compounds, Water pollution effects.

To obtain further evidence on the nature of lead toxicity in plants, the Pb(2+) effect of several enzyme activities and nitrogenous compounds in soybean was investigated. Soybean seedlings were grown in culture solution treated with lead nitrate so that final concentrations of lead Pb(2+) were 0, 20, 60, and 100 mg/liter. Soybean leaves were analyzed 10 days after lead was added to the solution. Results showed increased respiration rate, increased activities of acid phosphatase, peroxidase and alphaamylase, and increases in soluble protein and ammonia. There was no significant change in malic dehydrogenase, and total free amino acids. A decrease was observed for glutamine synthetase activity and nitrate. Leaf calcium and phosphorus decreased as the lead concentration was increased in the culture solution. Increased activities of the hydrolytic enzymes and peroxidase indicates that the lead treatment enhances senescence. (Skogerboe-Colorado State).
W77-09280

EFFECT OF DISSOLVED OXYGEN ON REDOX POTENTIAL AND NITRATE REMOVAL IN FLOODED SWAMP,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
R. M. Engler, D. A. Antie, and W. H. Patrick, Jr.
Journal of Environmental Quality, Vol. 5, No. 3, p 230-235, July-September 1976. 6 fig, 2 tab, 14 ref.

Descriptors: *Nitrates, *Dissolved oxygen, *Louisiana, *Floodwater, Coastal marshes, Laboratory tests, Soil investigations, Swamps, *Oxidation-reduction potential.
Identifiers: Reduction capacity.

The O2 depletion rates, NO3(-) loss, and the effects of added O2 on NO3(-) disappearance and redox potential in four flooded or intermittently flooded soils from the swamp and coastal marshes of Louisiana were quantitatively characterized in a laboratory study. The NO3(-) added either to the shallow floodwater or mixed with the soil in a suspension rapidly disappeared. Eighty to ninety parts per million NO3(-) was lost from the soil suspensions in 1 to 4 days and from the floodwater over a soil in 10 to 20 days. No NO3(-) was lost from floodwater separated from the soils. Oxygen depletion in the soil suspensions occurred in 15 minutes to 4 hours. Redox potential curves exhibited a characteristic inflection after O2 disappearance in all soils studied. Nitrate disappearance did not appear to be inhibited by as much as 1 ppm O2 dissolved in the soil suspensions because the O2 was rapidly consumed. (Skogerboe-Colorado State)
W77-09286

STUDY OF MERCURY INTOXICATION IN A TELEOST FISH, ANGUILLA ANGUILLA: I ACCUMULATION OF MERCURY IN THE ORGANS, (IN FRENCH),
Liege Univ. (Belgium). Labortoire de Biologie Generale.
J. M. Bouquegneau.
Bull Soc R Sci Liege. 42(9/10), p 440-446, 1973.

Descriptors. *Mercury, *Telecosts, *Toxicity, Poisons, Fish, Inorganic compounds, Bioassay, Assay, Eels, Water pollution effects, Pollutant identification.
Identifiers: Anguilla anguilla, Brain, Organs, Gill, Kidney, Liver, Muscle, Spleen.

A profile of Hg accumulation is established during direct poisoning with HgC12. The gills are the only organ studied that accumulates Hg in any important fashion, when intoxication is of brief duration. During chronic intoxication, the gills, kidney, spleen, liver and brain are the organs most highly contaminated. An interpretation of Hg accumulation profiles is proposed, and the possibility of a biological test is indicated, based on the assay of Hg in the muscles and liver of the eel. (See also W77-093211) --Copyright 1975, Biological Abstracts, Inc.
W77-09320

STUDY OF MERCURY INTOXICATION IN A TELEOST FISH, ANGUILLA ANGUILLA: II EFFECT ON THE REGULATION OF OSMOLARITY, (IN FRENCH),
Liege Univ. (Belgium). Laboratoire de Biologie Generale.
J. M. Bouquegneau.
Bull Soc R Sci Liege. 42(9/10) p 447-455, 1973.

Descriptors: *Mercury, *Telecosts, *Toxicity, Poisons, Fish, Inorganic compounds, Eels, Adaptation, Ion transport, Water pollution effects.
Identifiers: Anguilla anguilla, Gill, Osmolarity, Ionic regulation.

When the HgC12 concentration in water exceeded 1 ppm, Hg has a lethal effect on the ionic regulation of the eel. At lower concentrations, Hg has a sublethal effect, followed by adaptation. The effect of Hg on ion transport in the gills and the ecologic followed by adaptation. The effect of Hg on ion transport in the gills and the ecologic consequences of adaptation are discussed. (See also W77-09320) --Copyright 1975, Biological Abstracts, Inc.
W77-09321

ACID MINE DRAINAGE (AMD) AND ITS IMPACT ON A SMALL VIRGINIA STREAM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
R. C. Hoehn, and D. R. Sizemore
Water Resources Bulletin. Vol. 13, No. 1, p 151-160, February 1977. 2 fig, 15 ref.

escriptors: *Mine drainage, *Acid mine water, oxicity, *Bioassay, *Virginia, Streams, Waste ater(Pollution), Benthic fauna, Snails, Sunf- es, Biodegradation, Invertebrates, Alkalinity, ydrogen ion concentration, Iron, Alkalis(Bases), ater pollution effects.
entifiers: Biological effects, Chemical effects, nthic population, *Chestnut Creek(Va).

study was conducted to (1) chemically charac- ize three AMD streams entering Chestnut eek in southwestern Virginia below the town of lax, Virginia, and (2) to assess the biological d chemical alterations in the creek. Over a six le reach, the benthic macroinvertebrate popula- n was reduced to zero, the naturally low al- linity (approximately 25 mg/l) of the stream was luced to less than 5 mg/l, and the pH was luced from 7.2 to 6.3. Increased concentration iron from less than 0.01 mg/l to more than 4.0 /l was accompanied by the deposition of a coat- of iron hydroxide up to 0.25 in thick in the eam bed, a phenomenon most likely responsible the absence of benthic macroinvertebrates. In bioassays with bluegill sunfish and one snail ecies showed that the creek water, after con- ence with all the AMD streams, was not toxic in 2 hours to fish, and snails survived 96 hours be- e they began to die. The undiluted AMD itself s highly toxic. (Visocky-ISWS)
7-09332

BIOLOGICAL AND CHEMICAL COM- RISON OF VARIOUS AREAS OF A RESER- OIR,
rginia Polytechnic Inst. and State Univ., acksburg. Center for Environmental Studies.
C. Hendricks, and J. K. G. Silvey.
ater Research, Vol. 11, No. 5, p 429-438, May 7. 3 fig, 8 tab, 18 ref.

scriptors: *Chemical properties, *Biological operties, *Limnology, *Reservoirs, utrophication, *Texas, Analytical techniques, ater properties, Analysis, Nutrients, Water emistry, Chlorophyll, Productivity, Nitrates, ater quality, Phosphates, Sediments, Water alysis.
entifiers: *Biological comparison, imnological survey, *Biological productivity, arza-Little Elm reservoir(Tex), Oxygen utiliza- n, Primary producers, Microbial activity, trient levels.

imnological survey was made of a Texas reser- r. Biological (heterotrophic and autotrophic up- e of carbon, chlorophyll a, and oxygen utiliza- n) studies and chemical (nitrate-N and osphate-P) studies were made on various areas the reservoir. The area were physically dif- ent, i.e., coves, open water, and nearshore ter, and the testing program was designed to ermine if differences did exist among the areas. e data indicated that a cove that had a marina ated on it was not significantly different from that did not have a marina but was very similar other aspects. An open water area in which ny trees had been left standing was shown to be re eutrophic than other areas near it. Another n water area with sediments rich in nutrients shown to be less eutrophic than shallower as near it. (Henley-ISWS)
7-09342

E OF LARGE SUBMERGED CHAMBERS TO ASURE SEDIMENT-WATER INTERAC- ONS,
at Lakes Basin Commission, Ann Arbor, h.
primary bibliographic entry see Field 5B.
7-09343

OXYGEN CONSUMPTION BY FRESHWATER SEDIMENTS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering; and Clemson Univ., S.C. Dept. of Microbiology.
W. S. Brewer, A. R. Abernathy, and M. J. B. Paynter.
Water Research, Vol. 11, No. 5, p 471-473, May 1977. 3 fig, 1 tab, 8 ref.

Descriptors: *Oxygen demand, *Oxygen requirements, *Sediments, *Biological communities, Biochemical oxygen demand, Laboratory tests, Sampling, Bacteria, Oxygen, Biological properties, Dissolved oxygen, Lakes, Lake sediments, Sedimentation, Limnology.
Identifiers: *Oxygen consumption.

The purpose of this study was to measure the oxygen consumption rate of sediments and to determine the amount of oxygen consumption attributable to biological activity. Closed systems were utilized to measure oxygen uptake, and phenol or potassium cyanide were introduced to eliminate biological respiration. (Sims-ISWS)
W77-09348

ENVIRONMENTAL CHANGES IN LAKE ERIE AND THEIR FUTURE IMPACT ON LAKE RESOURCES.
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
R. A. Cole.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 680, Price codes: A06 in paper copy, A01 in microfiche. Report No. MSU-IWR-TR-73-0032.3, 1973. (Technical Report 0.32.3) 106 p. 12 fig., 6 tab., 77 ref.

Descriptors: *Future planning(Projected), *Lake Erie, *Planning, *Management, *Competing uses, Water utilization, Recreation, Projections, Industries, Aesthetics, Fisheries, Etophication, Phosphorus, Dissolved solids, Nutrient removal, Waste treatment, Domestic wastes, Industrial wastes, Institutional constraints, Cost-benefit analysis.

Human-induced changes in Lake Erie and how they affect its current and future uses are discussed. Guidelines are suggested for comprehensive, interdisciplinary planning of the Erie basin based on assessment of the lake's resources and probable future demands. A generalized analysis of social costs and benefits indicates that a total ban on waste effluents into the lake would not be justified until the discharges begin to interfere with the total resource value of the lake. However, a modified form of pollution control would be appropriate even though it would not be compatible with present cost-benefit concepts. Conflicts over commercial and recreational uses, planning strategies, and bureaucratic inadequacies are discussed. Conflicts over uses and future demands, particularly as affected by energy shortages, are translated into resource values to point out the need for rigorous resource evaluation before costly management schemes are instituted. Appropriate resource management directions, other than the traditional justifications, are proposed. The impact of eutrophication on domestic water, the effect of phosphorus removal from domestic wastes, the impact of shipping, erosion from agriculture and construction, commercial and sport fishing industries, cooling and industrial water demand, industrial wastes, and the various recreation demands are evaluated in a simple cost-benefit analysis. (Auen-Wisconsin).
W77-09454

TECHNICAL AND MICROECONOMIC ANALYSIS: ARSENIC AND ITS COMPOUNDS,
Versar, Inc., Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-09465

ECOLOGICAL STUDIES ON ALGAL-LYSING BACTERIA IN FRESH WATERS,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
M. J. Daft, S. B. McCord, and W. D. P. Stewart.
Freshwater Biology, Vol 5, No 6, p. 577-596, 1975. 10 fig., 8 tab., 18 ref.

Descriptors: *Bacteria, *Distribution, *Aquatic algae, Freshwater, Ecosystems, Myxobacteria, Lakes, Reservoirs, Cyanophyta, Ecological distribution.
Identifiers: *United Kingdom, *Algal-lysing bacteria.

Data on the distribution of algal-lysing bacteria in various freshwaters of the United Kingdom and on some of the factors likely to influence their ecological distribution are presented. Algal-lysing bacteria examined were found in 8 freshwater habitats, including 6 lochs and 2 reservoirs, as well as a sewage works. None out of 36 isolates, all gram-negative non-fruiting myxobacteria, were studied in detail. All were aerophilic, required a neutral or alkaline pH for good growth, had a temperature optima of 28-37C, required contact with the host for lysis to occur, and were similar enough in morphology and host range to appear to be strains of a single genus. They lyse species of bloom-forming Cyanophyceae including Anabaena, Aphanizominon, Gloeotrichia, Microbystis and Oscillatoria. Their abundance correlated directly with the abundance of Cyanophyceae in eutrophic waters. It is suggested that the algae and bacteria co-exist in most ecosystems, but that if the equilibrium changes markedly as a result of environmental changes, the bacteria may play an important role in the lysis of algal blooms. (Luedtke-Wisconsin).
W77-09469

INTERDEPENDENCE BETWEEN SEVERAL DIFFERENT SPECIES OF ALGAE INVESTIGATED IN CULTURES,
M. Bombowna, H. Bucka, J. Zygmuntowa, and G. Jaworski.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p. 2741-2748, 1975. 6 fig., 11 ref.

Descriptors: *Algae, *Eutrophication, *Succession, Biological communities, Dominant organism, Foreign research, Nutrients, Diatoms, Chlorophyta, Cyanophyta, Growth rates, Productivity, Reservoirs.
Identifiers: *Poland.

As part of a study of eutrophication caused by construction of artificial reservoirs on rivers in the Carpathian mountains of southern Poland, regression and association of certain algal species in community structures by the introduction of nitrogen, phosphorus and silica was investigated at the Polish Laboratory of Water Biology, using cyanophytes, bacillariophytes, and chlorophytes in mixed and unialgal cultures. Experimental details are given of measurements of algal demand of nitrogen, phosphorus, and silica compounds, the biomass and growth rates under controlled temperature and light, and primary production and extracellular release of organic matter and free amino acids. There is usually a positive correlation between the relative algal growth rate, intensification of photsynthesis and the amount of organic matter released; in periods of intense growth a very small amount of amino acids are released extracellularly but with growth inhibition amino acid releases significantly increase. In mixed communities, the small body-size species dominate the photosynthesis and release of organic matter, thus their high productivity increases the trophic character of water. Phosphorus compounds are readily released from algal cells and are a source of orthophosphate in water bodies. The blue-green Aphanizominon flos-aquae reduces community diversity, while diatoms and chlorophytes enhance diversity. (Auen-Wisconsin).
W77-09470

EVALUATION OF PETROLEUM-DEGRADING POTENTIAL OF BACTERIA FROM WATER AND SEDIMENT,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W77-09472

ENVIRONMENTAL IMPACTS OF HIGH LEVEL RADIOACTIVE WASTE DISPOSAL,
Pittsburgh Univ., Pa.
B. L. Cohen.
Institute of Electrical and Electronic Engineers, Nuclear Science, Vol 23, No 1, p 56-59, 1976. 4 fig, 1 tab.

Descriptors: *Radioactive waste disposal, *Hazards, *Safety, *Breeding reactors, *Radioactivity effects, Mathematical models, Underground waste disposal, Nuclear wastes, Probability, Water pollution, Groundwater.

Possible potential hazards from underground disposal of high level nuclear wastes from fuel reprocessing plants are discussed and mathematically evaluated. The calculations are based on nearly twice the present annual United States nuclear power production and the various isotopes are plotted vs. time after reprocessing showing inhalation and ingestion effects as related to cancer doses and mortalities of the worst possible credible handling. A mathematical model presents an upper limit estimate of the probability for buried water to escape and be ingested by people using the comparison of radium in the rock above the buried waste and assuming that the probability for an atom of waste to be released from underground is no greater than for an atom of radium above it. The calculations show that after a few hundred years deaths would be below 0.000,001 per year from all nuclear power. On the assumption that no releases occur for the first two hundred years, it is essential that 0.4 eventual fatalities would be incurred for each year of all-nuclear power, as the upper limit. If a cancer cure is found after 100,000 years, the effect would be reduced by an order of magnitude. The burning of near-surface U-238 deposits is viewed as cleansing the earth of radioactivity. Several possibilities of underground waste releases are considered as are their effects on future generations. (Auen-Wisconsin)
W77-09473

PSEUDOMONAS AERUGINOSA-FECAL COLIFORM RELATIONSHIPS IN ESTUARINE AND FRESH RECREATIONAL WATERS,
National Marine Water Quality Lab., West Kingston, R.I.
For primary bibliographic entry see Field 5A.
W77-09474

ON THE OCCURRENCE OF THE SPECIES OF SYNURA (CHRYSOPHYCEAE),
J. Kristiansen.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p. 2709-2715, 1975. 6 fig., 11 ref.

Descriptors: *Chrysophyta, *Diatoms, *Plant morphology, *Systematics, *Plant ecology, Speciation, Electron microscopy, Temporal distribution, Plant ecology, Plant morphology, Lakes.
Identifiers: *Synura, *Denmark.

The ecological distribution of the chrysophycean diatoms of the Synura species and their typology were investigated in 138 Danish lakes and ponds. Their characteristic form is easily recognizable by means of light microscopy in dried preparations, and even living cells can be identified by phase contrast microscopy of their silica scales. However, species determination is most reliable when supported by electron microscopy. Use of the latter method has identified twelve species: S. curtispina (Petersen and Hansen) Asmund, S. echinulata Korshikov, S. favus Bradley, S. glabra Korshikov, S. lapponica Skuja, S. macracantha (Petersen and Hansen) Asmund, S. mannillosa Takahashi, S. petersenii Korshikov, S. sphagnicola Korshikov, S. spinosa Korshikov, S. splendiaa Korshikov, and S. wella Stein em. Korshikov. Seven of these species were found in Denmark. No geographical differences in distribution was found and their occurrence is believed to be related to cold water, mostly in early spring, but some species prefer warm and high temperatures. Their distribution in relation to pH varies with specie. (Auen-Wisconsin).
W77-09476

THE WINTER DARK SURVIVAL OF AN ALGAL FLAGELLATE--CRYPTOMONAS EROSA (SKUJA),
K. Morgan, and J. Kalff.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p 2734-2740, 1975. 5 fig, 1 tab, 10 ref.

Descriptors: *Algae, *Viability, *Winter, *Ice cover, Physiological ecology, Nannoplankton, *Canada, Light intensity, Photosynthesis.
Identifiers: *Dark survival of algae, *Cryptomonas erosa.

How the Cryptophycean and Chrysophycean algae survive under snow and ice cover and during polar nights is described. Using an isolate of Cryptomonas erosa exposed to a variety of light-temperature regimes, it was noted that its Mean cell volume at 15C correlated positively with light intensity, so that cells grown at 450 ft c were over 2.5 times larger than those grown at 10 ft c. At limiting light levels, the alga does not receive enough energy to saturate all growth phases, and this limited supply is first channeled into maintenance with any surplus going into growth and remainder into cell division. Only at high light regimes when energy exceeds these requirements, will storage products accumulate and induce cell enlargement. Growth at 4C reduces the light level at which the cell is saturated and inhibited, and lowers the estimated compensation intensity to approximately 1 ft c. While low temperatures retard cell division, photosynthesis at suboptimal light levels is temperature independent and carbon fixation per unit cell volume at 4C is equal to rates at 5C. Since carbon fixation and cell division occur at different rates, the cell accumulates organic mass which is reflected in a 50-100% increase in cell volume. Thus long survival of C. Erosa in the dark is largely dependent on the slow respiration of stored carbohydrates, initiated during late autumn. (Auen-Wisconsin)
W77-09482

MICROSTRATIFICATION OF LAKE WASHINGTON SEDIMENTS,
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p 770-775, 1975. 3 fig, 9 ref.

Descriptors: *Sedimentology, *Dating, *Stratigraphy, *Eutrophication, *Electron microscopy, *Lake sediments, Sedimentation, *Stratification, Cyanophyta, Diatoms, *Washington, Analytical techniques.
Identifiers: *Scanning electron microscopy(SEM), *Lake Washington(Wash).

In research aimed at studying the sedimentary record of eutrophication in Lake Washington (Wash.), scanning electron microscopy (SEM) was used to determine sediment distribution on as small a scale as possible. Examination of sediment cores at various levels of magnification shows that while the lake no longer produces dense populations of blue-green algae during summer, it produces some that contribute soft material to the sediment in the summer and it is still productive enough to support a prominent diatom population in the spring. During years of heavy eutrophication, each year after the spring diatom bloom, the summer and fall plankton was dominated by blue-green algae, mostly Oscillatoria. Relatively few diatoms were present at all times except spring. The condition persisted through 1973. In the deeper sediment, the lack of prominent diatom layers presumably results from a smaller rate of deposition of diatoms and a closer balance between deposition of silt and diatoms. Presumably a condition closer to that of 1950 and 1933 is being re-established, in which a less-differentiated layering will again be produced. While recent sediments are not visibly varved, varved sections do occur several meters deep in the sediment. Examination with SEM confirms the existence of diatom layers at 3.60 m depth, principally Stephanodiscus, but the intermediate layers consist mostly of minute fragments of diatom fustules. (Harris-Wisconsin)
W77-09483

DISTRIBUTION AND SEASONAL VARIATION OF BENTHIC FAUNA IN LAKE MANITOBA,
C. Tudorancea, and R. H. Green.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p 616-623, 1975. 2 fig, 4 tab, 6 ref.

Descriptors: *Benthic fauna, *Distribution, *Seasonal, Eutrophication, Lakes, On-site data collections, Basic data collections, *Canada, Biomass, Density, Animal populations, Diptera, Gastropods, Oligachaetes, Dominant organisms, Varieties.
Identifiers: *Lake Manitoba(Canada), Ostracoda, Spheriidae.

A sampling program conducted on a seasonal basis in 1973-74 at seven stations in southern Lake Manitoba (Canada) showed that the numerically dominant groups of benthic fauna in the shallow eutrophic waters are Nematoda, Ostracoda, Chironomidae, Gastropoda, Spheriidae and Oligochaeata. Other groups present in relatively low densities were Trichoptera, Hydracarina, and Ceratoponidae. Apart from Nematoda and Oligochaeta, which are not identified, 28 genera belonging to 19 families were found in the benthic fauna of the lake. Most of dominant groups were unevenly distributed on the bottom. Ostracods and chironomids seemed homogenously distributed but nematodes and gastropods had higher densities in the central-southern part of the lake and spheriids occurred in higher densities at the eastern stations. Of the major groups, oligochaets had the lowest densities and were found most often in the eastern part of the lake. Of 35 taxa identified only six occur with mean frequency higher than 50%, and another four species occur with frequencies between 25% and 50%. With respect to seasonal variation in density of the abundant species, two species of chironomids were maxima in August and October. Both ostracod species had maxima in June. Molluscs were well represented in all seasons. (Harris-Wisconsin)
W77-09484

CARBON DIOXIDE EXCHANGE AND PRODUCTIVITY IN LAKE ERIE AND LAKE ONTARIO,
R. R. Weiler.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p 694-704, 1975. 7 fig, 2 tab, ref.

Descriptors: *Lake Ontario, *Lake Erie, *Carbon dioxide, *Primary productivity, *Carbon cycle, Absorption, Diffusion.
Identifiers: Carbonic acid, Lyman dissociation constants, Carbon release, Dissolved inorganic carbon.

In a follow-up to earlier research on calculated carbon dioxide fluxes for Lake Ontario based on measured carbon dioxide partial pressures in the air (Pco2) over the lake and calculated partial pressure (pCO2) in the lake, three topics are covered in the present study: (1) applicability of the Lyman values for the dissociation constants for carbon

id was tested by comparing calculated and mea-
red value of alkalinity, total dissolved inorganic
rbon, pCO2 and acidity/alkalinity; (2) the flux
m Lake Erie has been calculated and compared
th the Lake Ontario results; and (3) direct mea-
rements of Pco2 and pCO2 at a site on the Bay
Quinte near Belleville, Ontario have been used
obtain biological uptake or release of carbon
xide according to a method described in 1966
search and compared with values obtained by
ier means. Comparisons between measured and
lculated components of the dissolved inorganic
rbon system showed that the Lyman apparent
ssociation constraints are in fact applicable to
ke Ontario. Calculations show that Lake Erie
s as a net source of carbon dioxide over a year.
ly in summer does it take up carbon dioxide.
t outflux from the lake is around 460 gC/sq
year, within a factor of two of the lake's
oductivity. Measurements of pCo2 and Pco2
re used to find net change in two 'limnocorrals'
the Bay of Quinte and the flux between these
l the atmosphere. Community metabolism and
gross productivity were calculated from these
asurements. Gross productivity measurements
re in reasonable agreement with values ob-
ied using the oxygen light and dark bottle
hnique. (Harris-Wisconsin)
7-09485

E AQUATIC THERMAL CAPSULE,
uthern Illinois Univ. at Carbondale. Dept. of
any.
). Parsons.
rhandlungen Internationale Vereinigung Lim-
ogie, Vol. 19, p 137-143, 1975. 3 fig, 17 ref.

scriptors: *Heat budget, *Energy budget,
vamps, Heat flow, Heat transfer, Seasonal,
inois, Thermal properties, Mud-water inter-
es, Sediment-water interfaces, Shallow water,
ds, Mixing, Solar radiation, Evaporation,
nfall, Atmospheric pressure, Humidity,
ow lakes, Mississippi River.
ntifiers: Big Muddy River(Ill), LaRue
mp(Ill), Otter Pond(Ill).

efforts to construct an energy budget which
ld adequately define the aquatic thermal cap-
of air, water and mud, thermal data was col-
ed weekly during 1972 in a pond formed in part
n old channel of the former Big Muddy River
the mid-Mississippi River flood plain in
thern Illinois. In Otter Pond, the open water
of LaRue Swamp, measurements were taken
olar and net solar radiation, rainfall, baromet-
ressure, relative humidity, and air, water and
temperatures. Analysis of the data showed
(1) the air phase of the thermal capsule during
summer and winter must be considered 'still
as opposed to the circulation of spring and fall;
eat change by high-low temperature change or
ible heat and evaporation-condensation are in
e agreement (3204 and 3281 cal sq cm for the
ng period); (3) vertical mixing under the 'still
mass fell below values for waters of the
limnion. However, the effects of periodic ice
vegetative mat cover on heat transfer have not
been ascertained. Comparative data is also
n for the Lake Hula swamp (Israel), and con-
s are made between the two study areas for
sivity and overall heat budgets. (Harris-
onsin)
-09486

**ECTS OF MAN-INDUCED AND NATURAL
DING OF PHOSPHORUS AND NITROGEN
HE LARGE SWEDISH LAKES,**
l.
andlungen Internationale Vereinigung Lim-
gie, Vol. 19, p 1125-1132, 1975. 5 fig, 2 tab, 17

riptors: *Eutrophication, *Phosphorus,
ogen, Self-purification, Foreign countries,
, Nutrient removal, Chlorophyll, Pollution
ment.

Identifiers: *Lake Vanern(Sweden), *Lake Vattern(Sweden), Lake Malaren(Sweden), *Lake Hjalmaren(Sweden), Water quality improvements.

The extent and effects of natural and anthropogenic loading of phosphorus and nitrogen on the Swedish Lakes Vanern, Vettern, Malaren and Hjalmaren are discussed. Lake Vattern is characterized as oligotrophic, while Lake Vanern is becoming mesotrophic. The other lakes are considered eutrophic. Phosphorus loadings, due to human activity, have increased faster than nitrogen loadings. N:P ratios for man-induced loadings ranged from 2 to 18 with an average of 14. This caused a decrease in the N:P ratio from between 20 and 30 for the natural loading to between 15 and 20 for the man-induced load and increased the proportions favorable for algal growth and changes in species composition from cryptophycean and chrysophycean to chlorophytes and cyanophytes. The effect of reduction in P and N is predicted by equations giving the relationship between concentrations of summer chlorophyll-a and the annual loading rates of these nutrients. N and P loadings to the central part of Lake Malaren in 1972 were 40% of the 1967 values while chlorophyll concentration was 55% of the 1967 value. Decreased rates of sewage influents to Lake Malaren reduced both the N and P loads and were followed by a decrease in the summer chlorophyll concentrations even before improved sewage treatment was instituted. (Auen-Wisconsin)
W77-09487

ANALYSIS OF THE MACROFAUNA-COMMUNITY ON STRATIOTES VEGETATIONS,
L. W. G. Higler.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p 2773-2777, 1975, 3 fig, 2 ref.

Descriptors: *Marsh plants, *Biological communities, *Rooted aquatic plants, Foreign countries, Algae, Zooplankton, Invertebrates, Submerged plants, Distribution patterns.
Identifiers: *Stratiotes, *Netherlands.

Inhabitants of Stratiotes aloides (water soldier) communities were investigated in Dutch shallow freshwaters, marshes, ponds, canals, and oxbow rivers. A thick saprobic layer is needed for optimal growth of this rooting waterplant, which is formed to a great extent by the dead plants themselves. This plant grows submerged in its younger stages or floats in the older stages. Its shape and dimensions provide a large surface for diatoms and filamentous algae and thus constitute lush meadows for grazers and their predators as well as providing shelter and attachment for benthic organisms. Preliminary investigations showed that about 150 species of macrofauna, excluding Chironomidae and Hydrachnellae, inhabit the Stratiotes vegetation. The most numerous were snails, followed by leeches, caddisfly larvae, mayfly larvae, flatworms, Asellus and the oligochaete Stylaria lacustris. Out of the twelve waterbug species collected only Cymatia coleoprata was numerous. About fifteen species of dragonfly larvae were identified but they rarely occurred in large numbers. Adult dragonflies were always present and numerous and about 30 species were identified. A regular distribution pattern of a number of insect larvae was found to be related to the developmental stages of the Stratiotes. (Auen-Wisconsin)
W77-09489

NITROGEN FIXATION IN AQUATIC ENVIRONMENTS--A CRITICAL STUDY OF ACETYLENE REDUCTION ASSAY,
For primary bibliographic entry see Field 5A.
W77-09490

RESPONSE OF THE MACROINVERTIBRATE FAUNA TO A COPPER GRADIENT IN AN EXPERIMENTALLY-POLLUTED STREAM,
R. W. Winner, J. S. Van Dyke, N. Caris, and M. P. Farrel.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p 2121-2127, 1975. 3 fig, 3 tab.

Descriptors: *Water pollution effects, *Copper, *Biological communities, *Invertebrates, Streams, Model studies, *Ohio, Analytical techniques, Measurement, Freshwater.
Identifiers: *Shayler Run(Ohio).

Freshwater invertebrate fauna, previously exposed to copper stress, was subjected to increased copper concentrations in Shayler Run (Ohio) and community response was measured. Four indices were used to evaluate community structure: (1) total number of species collected in two samples; (2) total number of individuals collected in two samples; (3) Margalef's index; and (4) Shannon's index. All Psephenus, Baetis, Lirceus and Stenonema interpunctatum completely disappeared where mean copper concentrations were 120 and 66 ppb, leaving the communities dominated by larval chironomids. Zygopterans were most abundant at mean Cu concentrations of 66 ppb, and a species of Stenelmis and one of Chematopsyche attained maximum densities at Cu concentrations of 38 ppb; but this increase may have only reflected reduction in competition, predation, or both. Community composition where Cu concentration was 23 ppb was very similar to that of the control station (mean Cu concentration 9 ppb). It was found that simple, unmanipulated data, i.e., number of species and number of individuals, reflected the same pattern of community response to copper stress as did the more complex indices; furthermore, the simpler indices were more sensitive in detecting changes in community structure and exhibited a stronger correlation with the stressing agent. (Auen-Wisconsin)
W77-09491

CHLORINE-CONTAINING STABLE ORGANICS: NEW COMPOUNDS OF ENVIRONMENTAL CONCERN,
C. W. Gehrs, and R. L. Jolley.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p 2185-2188, 1975, 3 fig, 5 ref.

Descriptors: *Chlorine, *Organic compounds, *Daphnia, *Water pollution effects, Zooplankton, Lethal limit, Reproduction, Mortality, Sewage treatment.
Identifiers: 5-chlorouracil, 4-chlororesorcinol, Biocides.

To examine toxicity effects of chlorine on aquatic life as the chemical enters natural waters from secondary treatment systems and powerplants, survival, mortality and maturation of Daphnia magna when exposed to the chlorine-containing stable organics 5-chlorouracil and 4-chlororesorcinol were tested in concentrations of 0.01, 0.1, 1 and 10 mg/l. These chemicals were chosen because of their relatively high concentrations in secondary effluents, and because 5-chlorouracil is a pyrimidine analog of thymine and consequently has the potential for incorporation into genetic material. A dose-response relationship between 4-chlororesorcinol and mortality of Daphnia was found with all concentrations used, decreasing the time to LC-50. The 0.1 and 1 mg/l concentrations greatly increased the mortality rate. All concentrations of 5-chlorouracil did not affect survivorship. All concentrations of 4-chlororesorcinol lowered reproduction, with no reproduction occurring in the 1 and 10 concentrations. The lowest concentration of 5-chlorouracil stimulated reproduction with the higher concentrations indicating only a delay in onset of reproduction. The 5-chlorouracil experiment indicated a significant lowering of specific birth rates at all but the lowest concentration. The dichtomy of results for 5-chlororesorcinol between the survivorship and reproductive matu-

ration segments of the experiments show the need for using more than a single parameter, particularly the mortality response, when determining the potential effects on a population. (Auen-Wisconsin)
W77-09492

PHYTOPLANKTON PERIODICITY IN A NEW RESERVOIR, LAKE ANNA, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
B. Armitage, and G. M. Simmons.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p 1814-1819, 1975. 1 fig, 10 ref.

Descriptors: *Period of growth, *Phytoplankton, *Dominant organisms, *Reservoirs, *Post-impoundment, Population, Seasonal, Ecological distribution, *Virginia, Fluctuations, Nuclear powerplants.
Identifiers: *Lake Anna(Va).

The type and degree of phytoplankton seasonal fluctuations in newly-filled Lake Anna, Virginia, were investigated. The reservoir and lagoon complex will serve as a coolant source for four nuclear power reactors. In addition to acidic Contrary Creek joining the North Anna River above the reservoir, effluent from a sewage treatment unit enters Lagoon 1 and runoff from a dairy cattle farm enters Lagoon 2A. The phytoplankton periodicities were representative of the greater portion of Lake Anna but other areas were atypical because of their allochthonous inputs. Increased enrichment was paralleled by increased cell volume per ml of water both in the reservoir and lagoons. The influx of Contrary Creek water induced low species diversity and the dominance by one species in comparatively large numbers. However, Peridinium inconspicuum reached its population maximum in Contrary Creek (pH 3.5-4.5) and Lagoon 1 (neutral pH, with allochthonous input) and in Lagoon 2B (neutral pH, no allochthonous enrichment) at the same time. No significant population of P. inconspicuum was present either in the reservoir or in Lagoon 2A during the same period. The dominant organisms are described. The anomaly evidenced by the occurrence of Asterionella formosa in the reservoir but not in the lagoons is not defined. (Auen-Wisconsin)
W77-09493

INTERACTIONS BETWEEN POPULATION DENSITY AND WATER QUALITY PARAMETERS DURING A DINOFLAGELLATE BLOOM,
T. H. Sibley, P. L. Herrgesell, and A. W. Knight.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p 1820-1828, 1975. 6 fig, 2 tab, 14 ref.

Descriptors: *Dinoflagellates, *Reservoirs, *Water properties, Freshwater, *California, Water temperature, Conductivity, Dissolved oxygen, Hydrogen ion concentration, Euphotic zone, Nitrates, Biomass, Dominant organisms.
Identifiers: *Lake Berryessa(Calif), Peridinium penardii.

The effect of spring dinoflagellate blooms of Peridinium penardii (Lemm.) Lemm. fo. californicum Javorn on water properties were investigated in Lake Berryessa, a California reservoir. The most remarkable characteristics of the bloom are its discreteness, the magnitide of corresponding chemical differences that can be generated over small distances, and the maximum alteration caused by the bloom relative to the average conditions of the lake. Temperature, dissolved oxygen and pH correlated positively with population density while conductivity, nitrates and inorganic carbon correlated negatively. The bloom raised the dissolved oxygen from 10.6 mg/l to exceed 20.0 mg/l and the surface pH from 8.2 to 10.0 within the top of 0.5 m. While other parameters quickly recover from changes due to the Peridinium physiology, pH changes may persist longer; this may be deleterious to aquatic life. The mobile species might be able to avoid areas adversely affected but both biomass and species diversity of crustacean zooplankton were significantly decreased within the bloom. The blooms may remove nutrients from the water column so that they are not available for other algae species later. Although the blooms do not currently produce adverse effects, they may in the future, because indications show they are becoming more widespread and persistent annually.
W77-09494

AQUATIC BASELINE SURVEY OF SELECTED TEST AREAS ON EGLIN AIR FORCE BASE RESERVATION, FLORIDA,
Air Force Armament Lab., Eglin AFB, Fla.
For primary bibliographic entry see Field 7C.
W77-09499

PRODUCTION CYCLES IN AQUATIC MICROCOSMS,
California Univ., Berkeley. Lawrence Berkeley Lab.
A. Jassby, M. Dudzik, J. Rees, E. Laysaw, and D. Levy.
Available from the National Technical Information Service, Springfield, VA 22161 as LBL-5965, Price codes: A04 in paper copy, A01 in microfiche. Report No. LBL-5965, February 1977. 52 p., 7 fig., 3 tab., 41 ref. W-7405-ENG-48.

Descriptors: *Laboratories, *Microenvironment, Model studies, Aquatic environment, Ecosystems, Analytical techniques, Evaluation, Feasibility, Phytoplankton, Zooplankton, Trophic level, *Productivity, Nutrients, Catfishes, Snails, Oligochaetes, Midges, Protozoa.
Identifiers: *Microcosms, Mosquito fish.

Analogies between laboratory microcosms and natural water bodies were examined and major problems associated with the use of microcosms in environmental research are defined. Four 700-liter cylindrical containers were filled with demineralized water, enriched with nutrients, and inoculated with 3.5 liter lake water samples. The microcosma were maintained at a temperature of 18 C under a 12:12 L;D cycle for 6 months while their trophic structure was manipulated by the addition of snails, midge larvae, oligochaetes, mosquito fish, and catfish. Results demonstrated that temporal variation of the phytoplankton resembled the bimodal patterns of certain natural systems and there was a close analogy with predator-prey oscillations of temperate marine waters. Drawbacks encountered included: (1) size scaling problems such as shallow depths which result in higher sinking losses, smaller vertical irradiance changes, and smaller migration distances for zooplankton, (2) stocking planktovorous fish in realistic concentrations, (3) poor replication and an unnaturally important role played by protozoa, and (4) high periphyton growth, leading to its dominance in the microcosms. Possible solution to the latter three problems are discussed, and modifications to increase the ability of the microcoms to simulate natural systems are suggested. (Luedtke-Wisconsin).
W77-09500

THE ECOLOGICAL BEHAVIOR OF PLUTONIUM AND AMERICIUM IN A FRESHWATER POND,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
R. M. Emery, D. C. Klopfer, T. R. Garland, and W. C. Weimer.
Available from the National Technical Information Service, Springfield, VA 22161 as BNWL SA 5346, Price codes: A03 in paper copy, A01 in microfiche. Report No. BNWL-SA-5346, March 1975. 37 p. 8 fig., 4 tab., 24 ref.

Descriptors: *Absorption, *Ponds, *Radioactive waste disposal, *Nuclear wastes, Limnology, Food webs, Bottom sediments, Algae, Detritus, Nutrients, Invertebrates, Dragonflies, Biota, Distribution, Productivity, Connate water, *Washington, Aquatic plants, Radioecology.
Identifiers: *Plutonium, *Americium, Macrophytes, Goldfish, Hanford atomic plant(Wash), Bioaccumulation.

The limnology and ecological behavior of a freshwater pond used for the disposal of plutonium processing waste at the Hamfard atomic plant, Washington, is examined. Waste disposal trenches leading to the shallow, highly eutrophic, 14-acre pond have received about 8.1 kg of Pu over a thirtyyear period. It was found that a large portion of this discharge seemed to be retained in the trenches. Nutrient enrichment supplied by the laundry supported massive algae and macrophyte populations. A simple food web was found with algae, macrophtes, and to a large extent, detritus supplying the autochtonous carbon base. Predation was relatively minor, with dragonfly larvae the major predator. Non-predacceous invertebrates and goldfish were major omnivorous components, feeding primarily on detritus and live plant and algae tissue. Plutonium and americium were concentrated almost entirely in the sediments, and randomly distributed across the pond bottom. Algal floc was the major concentrator of Pu and Am. Watercress had similar Am levels. Although goldfish remained in the pond longer than any other fauna, they accumulated relatively small amounts of Pu and Am. The transuranics were made available and/or utilized by pond organisms in ratio which were not reflected by pond sediment concentrations. (Luedtke-Wisconsin).
W77-09501

CONTRIBUTIONS OF SUSPENDED AND DISSOLVED SUBSTANCES TO THE ARCTIC OCEAN DURING BREAKUP OF THE COLVILLE RIVER, ALASKA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
R. A. Hamilton, C. L. Ho, and H. J. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-02318, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 203, January 1976. 30 p. 16 fig., 6 tab, 53 ref. NR 388 002, ONR N00014-69-A-0211-0003.

Descriptors: *Nutrients, *Arctic Ocean, *Suspended solids, *Melt water, *Rivers, Alaska, Arctic, *Primary productivity, Organic matter, Continental shelf, Carbon, Nitrogen, Phosphorus, Silica, Winter, Spring, Limiting factors, Coast, Littoral, Shores.
Identifiers: *Colville River(Alaska), North Slope(Alas), Coastal waters.

In a study of riverine influences on primary productivity in near-shore ocean waters, samples were collected of suspended and dissolved substances contributed by the Colville River delta to the Arctic Ocean off northern Alaska. Extensive sampling in late winter, prior to ice breakup, during breakup and after breakup flooding provided information on the spatial distribution and temporal variation of dissolved and particulate organic carbon, nitrogen and phosphorus compounds, and silicon. Ice breakup flooding is a major contributor of mineral and organic matter to the ocean, significantly raising the inorganic nitrogen level and the ratio of inorganic nitrogen to phosphate phosphorus to a proportion beneficial to primary producion. Nitrogen is the limiting factor in arctic coastal waters. The contribution of dissolved silicate may also be significant for the growth of planktonic organisms such as diatoms which are important in the marine zooplankton food chain. The physiography of the Colville River drainage basin and the hydrography of the Beaufort seacoast and continental shelf are described. (Auen-Wisconsin).
W77-09503

OLUMBIA RIVER NUTRIENT STUDY-1972,
ivironmental Protection Agency, Seattle, ashington. Surveillance and Analysis Div.
Hileman, R. Cunningham, and V. Kollias.
ailable from the National Technical Informa- n Service, Springfield, VA 22161 as PB-253 571, ce codes: A05 in paper copy, A01 in microfiche. orking Paper No. EPA-910-9-75-011, July 1975. p. 21 fig., 7 tab., 8 ref., 1 append.

scriptors: *Columbia River, *Tributaries, utrients, Pacific Northwest U.S., Water quali- Nitrogen, Phosphorus, Dissolved oxygen, drogen ion concentration, Temperature, liforms, Rivers, Water pollution sources, tersheds(Basins).
ntifiers: *Nutrient loading.

ter quality aspects of the Columbia River and tributaries were assessed to determine which utarie s had the greatest adverse influence on Columbia River proper. Parameters evaluated luded nitrogen ion concentration, with sources l ambient concentrations of nitrate and hophosphate receiving special emphasis. It was nd that nutrient loading levels in the Columbia er increased from the Canadian border to the uth, with a relative variation of 1.7- to 20.0-fold total nitrogen and 2.3-to 11.0-fold for total sphorus, depending on the hydrologic quarter. e major proportion of nutrient loading came n tributaries. The Snake and Willamette Rivers ether accounted for 56.5% to 80.2% of the total utary nitrogen and 46.3% to 85.4% of the total utary phosphorus. Based on annual average centrations, orthophosphate-phosphorus ex- ded the critical level for algae bloom potential all Columbia River stations while nitrate- ogen exceeded the critical level at only one sta- . Temperature and total coliforms standards ations were observed at several Columbia er Stations. (Luedtke-Wisconsin).
7-09504

ECTS OF PHOSPHATE UTILIZATION BY JE-GREEN ALGAE,
bert H. Lehman Coll., Bronx, N.Y.
. Jensen, and L. Sicko-Goad.
ort No. EPA-600/3-76-103, September 1976. p, 109 fig, 7 tab, 211 ref. 1BA031, EPA R- 431-03-0.

criptors: *Cyanophyta, *Phosphates, *Plant siology, *Metabolism, *Absorption, Cytologi- studies, Literature reviews, Eutrophication, t morphology, Cycling nutrients, X-ray analy-

tifiers: Plectonema boryanum, phosphates, Luxury uptake.

ability of cyanophytes to bloom at very low sphorus levels, suggesting a mechanism which es the plants extremely efficient in taking up sphorus at very low concentrations, was in- gated with cultures of Plectonema boryanum letermine the physiological and cytological onses of the alga during phosphate limitation phosphate excess. P. boryanum tolerates phate concentrations from 1 to 1000 mg/l. vth changes the subcellular distribution of phorus-containing compounds and induces ul- ructural changes. Cultures in phosphate-free deficient media reduces phosphate in all cell ions, with the most dramatic decrease in both - and long-chain polyphosphates. Phosphate ation induces development of cytological of medium electron density and vacuoliza- resulting from expansion of intrathylakoikal es. Inoculation of the phosphate-starved algae a medium with phosphate increases all phorus-containing fractions, particularly both hort and long-chain polyphosphates within an The polyphosphate bodies consist of phorus and calcium. The algae is unable to e condensed phosphate without its prior lysis to orthophosphate. A literature review des discussions of biological occurrence of polyphosphate, parameters affecting active phosphate uptake, microscopy of polyphosphate bodies, aspects of phosphate metabolism, phosphagen hypothesis vs. phosphate storage, polyphosphateas a phosphorus reserve, ecological aspects of phosphorus in waters, nutrient sources in aquatic ecosystems, and hydrolysis of condensed phosphates. (Auen-Wisconsin)
W77-09505

DEGRADATION OF PARATHION IN SEA-WATER,
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5B.
W77-09506

PHYTOPLANKTON OF LAKE RUSALKA (POLAND), (IN POLISH),
Adam Mickiewicz Univ., Poznan (Poland). Inst. of Systematic Geography and Plant Protection.
For primary bibliographic entry see Field 2H.
W77-09507

EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF,
Utah Water Research Lab., Logan.
D. S. Filip, and E. J. Middlebrook.
Water Research, Vol. 10, No. 1, p 89-93, 1976. 6 fig, 13 ref. USAID/csd-2459.

Descriptors: *Eutrophication, *Feed lots, Nutrients, Nitrogen, Phosphorus, Carbon, Runoff, Agricultural runoff, Bioassay, Toxicity, Cattle, Chemical analysis, *Farm wastes.
Identifiers: *Beef cattle, *Dairy cattle.

The biostimulatory properties of dairy cattle feedlot runoff were studied and the differences between the biostimulatory properties of beef cattle and dairy cattle feedlot runoff were characterized. The characteristics of dairy cattle waste runoff were evaluated utilizing standard bottle test algal bioassays correlated with chemical analysis for growth limiting nutrients. Results showed that this runoff was extremely rich in nutrients, stimulating prolonged heavy algal growth in very dilute concentrations. Low inorganic nitrogen to phosphorus ratios of about 8:1 were found, indicating that nitrogen is first to limit algal growth in most feedlot runoff. In concentrated solutions, biostimulation was inhibited by toxins which seemed indigenous to concentrated runoff water. Analysis of samples for heavy metals indicated that metal concentrations were apparently inadequate to cause toxicity. Because topography and animal numbers differed between dairy cattle feedlots and previously studied beef cattle feedlots, exact comparisons were not possible. However, it was found that the chemical nature of the more concentrated dairy cattle was consistent, whereas the water chemistry of the more dilute beef cattle runoff changed suddenly in response to cattle density near streams. (Luedtke-Wisconsin)
W77-09509

FILAMENT FORMATION IN THE DIATOM SKELETONEMA COSTATUM,
University of Southern Mississippi, Hattiesburg. Dept. of Biology.
H. L. Housley, R. W. Scheetz, and G. F. Pessoney.
Protoplasma, Vol. 86, No. 4, p 363-369, 1975. 12 fig, 10 ref.

Descriptors: *Diatoms, *Cytological studies, *Marine algae, Plant morphology.
Identifiers: *Skeletonema costatum.

Intercellular bands of wall material were discovered as a component in the cell morphology of the marine diaton morphology of the marine diatom, Skeletonema costatum. Electron microscopic examinations showed that the cells are joined by open gutter-like spines (strutted tubuli) which form the margin of the valve face. The intercellular spaces occupied by tubuli are alternately enclosed by finely perforated bands (0.01 micrometer in diameter) of wall material. The intercellular bands are in the form of overlapping, open ended cylinders attached to the epitheca in the region of the cell girdle. Although newly-formed tubuli and closed, they are open or gutter-like in older filaments. The bands encircle only alternate sets of tubuli and the bands consist of two open ended cylinders which overlap in the intercellular area. The role of the intercellular wall material is uncertain; it may contribute to the mechanical stability of the filament by reducing fragmentation of the junction of tubuli. (Auen-Wisconsin)
W77-09510

SEGMENTED POPULATION MODEL OF PRIMARY PRODUCTIVITY,
NUS Corp., Pittsburgh, Pa. Ecological Science Div.
G. C. Slawson, and L. G. Everett.
Journal of the Environmental Engineering Div., Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE1, p 127-138, February 1976. 7 fig, 4 tab, 16 ref.

Descriptors: *Primary productivity, *Algae, *Mathematical models, Equations, *Nevada, Estimating, Regression analysis.
Identifiers: *Lake Mead(Nev), Algal population model.

As part of a study focused on development of models usable for predicting effects of changes in environmental factors such as nutrient inputs in aquatic ecosystems, a primary productivity model was developed for Lake Mead, Nevada, on the basis of division levels of algal populations. The algal divisions considered were Chlorophyta, Bacillariophyta, Chrysophyta, Cryptophyta and Cyanophyta. It was formulated on Michaelis constants (as adapted from the literature) of temperature in degrees Celsius, nitrogen in Mg/l as nitrates, phosphorus in mg/l as phosphate, and light, in calories/sq m per day, providing initial input coefficients. Multiple linear regression analysis utilizing these coefficients yielded a set of values for the optimal productivity rate for the six algal divisions. The main assumption in the formulation was the postulation of an optimal photosynthetic productivity rate, for an optimal temperature, optimal supplies of nutrients and light, and absence of competition for light and nutrients. For Lake Mead, total algal productivity rates were adequately approximated as the sum of the activity of each algal division, thus eliminating the need for detailed information at the species level. (Auen-Wisconsin)
W77-09512

A SPECIES OF STYLOSCOLEX MICHAELSEN (OLIGOCHAETA, LUMBRICULIDAE) FOUND IN TWO LAKES IN NORTHERN ALASKA,
Naturhistoriska Riksmuseet, Stockholm (Sweden). Section for Invertebrate Zoology.
C. Holmquist.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A003 882, Price codes: A02 in paper copy, A01 in microfiche. Internationale Revue der Gesamten Hydrobiologie, Vol. 59, No. 1, p 49-55, 1974. 4 fig, 1 tab, 14 ref. ONR-412:8, ONR N 00014-70-A-0219-0001.

Descriptors: *Systematics, *Oligochaetes, *Ecological distribution, Worms, *Alaska, Arctic, Benthos, Invertebrates, Varieties, Phylogeny.
Identifiers: Styloscolex, *Lumbriculus, *Styloscolex opisthothecus.

Although the oligochaete Styloscolex had been thought of as restricted to Lake Baikal (U.S.S.R.), it has also been found in the vicinity of Sapporo on

Hokkaido, Japan, and in Kamchatka and Manchuria. This genus has now been found also in two Alaskan lakes and is classified as Styloscolex opisthothecus. St. opisthothecus was not abundant, as out of one hundred lakes investigated, the species was found in only two lakes, Noluck and Ikmakrak. The finding of St. opisthothecus in Kamchatka and Alaska, together with finds of St. japoninucs in Japan and St. tetrathecus in Manchuria, indicate its wide geographical distribution. A conclusion would be that all the known Styloscolex species may be fairly hardy as regards temperature. Winter is hard in all the areas where it has been found, and the rather shallow habitats cool down close to freezing for long periods. (Auen-Wisconsin)
W77-09513

PROBLEMS WITH RADIOMETRIC COLIFORM ASSAYS,
Framingham State Coll., Mass. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-09514

PHYTOPLANKTON OF LAKE MALTA (POLAND) (IN POLISH),
Adam Mickiewicz Univ., Poznan (Poland). Institute of Systematic Geography and Plant Protection.
B. Stefko.
Poznan Tow Przyj Nauk Wydz Mat-Przyr Pr Kom Biol 42, p 55-102, 1976.

Descriptors: *Artificial lakes, *Phytoplankton, *On-site investigations, Lakes, *Diatoms, Organic matter, Biorhythms, Distribution patterns, Productivity, Eutrophication, Systematics, *Chlorophyta, *Cyanophyta, Seasonal.
Identifiers: Cryptomonas, *Lake Malta(Poland), Oscillatoria agardhi, Phragmites communis, *Poland, Seasonal changes, Sanitary conditions.

Phytoplankton investigation in artificial Lake Malta were established on the shore of the River Warta within greater Poznan (Poland) for recreation, sport, aesthetics and improvement of the microclimate. During the 13 yr which have elapsed since the 1st elaboration, visible changes in vascular vegetation have been observed, e.g., the appearance of Phragmites communis and its dominance over 1/4 of the length of the shore. There was a reduction of water pollution by organic matter, probably because the brook Piasnica has been redirected to the stream Obrzyca, debouching directly into the river Warta. Phytoplankton were taken (398 algal taxa) at 3 points on the lake in 1969/70. The greatest number of taxa are diatoms; less are Chlorophyceae. Although Cyanophyceae are represented by a smaller number of taxa, they play an important role in the reservoir. In summer Cyanophyceae dominate, especially Oscillatoria agardhi. In autumn Cyanophyceae and, in Nov. in connection with a temperature decrease, diatoms dominate. In winter only Cryptomonas bloomed, in spring diatoms and Cyanophceae bloomed. An attempt was made to characterize the sanitary conditions of the reservoir. Comparing changes in the phytoplankton of Lake Malta with those observed in Lake Rusalka in the same period, an increase of taxa and an increase of abundance was noted in both reservoirs, as well as a progressing eutrophication. In Lake Malta this process is less distinct, probably owing to the suppression of 1 of the pollution sources (Piasnica Brook).--Copyright 1977, Biological Abstracts, Inc.
W77-09515

LAKE DRAWDOWN AS A METHOD OF IMPROVING WATER QUALITY,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5G.
W77-09516

THE DYNAMICS OF AN ESTUARY AS A NATURAL ECOSYSTEM.
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
F. J. Vernberg, R. Bonnell, B. Coull, R. Dame Jr., and P. De Coursey.
Available from the National Technical Information Service, Springfield, VA 22161. Ecological Research Series EPA-600/3-77-016, January 1977. 94 p., 9 fig., 10 tab., 169 ref. 1EA615. R 802928

Descriptors: *Estuaries, *Ecosystems, *Salt marshes, *Baseline studies, *Energy transfer, *South Carolina, Productivity, Mathematical models, Oysters, Algae, Zooplankton, Food chains, Microbial degradation, Solar radiation, Hydrography, Laboratory tests, Benthos, Data storage and retrieval.
Identifiers: *North Inlet Estuary(SC), *Estuarine energetics, *Salt marsh energetics.

The results of the first two years of study of equilibrium and change in an undisturbed estuary-marshland ecosystem, the North Inlet Estuary near Georgetown, South Carolina, are presented as a baseline for comparison of the effects of various pollutant stresses on estuarine environments. A substudy developed a conceptual model of energy flow for the entire ecosystem, with three subsystems representing the water column, the intertidal marsh zone and the benthic subtidal zone. Another substudy simulates an intertidal oyster community by a linear systems model. The data collection methods and retrieval systems are described. Detailed studies were collected on the phytoplankton and microbenthic algae; the composition, and seasonal dynamics of the zooplankton; vertical migration of crab larvae as related to the food chain energy transfer; and light, diurnal migration and metabolism of the crab larvae, Uca pugilator. Data were also compiled on the abundance, diversity and respiration of the macrobenthic fauna and on microbial decomposers. The radiation balance in North Inlet Marsh was computed together with details of the hydrography of North Inlet. The design and replicability of laboratory salt marsh microecosystems to assess perturbations caused by pollutants are described. (Auen-Wisconsin).
W77-09517

ON ALEXANDROVIA ONEGENSIS HRAVE FROM ALASKA, WITH A REVISION OF THE TELMATODRILINAE (OLIGOCHAETA, TUBIFICIDAE),
Naturhistoriska Riksmuseet, Stockholm (Sweden). Section for Invertebrate Zoology.
C. Holmquist.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-003 884, Price codes: A02 in paper copy, A01 in microfiche. Zoologische Jahrbuecher, Abteiling fuer Systematik Oekologie und Geographie der Tiere, Vol. 101, p.249-268, 1974. 13 fig, 1 tab, 21 ref. ONR-412:9, ONR N 00014-70-A-0219-0001.

Descriptors: *Speciation, *Oligochaetes, *Tubificids, *Ecological distribution, Arctic, *Alaska, Invertebrates, Lakes.
Identifiers: *Alexandrovia onegensis Hrave, Telmatodrililus mcgregori, Telmatocrilus multiprostatus, Telmatodrilus pectinatus.

Discovery of the tubificid worm Alexandrovia onegensis Hrabe in (seven lakes) in northern Alaska lakes has resulted in the revision of the subfamily Telmatodrilinae and the genus Telmatodrilus mcgregori Eisen. The genera Telmatodrilinae and Alexandrovia represent worms so different from each other that they cannot be considered synonymous. Two Tasmanian species, Telmatodrilus multipoostatus Brinkhurst and Telmatodrilus pectinatus Brinkhusrt probably do not belong to this or to the Alexandrovia genera but poor specimens precluded definitive classification. The distribution and ecology of the worms are summarized. No common denominator among ecological factors of the various lakes which elucidate any demands on A. onegensis have has been found to date. (Auen Wisconsin)
W77-09518

USER'S MANUAL FOR THE M.I.T. TRANSIENT WATER QUALITY NETWORK MODEL--INCLUDING NITROGEN-CYCLE DYNAMICS FOR RIVERS AND ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-09519

THE USE OF WETLANDS AS NUTRIENT REMOVAL SYSTEMS,
Virginia Inst. of Marine Science, Gloucester Point
For primary bibliographic entry see Field 5G.
W77-09520

BIODEGRADATION OF CELLULOSIC SUBSTRATES,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 5B.
W77-09522

THE SEDIMENTS OF LAKE GEORGE (UGANDA). II: RELEASE OF AMMONIA AND PHOSPHATE FROM AN UNDISTURBED MUD SURFACE,
Malaya Univ., Kuala Lumpur (Malaysia). School of Biological Sciences.
A. B. Viner.
Archiv fur Hydrobiologie, Vol 76, No 3, p 368-37 1975. 4 fig, 11 ref.

Descriptors: *Sediment-water interfaces, *Mu water interfaces, *Adsorption, Lake Phosphates, Ammonia, Aerobic condition Nitrification, Africa, *Lake sediments.
Identifiers: *Lake George(Uganda), *Nutrie release.

Investigations were made into the liberation nitrogen and phosphate to the waters of La George, Uganda from undisturbed surface mu to obtain an indication of the minimal amou which might be contributed by the sedimen Laboratory experiments compared aerobic anaerobic muds either poisoned or non-poison so as to distinguish biogenic from non-bioge phenomena. A conclusion was reached that biol ical mineralization was low, so that non-bioge equilibria were more likely to control the rele of nutrients and that this would be dependent the nutrient concentration in the superficial m Concentrations of nitrogen and phosphate are l in this layer, and experimental release of nutrients into the interstitial water of the m showed that this release was very slow relative the potential demands by the primary producers was therefore thought that the sediments c tribute proportionately little to the nutri recycling of the lake. (See also W77-007 (Harris-Wisconsin)
W77-09523

EFFECTS OF THREE ENVIRONMENT VARIABLES ON SULFATE UPTAKE BY AE BIC BACTERIA,
New York State Museum and Sciences Serv Albany.
R. H. Monheimer.
Applied Microbiology, Vol 30, No 6, p 975-9 December, 1975. 5 fig, 1 tab, 16 ref. NSF BMS 03352.

Descriptors: *Aerobic bacteria, *Sulfa *Absorption, Organic matter, Laboratory te Productivity, Pseudomonas.
Identifiers: Pseudomonas fluoresc Corynebacterium striatum, Serratia marcescen

idence is presented which indirectly links the ake of sulfate and organic carbon by aerobic teria, reinforcing the belief that sulfate uptake be used as an indicator of microbial biomass duction in freshwater ecosystems. Pure cul- es of Pseudomonas fluorescens, Corynebacteri- striatum and Serratia marcescens in defined dia indicated that uptake of glucose and other anic substrates by bacteria is an active abolic process such that, as the concentration these substrates increases, the rates at which y are taken up also increase, but only up to e maximum concentration above which uptake s remain constant. Thus, if some metabolic tionship exists between the uptake of the ate and the uptake of organic carbon, then en bacteria are subjected to a constant sulfate ake increases but only up to some maximum or- ic carbon concentration. The P. fluorescens C. striatum cultures took up sulfate faster n young, but sulfate uptake by S. marcescens faster in older cultures. Organic sulfur was d to decrease sulfate uptake, but at concentra- s somewhat higher than occur in most fresh- er ecosystems. Low levels of sulfate can retically limit bacterial biomass production this limitation is unlikely in natural systems. en-Wisconsin)
7-09524

CURRENCE OF OSCILLATORIA AGARD- GOM. IN SOME SHALLOW EUTROPHIC KES,
erger.
handlungen Internationale Vereinigung Lim- gie, Vol 19, p 2689-2697, 1975. 4 fig, 2 tab, 17

criptors: *Nuisance algae, *Organic matter, on, *Eutrophication, Europe, Phosphorus, t ecology, Nutrient requirements, Impound- ts, Artificial lakes.
tifiers: *Flevoland(Netherlands), cillatoria.

stigations of the occurrence of Oscillatoria dhii and O. rubescens in five shallow, phic impoundments bordering the polder oland in the Netherlands, are detailed. All s received domestic effluents and one, the derwijd, received dairy wastes. The phorus load to the Drontermeer and the Velu- eer was about 4 to 5 g P/sq m/yr; Wolderwijd ably received less than 3 g P/sq m/yr, and the meer and Gooimeer received 20-30 g P/sq . The striking fact noted in the investigation the constant presence of O. agardhii in Wol- ijd--the lake which receives only dairy wastes vith the smallest phosphorus load, and its sud- disappearance from the Eemmeer and meer during a period of diminishing supply of ic matter. The role of organic matter as a car- ource seems very important although it is not n how much organic compounds as a carbon e are necessary for these algae when there is g carbon as carbonates and carbon dioxide, a f 9.0 and gross production of 5 mg C/l. The ent requirement for organic compounds by bescens in an environment with high inor- carbon concentrations may be that organic r supplies more than pure carbon. Or perhaps ic matter is relatively more important when nation is low. (Auen-Wisconsin)
09525

CT OF CRUDE OIL ON POPULATIONS ACTERIA AND ALGAE IN ARTIFICIAL DS SUBJECT TO WINTER WEATHER AND ORMATION,
Shindler, B. F. Scott, and D. B. Carlisle.
ndlungen Internationale Vereinigung Lim- e, Vol 19, p 2138-2144, 1975. 6 fig, 2 tab, 12

iptors: *Freshwater, *Oil spills, *Water pol- effects, *Bacteria, *Algae, Model studies, da, Ice cover, Winter.

Identifiers: Crude oil pollution, Hydrocarbons.

As part of an effort to study effects of crude oil spills on microorganisms in natural freshwater, effects of a winter Norman Wells crude oil spill on bacteria, algae and the chemical events which occur in lentic waters were investigated in artificial enclosures near the Ottawa River (Canada). The control and test ponds all contained Flavobacterium (including Cytophaga and Xanthomonas) and Caulobacter. Just after the ice melted and the oil contacted the water Arthrobacter became numerous. About three weeks later, in the under the ice application, a flavobacterium increased. When the water warmed Caulobacter again proliferated. Algae were most numerous in the heavily-oiled pond and least numerous in the control pond, with either N or P growth-limiting. Nitrate increased to high levels during summer in the oiled ponds. Although the multiple factors involved make it difficult to predict the kind of bacterial selection or enrichment which will take place with oil additions, after the oil contacts the water, an initial selection of one or a few bacterial types will take place, followed by greater diversity; the initial bacteria population was similar to types which degrade crude oils. The ponds did not become anaerobic. Obligate aerobes such as Axotobacter seemed to thrive under the oiled conditions. Aerobic nitrogen-fixing bacteria may have altered the N:P ratio, contributing to an increased rate of eutrophication. (Auen-Wisconsin)
W77-09526

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN.
Environmental Protection Agency, Washington, D.C. Water Quality Office.
For primary bibliographic entry see Field 5G.
W77-09528

DOES SALINITY INFLUENCE THE NUMBER OF VERTEBRAE DEVELOPING IN FISHES,
North Carolina Univ. at Chapel Hill. Inst. of Marine Sciences.
W. E. Fahy, and R. K. O'Hara.
International Council for the Study of the Sea, Journal du Conseil, Vol. 37, No. 2, p. 156-161, February 1977. 2 tab., 28 ref.

Descriptors: *Salinity, *Environmental effects, *Fish physiology, *Killifishes, *Fish, *Embryonic growth stage, Laboratory tests, Metabolism, Reviews, Water quality, Growth stages.
Identifiers: *Vertebral number, *Fundulus.

Using the cyprinodomtid fish, Fundulus majalis, five lots of 44 embryos each were reared in jars from gastrulation to hatching in a controlled-temperature room at five different salinities (16,21,26,31 and 36%). Comparisons of mean vertebral counts show no statistically significant differences occurring between them and thus no salinity influence upon vertebral number is indicated. The literature from the field of salinity influence upon vertebral number in fishes is reviewed and it is concluded that there is little evidence, from the field or the laboratory, to support the generally expressed acceptance of salinity as an important environmental factor known to modify vertebral number in developing fishes. (Katz)
W77-09589

AN AUTOMATIC SYSTEM FOR RAPID DETECTION OF ACUTE HIGH CONCENTRATIONS OF TOXIC SUBSTANCES IN SURFACE WATER USING TROUT,
Netherlands Waterworks, Rijswijk. Testing and Research Inst.
For primary bibliographic entry see Field 5A.
W77-09590

THE IMPORTANCE OF MONITORING CHANGE,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5A.
W77-09591

SOME DISSENTING REMARKS ON 'DELETERIOUS EFFECTS OF COREXIT 9527 ON FERTILIZATION AND DEVELOPMENT',
Exxon Research and Engineering Co., Florham Park, N.J.
G. P. Canevari, and G. P. Lindbloom.
Marine Pollution Bulletin, Vol. 7(7), 1976, p 127-128, 1 tab, 10 ref.

Descriptors: *Toxicity, *Bioassay, Mortality, Laboratory tests, Laboratory animals, Water pollution effects, Waste disposal, Oil, Oil spills, Dispersion, Sea water.
Identifiers: *Corexit 9527, Water soluble chemical dispersant.

The article discusses the relevance of laboratory toxicity studies of a chemical oil dispersant in general. While Lonning and Hagstrom use a sensitive means to determine the more ubtle, sublethal effects of chemicals on marine life, two major aspects of their work should be clarified. First, a concentration of 1-10 ppm of chemical dispersant, wherein fertilization of the sea urchin egg was affected in their work, does not occur in the usual marine environment with proper use of the dispersant. Second, there is no evidence to support the conclusion that the specific chemical dispersants studied by Lonning and Hagstrom preferentially release 'toxic substances' from the crude oil. (See W75-11091 and W75-11090) (Katz)
W77-09593

EFFECTS OF ANAEROBICALLY DIGESTED SEWAGE SLUDGE ON ORGANIC MATTER IN SOIL AND SOIL WATER,
Illinois Univ. at Urbana-Champaign.
G. N. Hohla.
Ph D Thesis, 1976. 101 p.

Descriptors: *Sludge disposal, *Sludge digestion, *Soil types, *Anaerobic treatment, *Leachate, Carbon, Nitrogen, Analysis, Organic matter, Disposal.
Identifiers: Land application.

A six-year study was conducted to determine anaerobically digested sludge effects on soil and soil water organic matter. Lysimeters containing Blount silt loam and Plainfield loamy sand were furrow irrigated with the sludge. Lysimeter leachate waters and Blount silt loam leachate waters were also studied. Total organic carbon, carbohydrate carbon, oil and grease carbon, and organic nitrogen were determined in the soils and lysimeter leachate waters. Blount silt loam leachate waters were characterized using infrared and ultrafiltration techniques. Results indicated that the coarse textured soil (Plainfield loamy sand) had a higher oxidation rate for sludge organic carbon and a higher leaching potential than fine textured Blount silt loam. Drainage is important in controlling oxidation rate of sludge organics in soils. Long-term sludge application caused an organic compounds distribution shift in the plow layer towards that of applied sludge. Finally, long-term sludge land application by ridge and furrow irrigation produces a relatively large organic carbon loss to oxidation, and a low potential loss to leaching. (Collins-FIRL)
W77-09598

5D. Waste Treatment Processes

THE EFFECTS OF CHILI WASTE ON AN ACTIVATED SLUDGE PROCESS,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
J. L. Gabbard.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 335, Price codes: A08 in paper copy, A01 in microfiche. Master of Science Thesis, June 1974. 54 p, 11 fig, 5 tab, 6 ref. OWRT A-047-NMEX(1).

Descriptors: *Activated sludge, *Chemical oxygen demand, Sewage, *Sewage treatment, Trickling filters, Anaerobic digestion organic loading, *Waste water treatment, Industrial wastes.
Identifiers: Chili, *Chili wastewaters.

A bench scale model of a completely mixed activated sludge system consisted of a primary clarifier, a completely mixed activated sludge unit, and a secondary clarifier. The activated sludge unit was rectangular with effluent flow over a single weir. Aeration and mixing were accomplished by compressed air injection. System performance was evaluated with sewage and chili waste influents while attempting to hold all other operational parameters constant. The mode of system evaluation was efficiency of COD removal by secondary treatment. Chili waste is highly degradable by aerobic microorganisms and is at least as susceptible to treatment by activated sludge as sewage. A completely mixed activated sludge system suffers only a mild upset from shock loading with chili waste and has a quick recovery from the upset. (Hain-NMex State)
W77-09141

OPTIMAL ARTIFICIAL AERATION DESIGN IN POLLUTED STREAMS RECEIVING THERMAL DISCHARGE,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5G.
W77-09146

OPTIMAL ARTIFICIAL AERATION POLICY FOR WATER QUALITY CONTROL OF STREAMS RECEIVING MULTIPLE THERMAL AND SEWAGE DISCHARGES,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W77-09147

AN OVERLAND FLOW - LAGOON RECYCLE SYSTEM AS A PRETREATMENT OF POULTRY WASTES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Soil Science.
M. R. Overcash, J. W. Gilliam, and F. J. Humenik.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 317, Price codes: A02 in paper copy, A01 in microfiche. Paper given at Third International Symposium on Livestock Wastes, ASAE, Urbana-Champaign, Ill., Apr. 1975, 14 p, 2 fig, 4 tab. OWRT B-067-NC(1), 14-31-0001-4113.

Descriptors: *Overland flow, Poultry, *Waste water treatment, *Recycling, Nitrogen, Phosphorous, Agricultural wastes, Nutrient removal, Farm wastes, Water reuse, Pretreatment(Water), North Carolina.
Identifiers: *Poultry wastes, Nitrogen removal, Phosphorous removal.

A field installation for overland flow was designed as a liquid recycling pretreatment facility for waste from a caged poultry house. Investigations were made to (1) evaluate the overland flow distance required to achieve varying levels of treatment as measured by chemical oxygen demand (COD), total organic carbon (TOC), nitrogen removal or conversions, and phosphorous transformation; (2) determine the pathways and amount of nitrogen removed per unit area in an overland flow animal waste pretreatment system; (3) evaluate the plant-soil system response to alternative loading strategies of animal waste. Significant reductions were obtained in the concentration of organics, nitrogen and phosphorous. Greater removal of COD occurred than TKN, with phosphorous removal the least efficient. Distance needed for overland flow will probably be less than 45 m for animal waste systems because of declining removal percentages found after 15 m of treatment. Good grass growth occurred and effective soil sealing was achieved and promoted runoff rather than downward movement. (See also W76-11775)
W77-09148

COST-EFFECTIVE ANALYSIS OF WASTE LOAD ALLOCATIONS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W77-09167

PATUXENT RIVER BASIN MODEL RATES STUDY,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 5B.
W77-09170

EFFICIENT STORAGE OF URBAN STORM WATER RUNOFF,
Environmental Protection Agency, Denver, Colo.
J. R. Doyle, J. P. Heaney, W. C. Huber, and S. M. Hasan.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 139-143, July 1976. 1 fig, 2 tab, 8 ref.

Descriptors: *Storm water, *Detention reservoirs, *Linear programming, *Flood plains, *Evaluation, *Alternative planning, Optimization, Storage reservoirs, Costs, Florida, Decision making, Urban runoff, Equations, Mathematical models, Systems analysis.
Identifiers: *Mixed integer programming, Cost minimization, Drainage basins.

Mixed integer linear programming is used to evaluate alternatives for use of storm water detention in flood plains and developing areas. This model is suitable where a refined analysis is needed. Mixed integer programming is appropriate when it is necessary to handle fixed charge problems. This added feature significantly increases the computational complexity of the model as compared to standard linear programming procedures. Given an inventory of available storage sites, both in and out of the flood plain, and costs for other flow reduction measures, the optimization model determines the least costly combination of storage reservoirs. Application to the Hogtown Creek drainage basin in Gainesville, Florida is included to demonstrate the techniques. In solving the problem, the model allocates the specified total potential runoff volumes from each subbasin among the subbasin and flood plain storage sites, while allowing only a specified volume of runoff to flow downstream. All storage allocations and costs are given. Results show that the fixed costs for providing storage within the flood plain and the subbasin are a small percentage of the total costs. (See also W77-09154) (Bell-Cornell)
W77-09171

JOINT USE OF SWMM AND STORM MODELS FOR PLANNING URBAN SEWER SYSTEMS,
Clinton Bogert Associates, Fort Lee, N.J.
H. L. Kaufman, and F-H. Lai.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 144-150, July 1976. 8 fig, 1 tab, 10 ref.

Descriptors: *Simulation analysis, *Sewers, *Planning, *Computer models, Flood control, *Water quality control, Design storm, Hydrographs, Hyetographs, Infiltration, Pollution abatement, Runoff, Systems analysis, Costs.
Identifiers: Cost effective.

The joint use of the SWMM and STORM simulation models has been demonstrated to provide a tool for sewer system planning which effectively alleviates urban flooding and prevents pollution in the receiving waters. Techniques were developed for projection of runoff characteristics from one drainage district to others for citywide sewer planning. A concept making use of the characteristics of runoff quantity and quality and interceptor capacity for cost-effective pollution control is described. The pollutants discharged to receiving waters for various interceptor capacities have been comparatively quantified. (See also W77-09154) (Bell-Cornell)
W77-09172

RADIONUCLIDE REMOVAL BY THE PH ADJUSTMENT OF PHOSPHATE MILL EFFLUENT WATER,
Eastern Environmental Radiation Facility, Montgomery, Ala.
D. L. Norwood, and J. A. Broadway.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-2 1976, Cincinnati, Ohio. Report EPA 600/9-76-01 U.S. Environmental Protection Agency, Washington, D.C., p 264-268, July 1976. 2 fig, 1 tab, 5 r append.

Descriptors: *Waste water treatment, *Wa quality control, *Phosphates, *Industri *Computer models, Flow rates, Evaluation, fluents, Equations, Systems analys *Radioisotopes.
Identifiers: *Wet process plant.

Application of the GASP IV computer simulat system to the waste water treatment process phosphate ore milling industry is present Specific attention is directed to a quantitat evaluation of precipitation of radionuclides du the limiting treatment (pH adjustment) used wet process plant and the residual radionuclide effluent water. The variation in ou radionuclide concentrations has been studied function of important system parameters such flow rate, liming rate, and pH. Extension of modeling capability to other large industrial ap cations is discussed and implications for fur study are indicated. As more information gathered concerning the phosphate plant releas the process water pond and its behavior in pond, this model can be used to determine the timal volumetric flow rate. (See also W77-09 (Bell-Cornell)
W77-09180

MODIFICATIONS TO QUAL - II TO EVALUATE WASTEWATER STORAGE,
Environmental Protection Agency, Atlanta, Technical Support Branch.
J. S. Tapp.
In: Proceedings of the Conference on Envi mental Modeling and Simulation, April 19 1976, Cincinnati, Ohio. Report EPA 600/9-76- U.S. Environmental Protection Agency, Was ton, D.C., p 350-352, July 1976. 5 fig, 3 ref.

Descriptors: *Water quality control, *Simula analysis, *Computer models, *Model stu Streamflow, Waste water(Pollution), Sto Flow, Effects, Low flow, Water tempera Treatment facilities, Waste water treatment, S dards, Seasonal, Systems analysis, *Dissolve ygen.
Identifiers: Receiving waters.

Effluent limitations for wastewater discharge commonly established based on maximum

ature at some critical statistical low streamflow dition, normally defined by water quality stan-ls. For situations where assimilative capacity mited and the storage of effluent from a waste-er treatment facility is feasible, the normal onal changes in water temperature and flow s can be utilized to allow instream water quali-tandards to be maintained at a cost less than by zing treatment alone. To use the wastewater age approach requires curves of streamflow us wastewater flow at a given quality to main-some instream constituent concentration, lly dissolved oxygen. Unfortunately, most olved oxygen models are not constructed so these curves can be determined without much and error input and manipulation. Described nodifications to the Model QUAL-II to allow generation of curves of streamflow versus ewater flow to maintain a given instream dis-ed oxygen concentration. Situations which themselves to application of the modified el are discussed. (See also W77-09154) (Bell-nell)
-09186

TER POLLUTION MODELING IN THE ROIT METROPOLITAN AREA,
oit Water and Sewerage Dept.Mich.; and ne State Univ. Detroit, Mich. Coll. of En-ering.
primary bibliographic entry see Field 5B.
-09187

ERALIZED METHOD FOR EVALUATING AN STORM WATER QUALITY MANAGE-T STORAGE/TREATMENT ALTERNA-ES,
da Univ., Gainesville. Dept. of Environmen-ngineering Sciences.
Heaney, W. C. Huber, S. M. Hasan, and M. P. hy.
Proceedings of the Conference on Environ-al Modeling and Simulation, April 19-22, Cincinnati, Ohio. Report EPA 600/9-76-016, Environmental Protection Agency, Washing-D.C., p 358-361, July 1976. 3 fig, 1 tab, 16 ref.

riptors: *Water pollution control, ulation analysis, *Rainfall, *Runoff, puter models, Storm water, Management, n runoff, Pollutants, Estimating, Cost analy-Optimization, Biochemical oxygen demand, odology, Evaluation, Storage, Treatment, ms analysis.
ifiers: Loading rates, Cost minimization.

letion is near of an EPA-sponsored study in nction with the American Public Works As-ion to estimate the nationwide cost of con-g pollution from combined sewer overflows torm sewer runoff. Two models, the USEPA Water Management Model and the Corps of eers' STORM, were used extensively in this to estimate pollutant loading rates and evalu-various storage/treatment alternatives. led modeling studies were performed in At-Denver, Minneapolis, San Francisco, and ington, D.C. This paper describes the results tinuous simulation of hourly rainfall and ru-n these cities for a wide variety of assumed bilities of storage and treatment combina-Results of these simulation studies are nted as isoquants showing the technologi-efficient combinations of storage and treat-to obtain a specified per cent pollution con-This information is combined with cost data oped herein to determine the optimal com-on of storage and treatment for any desired of control for each of the five cities. The are presented in a normalized form which s engineers and planners to derive preli-stimates of control costs for other cities. nformation is useful for early phases of 208 ng and for NEEDS surveys. A more ete description of this procedure is ted elsewhere. (See also W77-09154) (Bell-l)

W77-09188

CAPACITY EXPANSION FOR MUNICIPAL WATER AND WASTEWATER SERVICES: INCORPORATION OF UNCERTAINTY,
Curran Associates, Inc., Northampton, Mass.
R. G. Curran, D. S. Grossman, and D. H. Marks.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 639-645, July 1976. 1 tab, 46 ref.

Descriptors: *Municipal water, *Water supply, *Demand, *Model studies, *Investment, *Economic efficiency, Optimization, Linear programming, Alternative planning, Water shortage, Construction costs, Operations, Estimating, Decision making, Forecasting, Systems analysis, Waste water(Pollution), *Risks.
Identifiers: *Capacity expansion, Cost minimization, Penalty fees, Nonlinear programming.

Methods for the management of local water and wastewater investments are outlined. The strategy is to choose the least cost supply alternative that services a forecast but uncertain equilibrium demand. Careful attention is paid to the overall usability of the method by local planners. Linear and nonlinear models are categorized as to shortfalls, no shorfalls, certainty, and uncertainty. The research defines water and wastewater service demands, and identifies some controls available to local decision makers for modification of these demands. The level of future requirements for planning is uncertain; the form and magnitude of the uncertainty is explicitly included. Supply alternatives and forecst costs of supply are also presented. Forecasts are developed for local relevance and to best utilize available information. A detailed analysis of time phasing and scale of capacity expansion requires forecasts of the impact of supply shortage. Short term alternatives in shortage can either act to limit demand or to increase supply. Recommended cost assessment for these strategies is empirical. The criterion for expansion planning is to choose the alternative which minimizes total costs, where costs include construction, operating, and shortage penalty fees. The recommended expansions explicitly incorporate forecast uncertainty in the evaluation of alternative investment patterns. (See also W77-09154) (Bell-Cornell)
W77-09201

NEW MODELS FOR OPTIMAL SEWER SYSTEM DESIGN,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
B. C. Yen, H. G. Wenzel, Jr., L. W. Mays, and W. H. Tang.

Descriptors: *Sewers, *Design, *Economic efficiency, *Dynamic programming, *Model studies, Optimization, Routing, Hydrographs, Hydrology, Travel time, Installation costs, Manholes, Risks, Simulation analysis, Constraints, Illinois, Computer programs, Evaluation, Mathematical models, Equations, Systems analysis, Storm water.
Identifiers: *Cost minimization, Damage costs.

Considerable savings in sewer designs can be achieved by considering the sewers as a system and searching for the least-cost design using optimization techniques. Three new models have been developed for the minimum cost design of storm sewers. The basic model designs the crown elevations, slopes, and diameters of the sewers. The sewer system layout is predominant. Routing is accomplished by lagging the hydrographs by a travel time. Optimization is achieved through a discrete differential dynamic programming method to produce the least-cost design of the system based on specified cost functions for installation of the sewers and manholes. The second model is an expansion of the basic model incorporating risk-based damage costs in the design procedure, and the risks for each sewer associated with the minimum cost design are also given as part of the design results. The third model is similar to the basic model except that the least-cost sewer layout is also a part of the design result instead of being predetermined. (See also W77-09154) (Bell-Cornell)
W77-09205

SWAN, A SEWER ANALYSIS AND MODELING SYSTEM,
Erdman Anthony, Associates. Rochester, N.Y.
E. C. Tonias, and P. C. King.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 750-754, July 1976. 1 fig, 11 ref.

Descriptors: *Sewers, *Networks, *Simulation analysis, *Computer programs, Decision making, Design, Hydrologic aspects, Hydrographs, Backwater, Mathematical models, Systems analysis, Storm water, Flow.
Identifiers: *Collection networks.

The need for a thorough understanding of the sewage collection systems for many municipalities has resulted in the development of a system of computer programs to analyze an existing network. This computer system, called SWAN (an acronym for Sewer Analysis), can be employed to examine the collection network as a whole or in part(s), thus enabling the investigators to see the total character of the network at a glance and to make coordinated decisions concerning expansion and improvement. SWAN can store an entire sewage collection network on a data base which easily can be modified and employs a mathematical model to simulate the network flows under various sanitary and storm conditions and combinations thereof. SWAN was originally based on the Rational Method. Recent modifications have incorporated the Surface Hydrograph Method commonly referred to as the Chicago Method. Although SWAN's primary purpose is to analyze existing sewer systems, it may be used as a design tool. The principle of design by iterative analysis is facilitated immensely by SWAN's built-in feature of recommending appropriate pipe sizes for upgrading inadequate sewer reaches. Graphic documents produced automatically by the computer system may be utilized as final report or contract documents. SWAN is ideally suited for a small (IBM-1130) computer readily available to many consulting engineering offices and small governmental agencies and municipalities. Although SWAN is intended for batch processing, it may easily be converted for an interactive environment. (See also W77-09154) (Bell-Cornell)
W77-09206

ON-LINE MODELS FOR COMPUTERIZED CONTROL OF COMBINED SEWERS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. W. Labadie, N. S. Grigg, and P. D. Trotta.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 755-759, July 1976. 4 fig, 10 ref.

Descriptors: *Combined sewers, *Automatic control, *Computers, *Forecasting, *Optimization, *Model studies, Pollutants, Discharge(Water), Flow, Overflow, Computer models, Rainfall-runoff relationships, Constraints, Dynamic programming, Algorithms, Digital computers, Equations, System analysis.
Identifiers: Minimization.

Automatic computer control is a cost-effective approach to controlling polluting discharges from

combined sewer systems. Perhaps the greatest challenge is development of programmable models and control logic that can find the best positioning of field control elements within the restriction of the on-line, real-time environment. Control strategies can be developed off-line or on-line, and may be reactive or adaptive. It appears that simple reactive control, or rule curves, can adequately control total overflows, but may produce high overflow rates. Stochastic adaptive policies produce a smoother distribution of overflows, but are highly dependent on the accuracy of the storm inflow forecasting model. Autoregressive moving-average transfer function models are proposed as an efficient approach to forecasting. Initial indications are that total city-wide automatic control is feasible, both technically and economically. A quantified control objective and mathematical specification of all pertinent constraints on system response, in conjunction with a systematic optimization algorithm for finding the best or near-best controls, is termed an optimizing model. Development of efficient, yet sufficiently accurate, optimizing models for on-line use remains a challenging area for future research. (See also W77-09154) (Bell-Cornell)
W77-09207

MATHEMATICAL MODELS FOR CALCULATING PERFORMANCE AND COST OF WASTEWATER TREATMENT SYSTEMS,
Municipal Environmental Research Lab., Cincinnati, Ohio. Systems and Economic Analysis Section.
R. G. Eilers.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 760-763, July 1976. 1 fig, 4 tab.

Descriptors: *Waste water treatment, *Computer programs, Costs, Estimating, Performance, Waste water(Pollution), Municipal wastes, Sewage, *Computer models, Activated sludge, Mathematical models, Systems analysis.
Identifiers: Minimum cost, Design variables.

The Systems and Economic Analysis Section of the Wastewater Research Division of EPA in Cincinnati, Ohio is concerned with finding quantitative expressions for calculating the performance and cost of wastewater treatment processes as a function of the nature of the wastewater to be treated and the design variables associated with the individual unit processes. These models are intended primarily to characterize the treatment of municipal sewage. Since the procedure for solving all of the quantitative equations is usually too laborious or complex to be accomplished by hand calculation, various FORTRAN computer programs have been developed to perform the task. A description in tabular form of the most significant of these programs is given. Discussed also are models for the activated sludge process and specialized cost estimating programs. In conclusion, the mathematical computer model can minimize the computational work required for examining alternative designs, and, if correctly developed, will reflect the best obtainable experimental and scientific information. EPA is interested in promoting the use of computerized design techniques in order to achieve better treatment at a minimum cost. (See also W77-09154) (Bell-Cornell)
W77-09208

MATHEMATICAL MODELING OF DUAL WATER SUPPLY SYSTEMS,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 6D.
W77-09210

FUTURE DIRECTIONS IN URBAN WATER MODELING,
Water Resources Engineers, Inc., Walnut Creek, Calif.
M. B. Sonnen, L. A. Roesner, and R. P. Shubinski.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 829-832, July 1976. 14 ref.

Descriptors: *Mathematical models, Storm water, Combined sewers, Water distribution(Applied), Waste treatment, Water quality control, Systems analysis, Hydrology, Simulation analysis, *Water resources.
Identifiers: *Urban water systems, Sewer systems, Water use, Receiving waters, Modeling philosophy.

In 1974-75, a review was performed by Water Resources Engineers (WRE) for EPA's Storm and Combined Sewer Section Concerning the state-of-the-art of urban water modeling. Moreover, WRE was then to recommend what model development work could be undertaken most feasibly in the following five years. The scope of the review was to include all the urban water subsystems, such as watersheds, water supplies, treatment, or water use, but the emphasis was place on storm and combined sewer problems and their modeling. Herin, an outline is presented of the findings with respect to most of the urban water subsystems reviewed. Gaps in needed modeling technology are identified, and philosophical approach to filling those gaps in developed. Finally, a phased implementation program for developing the needed models is suggested. Inadequacies that continue to exist in problem-solving capability are more philosophical and scientific than numerical. (See also W77-09154) (Bell-Cornell)
W77-09213

TO ESTABLISH VIABLE METHODS OF MAINTAINING WASTE TREATMENT FACILITY EFFICIENCIES WITH REFERENCE TO FLOW VARIATIONS, VOLUME II.
MacLaren (James F.) Ltd., Toronto (Ontario).
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 55, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, 1977. 67 p, 30 fig, 18 tab, 6 ref, 2 append.

Descriptors: *Treatment facilities, *Waste water treatment, *Sewage treatment, *Sewage disposal, Flow rates, Flow measurement, Flow system variability, Efficiencies, Average flow, Peaking, Design criteria, Viability, Methodology, Municipal wastes, Fluctuations, *Canada.
Identifiers: *Ontario.

Sewage flow records from eleven individual sewage systems of varying sizes were examined. Daily flow records have been evaluated for all plant to establish variations in average daily flow over periods of one, two, and in some cases three years. Flow records were statistically analyzed to determine the flow rate occurring at the 10 and 25 percent exceedence levels. Typical exceedence flow profiles for two municipal waste treatment plants are presented, along with the mean daily flow, the maximum flow and ten and 25 percent exceedence levels. To establish meaningful design criteria for equalization, extensive analysis of daily and diurnal variations of flow in Ontario sewage treatment plants was carried out. A significant conclusion of the analysis was that the peaking factors are essentially independent of the plant size. The most important criteria for flow equalization appeared to be the maximum daily peaking factor and the diurnal peaking factor. Diurnal peaking factors decreased with increasing peaking periods. On the basis of the findings a new and simplified method is suggested for sizing and operation of equalization basins. Maximum benefit due to equalization can be predicted for the performance of primary clarifiers. A construction cost comparison for plant sizes of 5 and 50 mgd indicates that fully equalized flow can result in a small reduction over variable flow design. Partial equalization does not appear to be a viable alterna tive. The cost benefits may be considered to b conservative, yet potential cost benefits may b higher when increased performance of the variou units and the elimination of surcharge energy cos at peak loadings are included. (See also W7 08398) (WATDOC)
W77-09214

DESIGN AND PERFORMANCE CRITERIA FO SETTLING TANKS FOR THE REMOVAL C PHYSICAL-CHEMICAL FLOCS, VOLUME II,
Toronto Univ. (Ontario). Inst. Environment Sciences and Engineering.
G. W. Heinke, M. A. Qazi, and A. Tay.
Canada-Ontario Agreement on the Great Lak Water Quality, Research Report, No 56, Enviro mental Protection Service, Fisheries and Enviro ment Canada, Ottawa, Canada, 1977. 115 p, 36 fi 12 tab, 88 ref. 72-5-7.

Descriptors: *Flocculation, *Chemical waste *Physical properties, *Design criteria, Pe formance, Suspended solids, Sediments, *Wa water treatment, Waste treatment, Chemical rea tions, Behaviour, Hydrolysis, Laboratory tes On-site tests, Industrial plants, Influent stream Effluent streams, *Settling basins, *Canada.
Identifiers: *Settling tanks, *Quiescent con tions, *Variable flow conditions, Toronto, Sarn Windsor, Burlington, Ontario.

The objective was the study of settling behavior physical-chemical suspensions, on both a labo tory and plant basis, in order to suggest des guidelines and methods to predict the performan of settling tanks treating such suspensions. A br literature review confirmed the belief that relati ly little work on this topic had been carried o although there was much pertinent backgrou material available. Laboratory studies un quiescent settling conditions and plant stud have been carried out during the past three ye at Toronto, Sarnia, Windsor and the Wastewa Technology Centre in Burlington. The addition coagulants (ferric chloride, alum and polymer domestic wastewater for the primary purpose phosphorus removal has an important side eff in increased suspended solids and BOD remov In addition, this study shows that flow rates can increased substantially, thus increasing the cap ty for existing settling tanks. Tentative guideli have been suggested for the dsign of setling tan The use of these guidelines will result in sma settling tanks than would be required by the c rent guidelines. The cost savings for the expans of existing plants and the construction of new tling tanks are expected to be significant. (See W74-0896) (WATDOC)
W77-09215

AEROBIC DIGESTION OF ORGA SLUDGES CONTAINING INORGA PHOSPHORUS PRECIPITATES, VOLUME SLUDGES PRECIPITATED BY LIME AD TIONS TO RAW SEWAGE,
Toronto Univ. (Ontario). Dept. of Civil Engin ing; and Toronto Univ. (Ontario). Inst. for vironmental Studies and Engineering.
J. Ganczarczyk, and M. F. D. Hamoda.
Canada-Ontario Agreement on the Great La Water Quality, Research Report No 58, Envi mental Protection Service, Fisheries and Envi ment Canada, Ottawa, Canada, 1977. 81 p, 44 f tab, 13 ref. 72-5-4.

Descriptors: *Organic wastes, *Aerobic tr ment, *Sludge digestion, *Digestion tanks, I ganic compounds, Phosphates, *Lime, *Chem precipitation, Sewage, *Waste water treatm Industrial plants, Model studies, Chelation, F culation, Carbon, Nitrogen, Dewater Suspended solids, *Sludge treatment, *Can Industrial wastes.
Identifiers: *Batch loading experime *Semicontinuous loading experime *Toronto(Ontario).

boratory experiments were carried out at 20 C completely mixed digestion units on sludges col- ted from a municipal wastewater treatment nt in Metropolitan Toronto. Tests were carried simultaneously on lime-primary sludges ecipitated with Ca (OH)2) and primary sludges chemical addition). Batch digestion experi- nts and semi-continuous (fed once a day) load- experiments were carried out. Lime-primary dges from raw sewage precipitated with dif- nt lime dosages (140-600 mg/1) were studied at values in the range of 9-12. For comparative oses, all sludges studied had initially a similar atile solids content. Digester detention time varied from 7-15 days to investigate the effect this parameter on aerobic digestion of the dges. Aerobic periods of at least 15 days at 20 C e required for effective treatment, especially sludges having an initial pH in the higher range values. The digestion process kinetics of lime- nary sludges with initial pH in the range of 9-10 e higher than those of the primary sludge ntrol) but for lime-primary sludges having ini- pH in the range of 10-12, the high alkalinity or ium content of the sludge resulted in lower cess kinetics. The nitrification process was in- ted in digesters treating sludges precipitated h high lime dosages. The supernatant of the ested sludges had low soluble organic carbon nutrient (phosphorus and nitrogen) contents. aerobically digested lime-primary sludges had ellent dewatering characteristics. (See also 4-07268) (WATDOC)
7-09216

GRADING OF SEWAGE LAGOON EF- UENTS,
ario Ministry of the Environment, Toronto. ution Control Branch.
. G. Rupke, and K. Chisholm.
ada-Ontario Agreement on the Great Lakes ter Quality, Research Report No. 54, Environ- tal Protection Service, Fisheries and Environ- t Canada, Ottawa, Canada, 1977. 27 p, 11 fig, 4 74-1-37.

criptors: *Sewage lagoons, Effluents, fluent streams, *Waste water treatment, ste storage, Quality control, Biochemical ox- n demand, Suspended solids, Pollutants, Floc- tion, Sedimentation, Filtration, Flow mea- ment, Systems analysis, Chemical reactions, nada, Water quality standards, *Treatment.
tifiers: *Strathroy(Ontario).

ous unit processes were evaluated at the throy, Ontario, lagoon for the purpose of up- ing conventional lagoon effluent quality. ems to reduce both the suspended matter and the soluble components were used. Unit esses investigated included physical-chemical ment followed by filtration, air flotation, rostraining and the rotating biological contac- It was found that a suitable system for upgrad- agoon effluent quality would involve a rotat- iological contactor for ammonia nitrogen and ble BOD reduction, followed by chemical ulation-sedimentation and multimedia filtra- (WATDOC)
-09218

ASSESSMENT OF KRAFT BLEACHERY EF- ENT TOXICITY REDUCTION USING AC- ATED SLUDGE,
ronmental Protection Service, Ottawa ario). Water Pollution Control Directorate.
Jank, D. W. Bissett, V. W. Cairns, and P. H. uo.
nology Development Report No. EPS 4-WP- May, 1977. 109 p., 19 fig., 8 tab, 22 ref., 8 ap- .

riptors: *Pulp and paper industry, *Bleaching es, *Effluents, *Influent streams, *Toxicity, ivated sludge, Waste water treatment, es, Bioassay, Methodology, Testing, Testing procedures, On-site tests, Analysis, Variability, *Canada, Industrial wastes.
Identifiers: *Two stage system, *Single stage system, Espanola, Ontario.

Bleach plant effluent is considered to be one of the major contributors to toxicity in kraft pulp and paper mill operations. A pilot scale two-stage activated sludge system was operated on the six-stage kraft bleachery effluent at Eddy Forest Productions Limited, Espanola, Ontario, to study the practicability of using a two-stage biological system to meet effluent requirements specified in the Pulp and Paper Effluent Regulations (1971). For comparison purposes a conventionally loaded single-stage activated sludge system was operated in parallel with the two-stage system. Emphasis was placed on an assessment of the capabilities of the activated sludge systems for the reduction of acute toxicity to juvenile rainbow rainbow trout. The results showed that the two-stage system was consistently achieving greater toxicity reduction than the single-stage system even at considerably higher volumetric loadings. At similar volumetric loadings the two-stage system also provided greater BOD5 removal than the single-stage system. Treatment efficiency and toxicity reduction were both affected by wood species. Effluents from both activated sludge systems treating kraft bleachery effluent would not meet the toxicity requirements specified in the Pulp and Paper Effluent Regulations (1971). (WATDOC)
W77-09223

LAND APPLICATION OF WASTE WATER, A BIBLIOGRAPHY.
Office of Water Research and Technology, Washington, D. C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 511, Price codes: A18 in paper copy, A01 in microfiche. --Water Resources Scientific Information Center, Report OWRT/WRSIC 77-204, June 1977. 408 p.

Descriptors: *Waste water disposal, *Bibliographies, *Waste disposal, *Water reuse, *Waste water treatment, Industrial wastes, Municipal wastes, Recycling, Reclaimed water, Sewage disposal, Sludge disposal, Soil disposal fields, Sprinkler irrigation, Tertiary treatment, Water spreading.
Identifiers: *Land application.

This report, containing 460 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 101,774 abstracts covering SWRA through September 15, 1976 (Volume 9, Nuber 18). Author and subject indexes are included.
W77-09265

RENOVATION RESPONSE TO APPLICATION FREQUENCIES FOR GRASS FILTRATION TREATMENT OF SEWAGE EFFLUENT,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
J. V. Husted.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 512, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, August 1974. 63 p, 20 tab, 12 fig, 23 ref. OWRT B-054-PA(1), 14-31-0001-3931.

Descriptors: *Overland flow, *Rates of application, *Waste water treatment, *Sewage treatment, Seasonal, Effluents, Nitrates, Phosphates, *Filters, *Filtration.
Identifiers: *Nitrate removal, *Phosphate removal, *Grass filtration systems, *Final treatment, Wastewater systems, Flow distance, Application frequency, Long contact time.

Effects were determined of four application frequencies on wastewater renovation by grass filtration. Frequencies chosen for study were two-, three-, and six-times-per-week, and a continuous-flow application. A hydrologic analysis of the three plots was made through the use of inflow rates, runoff rates, piezometers, and soil profile investigations. Infiltration rate was slightly influenced by application rate and frequency. The reductions of nitrate-N and orthophosphate-P for the two-, three-, and six-time-per-week application frequencies were less than five percent. Continuous-flow treatment gave greater reductions of nitrate-N and orthophosphate-P than the intermittent method. Infiltration rate decreased with a decrease in application rate, but remained nearly constant for the two-, three-, and six-times-per-week application frequencies. Piezometer response indicated that no wastewater appeared as interflow in the surface runoff from the plots. (Sink-Penn State)
W77-09271

AMMONIA TRANSPORT IN WATER SATURATED POLYMERIC FILMS,
Missouri Univ.-Kansas City. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-09274

WATER RECLAMATION: TECHNOLOGY AND PUBLIC ACCEPTANCE,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
R. Stone.
Journal of the Environmental Engineering Division-ASCE, p 581-594, June, 1976. 7 fig, 4 tab, 3 ref.

Descriptors: *Attitudes, *Reclamation, *Water reuse, *Surveys, *Feasibility, Public health, Viruses, Industrial water, Irrigation, Reclaimed water, Waste water treatment, Costs, *California.
Identifiers: Southern California.

Public attitude surveys among 10 Southern California communities, industrial plant management, public water resources officials, and water resources management experts were conducted to assess the public acceptance and technological feasibility of water reclamation. Public attitudes were largely accepting the lower contact uses. The public reuse of waste water for higher contact uses, particularly human consumption, encountered more severe constraints in attitude due to the higher treatment costs associated with additional treatment and possible adverse effects on public health resulting from the danger of treatment plant failure. Reuse in industrial cooling and processing appears particularly promising due to its low contact nature and relatively large water use. Reuse of waste water for other nonbody contact purposes, particularly agriculture (irrigation), also appears promising. Existing technology is generally sufficient to provide waste water of acceptable quality for all uses; however, improvements in the detection and removal of viruses are needed. (Kreager-FIRL)
W77-09317

SYSTEM DESIGN OF A TUBULAR REVERSE OSMOSIS PLANT,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5F.
W77-09319

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PREVIEW.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09379

BINGHAMTON WASTEWATER MANAGEMENT STUDY: SUMMARY.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.

W77-09380

BINGHAMTON WASTEWATER MANAGEMENT STUDY: BACKGROUND INFORMATION APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09381

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PLAN FORMULATION APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09382

BINGHAMTON WASTEWATER MANAGEMENT STUDY: COMMENTS APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09383

BINGHAMTON WASTEWATER MANAGEMENT STUDY: SPECIALTY APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09384

BINGHAMTON WASTEWATER MANAGEMENT STUDY: DESIGN AND COST APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09385

BINGHAMTON WASTEWATER MANAGEMENT STUDY: IMPACT ASSESSMENT AND EVALUATION APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09386

BINGHAMTON WASTEWATER MANAGEMENT STUDY: INSTITUTIONAL ANALYSIS APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09387

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PUBLIC INVOLVEMENT APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09388

DAIRY MANURE CAN BE USED SAFELY,
California Univ., Davis.
For primary bibliographic entry see Field 5G.
W77-09389

WATER MANAGEMENT ASPECTS OF THE AGRICULTURAL UTILIZATION OF LIQUID MANURE AND PRELIMINARY EXPENDITURE STANDARDS, (IN GERMAN),
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 5G.
W77-09391

WATER MANAGEMENT PROBLEMS INVOLVED IN THE TREATMENT AND UTILIZATION OF LIQUID MANURE, (IN GERMAN),
Institut fuer Wasserwirtschaft, Berlin (East Germany).
D. Kramer.
Wasserwirtschaft-Wassertechnik, V 22, No 6, p 182-184, June, 1972. 4 fig, 6 ref.

Descriptors: *Waste water treatment, *Waste disposal, Liquid wastes, *Water pollution, Nitrogen, Phosphorus, Economics, Separation techniques, Activated sludge, Water pollution control, *Pollution abatement, *Farm wastes.
Identifiers: Land spreading, *East Germany.

General problems of the treatment and disposal of liquid manure in East Germany are discussed. Liquid manure constitutes a real problem in terms of water pollution due to its high BOD value (4,000 to 7,000 mg per liter), and its high nitrogen and phosphorus contents. While the use of organic fertilizer has been in steady decrease for decades, the application of liquid manure to farmlands represents the best solution in terms of economics and environmental protection. Laboratory tests adopting the activated sludge method for the treatment of liquid manure gave largely satisfactory results in one-stage operation, with no significant improvement in two-stage process. However, dilution of the liquid manure at a ratio of 25 or more, and phase separation with separate treatment of the sludge obtained were necessary. Increasing fish death during the last decade due to agricultural organic effluents has occurred. (Solid Waste Information Retrieval System)
W77-09392

DESIGN PARAMETERS FOR ANIMAL WASTE TREATMENT SYSTEMS - NITROGEN CONTROL,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
T. W. Bateman, R. C. Loehr, T. B. S. Prakasam, E. G. Srinath, and T. W. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 993, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Report No. EPA-600/2-76-190, Sept., 1976, 144 p., 37 fig., 27 tab., 29 ref.

Descriptors: *Design, *Waste treatment, Feasibility studies, Liquid wastes, *Oxidation lagoons, Crop response, Water pollution, Groundwater, Agricultural runoff, Grasses, Corn(Field), Aeration, *Farm wastes, Nitrogen, Rates of application.
Identifiers: Odor control, *Nitrogen control, Land application, Poultry manure.

The objectives were to: (a) develop design criteria for nitrogen and odor control in animal waste stabilization systems; (b) demonstrate the feasibility of nitrogen control using the oxidation ditch; (c) determine the rate, form, and time of manure application permissible without causing surface or groundwater pollution; and (d) determine the optimum rate, form, and time of application for best crop response. Laboratory, pilot plant, and full scale studies were conducted to develop design parameters for odor and nitrogen control. Information concerning the fate of manurial nitrogen and crop response was derived from agronomic field studies. A method of determining oxygen requirements for stabilization based on exerted carbonaceous and nitrogenous oxygen demand was developed. Controlled nitrogen removal in the range of 30 to 90 percent was developed. Controlled nitrogen removal in the range of 30 to 90 percent was demonstrated. Nitrogen losses were due to ammonia volatilization and/or nitrification-denitrification. Field studies indicated no differences between raw and aerobically stabilized poultry manure in nutrient availability to plants or surface runoff losses. At a given rate of manure application, soil nitrate levels were higher under corn in comparison to grasses. The maximum recommended application rate of poultry manure for corn was 224 kg N/ha. Application rates for grasses were limited to 100-170 kg N/ha by plant response. (East Central)
W77-09393

DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
F. J. Humenik, and M. R. Overcash.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 032. Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-76-233, Oct., 1976. 292 p, 89 fig., 57 tab., 9 ref.

Descriptors: *Farm wastes, *Waste treatment, *Hogs, *Design criteria, Lagoons, Waste treatment, Liquid wastes, Aeration, Model studies, Odor, Nitrogen, Irrigation.

Coordinated laboratory, field pilot-, and farm-scale lagoon studies were conducted to define relationships between loading intensity and frequency based on treatment performance, sludge accumulation, and odor potential. Surface aeration of field pilot units and farm-scale lagoons was also investigated to evaluate aeration levels required for odor control and the effect of surface aeration on nitrogen and organic transformations. Laboratory studies were designed to elucidate basic chemical, physical, and biological mechanisms important in explaining and modeling lagoon performance. Long-term mass balance studies were conducted to define the fate of waste input and thus total constituent loss from the system. Predictive and interpretive relationships for lagoons based on constant batch loading and continuous loading were derived to describe the supernatant concentration of unaerated lagoons. Methods for determining steady-state concentrations and first-order reaction rate constants for oxygen demand, organic carbon, and nitrogen were developed and compared with laboratory and field pilot-scale data. Lagoon liquid from a farm-scale unit was irrigated to nine 9.24 m x 9.24 m Coastal Plain soil-Bermuda grass plots at nitrogen loading rates of 300, 600 and 1,200 kg N/ha. /year. Mass balance data were collected to determine the fate of applied waste constituents. (East Central)
W77-09394

CONVERSION OF CATTLE MANURE INTO USEFUL PRODUCTS,
California Univ., Los Angeles. School of Engineering and Applied Science.
B. S. Dunn, J. D. Mackenzie, and E. Tseng.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-239 6. Price codes: A04 in paper copy, A01 in microfic. Environmental Protection Agency Report EPA-600/2-76-238, Sept., 1976, 33 p. 7 fig., 7 tab., 5 re.

Descriptors: *Farm wastes, *Waste treatment, *Cattle, *Byproducts, *Pyrolysis, Des. *Recycling, Rubber, Oil, Fertilizers, Paint.

The purpose was to design and build a pyroly apparatus for cattle manure and to investigate potential uses of the pyrolysis by-products. pyrolysis machine of semi-continuous feed ca bilities was designed and built. Various conditi of pyrolysis treatments were investigated and t influence on the amount and composition of by-products determined. High carbon resid were found to require lower pyrolysis temp tures. The carbons content of these residues peared to be unaffected by the geographic loca of the original manure. Contact with intere parties and appropriate industries who could prospective users of each of the products was itiated to obtain their technical expertise evaluating these products. The pyrolysis products seem to have some potential indus applications. These by-products include the residue, an oil fraction, and an aqueous frac The solid residue may serve as a carbon black stitute or as a filler material in rubber, ink, paint. The aqueous fraction collected during py ysis has been evaluated for fertilizer applicati (East Central)
W77-09395

NURE HARVESTING PRACTICES: EF-
CTS ON WASTE CHARACTERISTICS AND
NOFF,
orado State Univ., Fort Collins.
W. Hansen, J. M. Harper, M. L. Stone, G. M.
rd, and R. A. Kidd.
ilable from the National Technical Informa-
Service, Springfield, VA 22161 as PB-238 476,
e codes: A12 in paper copy, A01 in microfiche.
vironmental Protection Agency Report EPA-
/2-76-292, Dec., 1976, 104 p. 10 fig., 21 tab., 80

criptors: *Farm wastes, *Management, Pollu-
abatement, Feed lots, *Agricultural runoff,
mical properties, Physical properties, Biologi-
properties, Ash, *Waste treatment, Fertilizers.

develop a basis for better manure harvesting
agement practices, a combined field and
oratory study was conducted. The effect of
agement practices on manure qualities and ru-
pollution potential were compared on 3
llot pens with fully surfaced, partially sur-
d, and unsurfaced conditions. Average N, P
K elements were present in a ratio of approxi-
ely 4:1:2 providing 46 lbs. N, 11 lbs. p and 27
K per ton of dry manure. For recycling pur-
es ash is an important fraction of manure and
be reduced by use of hard surfaced pens. Ash
tent averaged 36.2%. Fiber and lignin in
ure are directly related to the fiber content of
ration. The effect of decomposition of the
ure was greatest on its viscosity and squeeza-
y. Bulk density and particle size remained the
e. Surfaced feedlot areas have a larger per-
age of precipitation in runoff with higher con-
rations of pollutants. Increased animal densi-
on surfaced pens will offset the difference
non-surfaced pens and can result in a lower
animal pollution potential from runoff.
7-09396

IGN PARAMETERS FOR THE LAND AP-
CATION OF DAIRY MANURE,
ell Univ. Agricultural Experiment Station,
ca, N. Y. Dept. of Agronomy.
. Klausner, P. J. Zwerman, and D. R. Coote.
ilable from the National Technical Informa-
Service, Springfield, VA 22161 as PB-264 282,
e codes: A12 in paper copy, A01 in microfiche.
ironmental Protection Agency Report EPA-
2-76-187, Oct., 1976, 248 p. 77 fig., 55 tab., 225

criptors: *Farm wastes, *Dairy industry,
ste treatment, *Waste disposal, *Design,
cultural runoff, Snowmelt, *Application
, Nitrogen, Sediments, Tile effluent,
phorus, Crop response, Computer models,
nomics, Surface drainage, Subsurface
nage, Legislation.

effects of climate, application rates of dairy
ure, timing of application and soil manage-
practice were studied in relation to discharge
trogen and phosphorous via surface runoff,
nent and tile effluent. Losses of nutrients
the land were influenced by the rate and tim-
f manure application in addition to the type of
tological event causing runoff. The greatest
arge of nutrients resulted from applying
ure on actively melting snow. Modest rates of
cation made in the winter during non-snow-
periods resulted in minimal losses. Concen-
ns of nitrogen in surface runoff as measured
time, were lower than those found in tile ef-
t. The reverse was true for soluble
phorus. The yield response of corn increased
efficiencies of nitrogen utilization decreased
e higher rates of application. A computer
l dealing with the economic impact of control
ation was developed. Modeling approaches to
scale environmental problems are feasible if
nptions and simplifications do not influence
sults too greatly, or in ways which are unpre-
ble. (East Central)
09397

LIVESTOCK AND THE ENVIRONMENT, A BIBLIOGRAPHY WITH ABSTRACTS--VOLUME III,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
M. L. Rowe, and Linda Merryman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 942, Price codes: A14 in paper copy, A01 in microfiche. Report EPA-600/2-76-189, July 1976, 310 p. EPA 1HB617, R-801454-03.

Descriptors: *Farm wastes, *Waste treatment, Waste disposal, *Livestock, *Bibliographies, *Feed lots, Abstracts, Environment.

Management and research information on animal wastes has expanded rapidly in recent years. This material has appeared in such diverse sources as journal articles, conference papers, university publications, government publications, magazine articles, books or book chapters, and theses. This bibliography of 1,200 references was compiled in order to speed the flow of information on findings in one segment compiled in order to speed the flow of information on findings in one segment of the livestock industry to other segments that could benefit from this technology. Included are the following indexes: (1) author, (2) keyword, (3) animal information categories. These indexes are followed by a section of abstracts of each reference entry found in the bibliography. Single copies of most articles can be obtained in hard copy or microfiche form at cost from the Animal Waste Technical Information Center, School of Environmental Science, East Central Oklahoma State University, Ada, Oklahoma 74820. (East Central)
W77-09398

ANIMAL WASTE MANAGEMENT IN THE NORTHERN GREAT PLAINS,
South Dakota State Univ., Brookings. Water Resources Research Inst.
M. L. Horton, J. L. Wiersma, and J. L. Halbeisen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 963, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency Report No. EPA-600/2-76-188, September, 1976. 83 p, 7 fig, 45 tab, 26 ref.

Descriptors: *Salinity, *Salts, *Cattle, *Feed lots, *Crop response, Performance, *Nutrients, *Cations, *Sodium, *Great Plains, *Farm wastes, Crop production, Management, Rates of application, Waste disposal, Waste treatment.
Identifiers: *Northern Great Plains, *Land application.

The effect of salt level of the ration for beef steers upon salinity of the waste and the effects of the applied waste upon the soil and upon crop production were investigated. In addition, the study was conducted in both covered and open feedlot pens to determine the effect of shelter in a northern climate upon animal performance and waste characteristics. The field portion of the study included 4 rates of waste up to 179 MT/ha. applied to plots 0.02 ha. in size. Detailed soil analyses were made which included salinity, nutrients, cations, and the dispersion hazard as indicated by the level of exchangeable sodium. The levels of salt used in the ration appeared to have little or no effect on animal performance; however, the salinity and sodium levels of the waste were directly affected. The salinity level of the surface 30 cm of soil where high rates of waste were applied was sufficiently high to affect the growth of corn. The lack of leaching water caused a maximum effect of the applied waste in the surface layer. (East Central)
W77-09399

CONVERSION OF CATTLE FEEDLOT WASTES TO AMMONIA SYNTHESIS GAS,
Texas Tech Univ. Lubbock. Dept. of Chemical Engineering.
J. E. Halligan, K. L. Herzog, H. W. Parker, and R. M. Sweazy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-239 668, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency Report No. EPA-660/2-74-090, December, 1974. 46 p, 7 fig, 5 tab, 38 ref. R 801065.

Descriptors: *Cattle, *Feed lots, Gases, Equipment, *Farm wastes, *Ammonia, *Waste treatment, Waste disposal.
Identifiers: *Fluidized bed reactor, Anhydrous ammonia, *Synthesis gas.

A study was undertaken to determine the potential of a process to convert cattle feedlot manure to anhydrous ammonia. Due to the fact that ammonia is currently produced on a large scale using natural gas and air, only the processing associated with a reactor system to convert the manure in a suitable synthesi s gas was considered in this study. The synthesis gas was considered in this study. The synthesis gas can be further processed to anhydrous ammonia using existing technology. (East Central)
W77-09401

SURVIVAL OF PATHOGENS IN ANIMAL MANURE DISPOSAL,
Minnesota Univ., St. Paul. Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5B.
W77-09402

CHEMICAL COAGULATION OF FEEDLOT RUNOFF,
R. J. Smaus.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 765, Price code: A04 in paper copy, A01 in microfiche. MS Thesis, May 1972. 60 p, 25 fig, 7 tab, 23 ref. OWRT A-022-NEB(3).

Descriptors: *Feed lots, *Agricultural runoff, Chemicals, *Coagulation, *Costs, Turbidity, Sludge, *Waste water treatment, Waste treatment, Farm wastes.
Identifiers: *Color reduction.

Treatment of feedlot runoff by chemical coagulation was evaluated, with color reduction as the prime goal. The removal of organic material and other desirable effects were also anticipated. Alkalinity was important in the chemical coagulation process. Turbidity and apparent color can be reduced by the application of moderate amounts of coagulants, whereas the colloidal color, believed to be hydrophilic, requires large coagulant dosages for significant removal. The reduction of the total solids, suspended solids, and COD may be related to the reduction of turbidity. Feedlot runoff can be clarified by coagulation using the common metallic coagulants. Estimated chemical costs of such treatment are in excess of $1.00 per 1000 gallons. From the chemical costs involved and the large volume of chemical sludge produced, chemical coagulation does not appear to be a practical method of treatment this waste. (Cartmell-East Central)
W77-09404

ACTIVATED CARBONS FOR EFFLUENT AND WATER TREATMENT,
J. S. Batchelor.
Effluent and Water Treatment Journal, Vol 17, No 4, p 175, 177, 179, 181, April, 1977.

Descriptors: *Activated carbon, *Effluents, *Waste water treatment, *Industrial wastes, Chemical wastes, *Recycling, Water quality, Water purification, Waste water treatment, Storage, Filtration, Byproducts.

The production and use of activated carbon for industrial waste effluent treatment were reviewed. Anthracite activation in a steam fluidized bed which was directly heated by submerged gas burners provided the means for commercial production of a high quality activated carbon. Activated carbon is available in a range of adsorptive capacities for various applications as a powdered or granular form. Primary treatment applications included removal of toxic, organic, or inorganic compounds from the effluents of chlorine, sodium hydroxide, and pesticides manufacturing. The concentration of these compounds can be reduced by 99% with activated carbon. The effluent can then undergo activated sludge treatment. Secondary treatment is usually more economical because less polluted effluents reduce the load on the activated carbon and extend the time between reactivations. Recovery of valuable substances from effluents enhances the economics of secondary treatment. This treatment level may be used for the recovery of acetic acid from rubber thread factory effluent, and for the removal of detergents from car wash waters. Moreover, industrial water can be recycled by using activated carbon treatment. Reactivating the carbon reduces the original amount of carbon by 10%. Economic comparisons were made for powdered and granular activated carbon. Granular carbon costs are 500% that of powdered carbon and its use requires some additional capital outlay. High-rate backwashing was an adequate treatment for the problem of bacterial growth on granular carbon beds. (Collins-FIRL)
W77-09409

TREATING WASTE WATER FROM BECKMAN PREPN. OF LACTAM--BY TWO STAGE CONCN. EXTN. OF RESIDUAL LACTAM, RESIDUE COMBUSTION, SULFUR DIOXIDE RECOVERY AND CONVERSION TO SULFURIC ACID FOR RECYCLING.
French Patent FR 2315-502. Issued February 25, 1977. Derwent French Patents Abstracts, Vol Y, No 14, p E2, May, 1977.

Descriptors: *Patents, *Chemical wastes, *Distillation, *Industrial wastes, Plastics, *Recycling, Chemical industry, Chemical reactions, *Waste water treatment, Water purification, *Organic wastes.
Identifiers: *Beckmann conversion, Sulfur dioxide, Caprolactam, Cyclohexanonoxime, Lactam.

A patent was issued for a treatment of waste water from the Beckmann conversion of lactam. Waste water is concentrated by a two-step distillation to 70-15% water. Lactam is recovered from an extracted aromatic hydrocarbon. The extract residue is subjected to oxidative combustion and SO2 is converted to form H2SO4. Organic solvents are recovered and the H2SO4 can be reused. Lactam and organic solvent recoveries are high. The process is highly useful in the preparation of caprolactam from cyclohexanonoxime. (Collins-FIRL)
W77-09410

SOME CONSIDERATIONS ON THE RECOVERY AND DISPOSAL OF PHOTOLAB WASTE,
C. T. Davies.
The BKSTS Journal, p 54-56, 58-60, 67, March, 1977. 1 fig, 5 tab, 4 ref.

Descriptors: *Chemical wastes, *Electrolysis, *Ion exchange, *Resins, Metals, Chemical reactions, Separation techniques, *Recycling, Sludge, Hydrogen ion concentration, Microorganisms, Waste treatment, *Waste water treatment.
Identifiers: *Photographic wastes, Silver, Sulfuric acid, Sodium sulfate.

The relationship of photographic wastes and British effluent control was considered. Effluent oxygen demand, pH, and metallic ion content were used as parameters of effluent quality. Reaction products of metals in photographic waste effluents were explored. Their effects included toxicity to sewage treatment microorganisms and the restriction of sludge as fertilizer because of its metallic ion content. Treatment of bleach baths must avoid the discharge of oxidizing ferricyanide or dichromate radicals into sewage systems. The control of pH was no problem. Chemical reactions produce a neutralization that creates a suitable pH. The expense of photographic processing chemicals was a prime inducement for the development of recovery systems. Silver recovery and fix solution re-use were investigated. The most efficient silver recovery system was based on electrolytic treatment. A high-grade silver was recovered from a continuous circulation system. Developer recovery must include bromide removal. An ion exchange method was developed, but resin regeneration using sulfuric acid presented handling and treatment problems. A substitute method using sodium sulfate was found. Another successful method employed sodium bicarbonate, sodium chloride, and sodium sulfate. Treatment systems which were developed to reduce effluent discharge included one employing Phenidone, and another employing water hyacinths. Water hyacinths were capable of absorbing gold, silver, cobalt, strontium, cadmium, nickel, lead, and mercury. (Collins-FIRL)
W77-09411

MEMBRANE ULTRAFILTRATION FOR TREATMENT AND WATER REUSE OF TNT-MANUFACTURING WASTES,
Kentucky Univ., Lexington. Dept. of Chemical Engineering.
D. Bhattacharyya, K. A. Garrison, and R. B. Grieves.
Journal Water Pollution Control Federation, Vol 49, No 5, p 800-808, May, 1977. 9 fig, 17 ref. DADA 17-72-C-5050.

Descriptors: *Membrane processes, *Chemical wastes, *Water reuse, Chemical industry, Organic compounds, Separation techniques, *Filtration, Polyelectrolytes, Hydrogen ion concentration, Chemical properties, Waste treatment, Model studies, Design criteria, Water purification, *Waste water treatment.
Identifiers: *TNT wastes, Nitrotoluenes, *Ultrafiltration(Membranes).

Membrane ultrafiltration was used to treat TNT waste water for in-plant reuse. The 'pink water' treated was the product of partially-purified TNT washing after selite treatment. Organic compounds in this water were alpha-TNT, dinitrotoluenes, and trace nitrotoluenes. Continuous flow ultrafiltration experiments were conducted to investigate four membranes. These were PSAL (Millipore), UM-05 (Amicon), PM-10 (Amicon), and F-601 (Gulf). Results showed that rejection of organic molecules was strongly pH-dependent. PM-10 showed very poor rejection even at pH 11.0. F-601 had a cellulosic composition. These factors eliminated them from pH variation studies. PSAL and UM-05 showed abrupt rejection improvements at pH 9.5 and above. PSAL was selected as the optimum membrane due to its consistently better performance. An average rejection of 0.88 was obtained at pH 11.0. PSAL also rejected inorganic ions, such as sulfate ions, because of its negative charge. This made possible the control of inorganic dissolved solids during water reuse. A computer simulation was used to develop a process design for a treatment and water reuse system for nitrotoluene production. Results of this design process indicated that a tapered module system would be optimum. This system had limited concentrate recycle requirements and produced the highest solute rejection at high water recoveries. Another model was used to determine possible dissolved solids build-up in recycle water at various numbers of passes. It was found that H2SO4 could adjust ultrafiltrate pH from 11.0 to 7.5 to eliminate Na2SO4 build-up. A membrane area of 192 square meters was suggested for treating a 52,000 gallon/day flow of pink water with 40 mg/liter organic carbon content. This would fo low a pH adjustment to 11.0. Average ultrafiltrat flux would be 24 gallons/square foot/day. A 10 fresh make-up water content would create a ma imum organic carbon concentration of 8.0 mg/lite Operating costs would be about $0.49 per cub meter of product water. (Collins-FIRL)
W77-09412

TREATING DISTILLERY EFFLUENT B RECOVERING TARTAR AND ORGANI MATTER--WITHOUT INCREASING THE VO OF EFFLUENT DURING PURIFICN.
French Patent FR 2311-757. Issued January 2 1977. Derwent French Patents Abstracts, Vol No 11, p D3, April, 1977.

Descriptors: *Patents, *Industrial waste *Crystallization, *Flocculation, *Hydrodynamic Effluents, Organic matter, Recycling, Water p rification, *Waste water treatment.
Identifiers: Tartar, *Distillery wastes recovery.

A patent was issued for a process to recover tar and organic matter during purification of wa water from wine lees. The wash water is fi mixed with calcium sulfate and sodium carbona for tartar crystallization. This is followed by t hydrodynamic recovery of tartar. Organ recovery by flocculation and skimming constit the third stage of the process. Treated effluent discharged by overflow from the flocculation ta The process maintains a treated effluent discha that does not exceed influent volume. Final fluent volume is reduced by up to 66% of t produced by previous processes. Process simpl cation has also reduced costs. (Collins-FIRL)
W77-09414

A THERMAL CONTROLLER FOR THE SHO COD DETERMINATION,
Agricultural Research and Education Cen Lake Alfred, Fla.
For primary bibliographic entry see Field 5A.
W77-09415

ANAEROBIC DIGESTION OF RUM STILLA
National Research Council of Canada, (Ontar Div. of Biological Sciences.
L. A. Roth, and C. P. Lentz.
Canadian Institute of Food Science and Techn gy Journal, Vol 10, No 2, p 105-108, April, 197 fig, 1 tab, 14 ref.

Descriptors: *Anaerobic digestion, *Indust wastes, *Foods, Chemical oxygen dema Loads(Forces), Operations, Performance, Yea Temperature, Salts, Inorganic compou *Waste water treatment.
Identifiers: Molasses stillage, Rum production.

A 14-month study was conducted to exp anaerobic contact digestion of molasses sti from rum production. Start up procedures loading rates were investigated. Digesters filled with sewage treatment plant effluent taining 0.5% solids. Stillage loads were grad increased from 0.05 to 0.15 pounds of vol solids/cu ft/day over a period of 2 to 3 weeks. liquid retention time was 55 days. Digester perature was maintained at 35 plus or minus The higher loading rate was used as the con Results showed that rum stillage could be suc fully treated by anaerobic digestion, if su mented with ammonium and phosphate Loading rates up to 0.2 pounds of volatile solid ft/day resulted in reliable digester opera Higher loading rates of up to 0.5 pounds/cu ft would require the addition of 1.5 grams of extract/liter of stillage. An operation efficien 77 to 83% was obtained at rates above pounds/cu ft/day, with or without yeast ex fortification. The effluent with a strength 13,000 ppm COD required additional treatmen fore discharge into waterways. (Collins-FIRL)

7-09416

T ONE DROP OF EFFLUENT'-- DROCHLORIC ACID RECOVERY FROM NT PICKLE LIQUOR.
EMSA, Vol 3, No 2, p 20-22, February, 1977.

criptors: *Metals, *Industrial wastes, *Acids, cycling, Gases, Separation techniques, Zinc, mical reactions, Chlorides, Pollution abate-t, Waste treatment, *Waste water treatment.
tifiers: Hydrochloric acid recovery, Pickling ors, Spray roaster process, Metsep process.

method was developed for regenerating rochloric acid from spent pickling waste. A th African facility was built to treat ferrous ride liquors from several plants in the Vaal . Nearly 50% of waste liquors contained up to grams/liter of zinc chloride. This resulted from use of waste liquor in jig stripping. The ence of zinc chloride prohibited treatment by conventional spray roaster technique. A reatment ion-exchange process (Metsep) was l, along with solvent extraction. Zinc chloride ration produced a dilute hydrochloric acid tion used to adsorb hydrogen chloride gas n the spray roaster process. No effluent was luced, but the system proved too expensive. h hydrochloric acid was then used for jig ping to allow spent liquor treatment by the ventional spray roaster process. The liquor passed through settlers and filtered before en-g the spray roaster. Recovery consisted of acting spent liquor with hot combustion gases hing 800 C. The liquor entered the reactor ugh spray nozzles. The water and hydochloric in the drops were separated and the drops e reduced to ferrous chloride. This product converted to solid iron oxide and gaseous rogen chloride. A cyclone separator removed t of the 10% of the oxide that escaped with the s. The remaining oxide dropped to the reactor om. An absorber removed hydrogen chloride n the reactor gases by absorption of hydrogen ride in the raffinate. The concentration of acid ing the absorber was 16-18%. The plant luced no effluent. A collection system for pu-d storm water provides water for the absorber. ut 70% of the customers' hydrochloric acid ls are met by this process. (Collins-FIRL)
-09417

CTICAL APPLICATION OF MEMBRANE HNIQUES OF WASTE OIL TREATMENT,
ken Co., Canton, Ohio.
. Hockenberry, and J. E. Lieser.
rication Engineering, Vol 33, No 5, p 247-251, , 1977. 2 fig, 3 tab, 4 ref.

criptors: *Oil wastes, *Membrane processes, ration, *Reverse osmosis, Membranes, mical treatment, Industrial wastes, Pilot ts, Separation techniques, *Waste water treat-.
tifiers: *Ultrafiltration, *Refinery wastes.

studies investigated treatment of oily waste r with ultrafiltration and reverse osmosis. ified acetate and similar compounds were as ultrafiltration membranes. Reverse osmo-nembranes were made of organic materials ed to become semipermeable. Both test ms had tubular membrane construction. The theory of both processes was presented. Test ts indicated a difference in the mechanics of lsification. Ultrafiltration removed surfac-from wastes in the water phase. This resulted mulsification. Demulsification, in reverse os-s, seemed to be due to high salt levels in the entrate tank. Wastes were diluted until oil s were 40-50% and volumes were 4-10% of in-volume. The water flux rate was too low for ent operation at this level. Oily waste was ferred to a holding tank where it separated hree phases. Heating to 40-50C speeded the separation. The differences between membrane and chemically treated wastes were noted in the 'cuff layer' between the oil and water phases. The cuff was well-defined and contained only dirt and grinding debris during membrane treatment. This debris could be filtered out for the water to be recycled for retreatment. The resultant oil from membrane treatment was very clean. Similar results were achieved with repeated chemical treatments. Reverse osmosis produced water with a significantly lower mineral content. The total extractables were higher in ultrafiltration water and were identified as surfactants. The water could be recycled on a limited basis within the plant or disposed of in sanitary sewer systems. (Collins-FIRL)
W77-09418

ALTERNATIVE METHODS OF PHENOL WASTEWATER CONTROL,
Envirex Inc., Waukesha, Wis.
W. M. Throop.
Journal of Hazardous Materials, Vol 1, No 4, p 319-329, March, 1977. 4 fig, 3 tab, 6 ref.

Descriptors: *Phenols, *Oil wastes, *Water pollution control, *Oxidation, Pollution abatement, Biological treatment, Activated carbon, Chlorination, Ozone, Adsorption, Activated sludge, Filters, Hydrogen ion concentration, Costs, *Waste water treatment.
Identifiers: Hydrogen peroxide, Potassium permanganate.

Phenol removal from waste water by chemical and biological oxidation and ozonation was investigated. Biological oxidation of phenols has been successful with trickling filters, activated sludge, and aerated lagoons. Phenol loads above 500 mg/liter decrease system performance significantly. Inconsistent effluent phenol concentrations greatly reduce the suitability of biological treatment for phenol removal. Effective chlorine treatment required careful pH control and the maintenance of residual chlorine to prevent chlorophenol production. Phenol removal by activated carbon was the most effective and most expensive method. Chemical oxidation by hydrogen peroxide or potassium permanganate was successful. Both systems presented process or cost disadvantages, but were reasonable choices for treatment of smaller flows. The best treatment for large flows was ozonation. The treatment was preceded by suspended solids removal by an anionic polyelectrolyte. Complete phenol oxidation by ozone required a 50:1 ozone to phenol ratio. (Collins-FIRL)
W77-09419

REFINERY EFFLUENT IMPROVED BY GRAVITY-PRESSURE DEWATERING,
Ecodyne Corp., Union, N.J.
C. B. Grimes.
Oil and Gas Journal, Vol. 75, No. 17, p 106-108, April, 1977. 2 fig, 3 tab.

Descriptors: *Dewatering, *Oil wastes, Oil industry, *Industrial wastes, *Waste disposal, Incineration, Landfills, Polyelectrolytes, Biological treatment, Sludge, Flotation, Evaluation, Filtration, Waste water treatment, Equipment, Costs, Performance.
Identifiers: *Gravity-pressure dewatering.

Refinery effluent improvement was evaluated. Various treatment processes may be compared by using the disposal-back method to determine end-product properties and disposal methods. Incineration and landfilling were investigated as disposal options. Treatment processes required for disposal by incineration incurred costs which were often prohibitive when compared to processes ending with landfilling. Gravity-pressure dewatering was investigated as an effluent treatment before landfill disposal. The two-step process dewatered sludge conditioned by synthetic high-molecular-weight polyelectrolytes. The sludge was gravity-filtered by a horizontal screen and filtrate was recycled to the process. An endless, variable-speed screen fed three sets of compression rollers in the pressure stage. The pressure was progressively increased and final dewatered sludge was disposed. Two such systems were described. In the first, oil was removed by gravity and followed by a dissolved air flotation treatment. The effluent was combined with that of another system - chemical precipitation followed by biological treatment. The combined waste sludge was 50% dissolved air flotation float, 30% biological wastes, 0.5% API separator bottoms, and 15% sludge from chemical precipitation. The other system produced sludges of API bottoms, dissolved air flotation float, aerobically digested waste activated sludge, and lime sludge. Other systems may require 10-15 times the horsepower of gravity-pressure systems and have capital costs that are 150-200% greater. (Collins-FIRL)
W77-09420

NEW TRENDS IN SOUR WATER STRIPPING,
Shell Canada Ltd., Toronto (Ontario).
P. T. Budzik.
Chemistry in Canada, Vol. 29, No. 3, p 24-27, March, 1977. 6 fig, 1 tab, 6 ref.

Descriptors: *Oil wastes, *Ammonia, *Sulfides, *Chemical reactions, *Separation techniques, Oil industry, Industrial wastes, Gases, Pollution abatement, *Waste water treatment, *Canada.
Identifiers: *Sour water stripping.

The treatment of petroleum refinery effluents in Canada was studied. The waste water may contain up to 25% sour water. Sour water is composed of sulfides, ammonia, carbon dioxide, mercaptans, phenols, cyanides, organic and inorganic acids, and free and dissolved oils. Hydrogen sulfide and ammonia are of the greatest concern because of Canadian restrictions on sulfides and ammonia in waste water. Effluents must also pass an acute fish toxicity test. Hydrogen sulfide is stripped for odor control. The stripping process is complicated by complex H2S-NH3 interactions with other chemicals. Carbonate and sulfite deposits and corrosion present other difficulties. Sour water stripper columns are based on the vapor liquid equilibrium of hydrogen sulfide and ammonia. These elments are present in sour water as ammonium bisulfide that undergoes hydrolysis to form free ammonia and free hydrogen sulfide. They are removed and transferred to vapor stage by lowering their partial pressure with steam or another insert medium. Acid components that can chemically fix the ammonia must be neutralized. Caustic may be added in stoichiometric proportions to combat corrosion. Successful stripper design is dependent upon the collection system; a column that minimizes stripping team and maximizes H2S and NH3 removal; and disposal of overhead gases. Older designs used a packed tray or column with optional acidification to aid sulfide removals. Overhead gases were incinerated. Ammonia concentration in stripper bottoms steam is presently the most critical operation factor. Canadian guidelines require bottom concentrations of 50 mg/liter or less of ammonia. This would require a stripping efficiency of 99.5%. This also would provide 99.9 hydrogen sulfide removal and 30-40% phenol reductions. A Claus sulfur plant has been used to treat off-gases to fulfill SO2 air pollution regulations. (Collins-FIRL)
W77-09421

CONTINUOUS PURIFICN. OF PETROLEUM REFINERY EFFLUENTS--BY BIOLOGICAL OXIDN. AND AERATION BETWEEN STAGES.
French Patent FR 2313-322. Issued February 4, 1977. Derwent French Patents Abstracts, Vol. Y, No. 12, p D6, May, 1977.

Descriptors: *Patents, *Oil wastes, *Biological treatment, *Aeration, *Activated sludge,

Hydrogen ion concentration, *Oxidation, Coagulation, Tertiary treatment, Filtration, Sedimentation, Industrial wastes, Effluents, *Waste water treatment.

A patent was issued for a four-stage activated sludge treatment of petroleum refinery wastes. There is a sedimentation phase in which significant amounts of oil and solids are removed. This is followed by stage two: equalization, pH adjustment, coagulation, oxidation, and filtration. The biological treatment section consists of aeration between the stages, biological oxidation, clarification, thickening, and aerobic digestion. The final stage employs tertiary treatment by coagulation/flocculation, filtration, and adsorption on activated carbon. The final effluent contains at least 5 ppm of dissolved oxygen to maintain the quality of the receiving waters. An equalization tank temperature of 32.2-37.8 C improves biological degradation. (Collins-FIRL)
W77-09422

REMOVING HEAVY METALS IN TEXTILE WASTE,
Permutit Co., Paramus, N.J.
H. N. Feigenbaum.
Industrial Wastes, Vol. 23, No. 2, p 32-34, March/April, 1977. 2 fig, 3 tab, 2 ref.

Descriptors: *Heavy metals, *Alkalis(Bases), *Sulfides, *Textiles, *Separation techniques, Industrial wastes, Chemical reactions, Hydrogen ion concentration, Sludge, Dewatering, Filters, Economics, *Waste water treatment.
Identifiers: Sulfex process, Hydroxide precipitation, Cyanides.

The removal of heavy metals from textile effluents was discussed. Heavy metals can be treated by using alkali to adjust pH for precipitation of insoluble metal hydroxides. This was called the 'lime and settle' method. Metals were removed from solution as sulfide precipitates by the Sulfex process. This involved the combination of heavy metal cations with sulfide anions. The process had several advantages over hydroxide precipitation. Effluent residues were lower. The process could overcome complexing or chelating agents that inhibited metal removal by the hydroxide method. Sulfide precipitation at pH 8-9 eliminated alkali and acid addition. A sludge blanket of excess sulfide was maintained that accommodated fluctuations of influent metal concentrations. The use of insoluble materials avoided the problems of chemical feeding of a soluble sulfide source. The equipment used was very similar to that of hydroxide precipitation. Wastes containing cyanide must be pretreated with either method. A batch process was used at flow rates below 10,000 gpd. This eliminated the benefits of the sludge blanket of continuous operation. The resultant sludge contained iron hydroxide, chrome hydroxide, and metallic sulfides. Its characteristics were similar to hydroxide sludge, but it had a greater density. Effective dewatering was accomplished by using centrifuges, vacuum filters, filter presses, or gravity filters. The quantity of sludge was directly dependent upon the ppd of heavy metals and settleable matter in the waste influent, as well as the amount of iron sulfide present. Use of either system should be evaluated on an individual economic basis. Sulfex may be advantageous for chromate wastes and hydroxide could be best for non-chromate wastes. (Collins-FIRL)
W77-09423

RECOVERING POLYVINYL ALCOHOL FROM WASTE WATER--BY COAGULATING WITH BORATE AND INORG. SALT IN PRESENCE OF QUAT. AMMONIUM CPD TO REDUCE WATER CONTENT OF GEL.
French Patent FR 2313-404. Issued February 4, 1977. French Patents Abstracts, Vol. Y, No. 12, p D7, May, 1977.

Descriptors: *Patents, *Coagulation, Water purification, Recycling, Textiles, *Industrial wastes, Chemical oxygen demand, Inorganic compounds, Separation techniques, *Waste water treatment, *Alcohols, Organic compounds, *Gels.

A patent was issued for a process to recover polyvinyl alcohol from waste water by coagulation. This is achieved by adding boric acid or a borate, an inorganic salt, and a cationically active quaternary ammonium base or its salt to the aqueous solution. This is followed by an adjustment to a pH of 8-10 to induce coagulation as a gel. The process also reduces COD in the waste water. The process has been used to treat waste waters of the textile industry. (Collins-FIRL)
W77-09424

TREATMENT OF WOOL-SCOURING EFFLUENTS WITH INORGANIC CHEMICALS,
Commonwealth Scientific and Industrial Research Organization, Victoria (Australia). Div. of Textile Industry.
J. R. Christoe.
Journal Water Pollution Control Federation, Vol. 49, No. 5, p 848-854, May, 1977. 9 fig, 3 tab, 29 ref.

Descriptors: *Textiles, *Industrial wastes, Biological treatment, Surfactants, Flocculation, Hydrogen ion concentration, Loads(Forces), Sulfates, Chlorides, Temperature, Performance, Evaluation, Polymers, Separation techniques, *Waste water treatment.
Identifiers: *Wool scouring effluents.

Several disadvantages were recognized in the use of 'acid-cracking' to destabilize wool scouring effluents. The process acidified effluents to a pH of less than four with sulfuric acid. This was the only chemical treatment process which allowed wool grease recovery. It was less effective on effluents containing non-ionic surfactants due to the poor and variable phase separation. The clarified phase contained 70% of the original BOD and 30% of the original grease. Recovered grease had a high free fatty-acid content and a dark color. Various chemicals used in the process and other factors were evaluated. The optimum pH range was found to be pH 5 to 6. Alum and ferric chloride were chosen as the most suitable chemicals because they were most economical, and their sludges were dewaterable without further treatment. Restabilization of flocculated or coagulated matter from overdosing was not apparent because of the amount of flocculable material in the liquor. Sulfate and chloride ions were compared. It was found that there was no significant effect on destabilization as a function of nominal cation content. On a weight-effectiveness basis, there were significant differences. The solubility of non-ionic surfactants was temperature-dependent because wool grease melts at about 40 C. The amount of pollutant removed decreases significantly above the softening temperature. Both the degree and duration of stirring had no effect on the chemical treatment. Biological pretreatment that creates a 5-10% reduction in BOD or COD can result in the removal of more pollutants per unit mass of flocculant. Polymeric flocculants can be used alone or as flocculant aids. Their selection must depend upon their properties. (Collins-FIRL)
W77-09425

ECONOMIC IMPACT OF EPA'S REGULATIONS ON THE PETROLEUM REFINING INDUSTRY. VOLUME 1. EXECUTIVE SUMMARY,
Sobotka and Co., Inc., Stamford, Conn.
For primary bibliographic entry see Field 5G.
W77-09451

ECONOMIC IMPACT OF EPA'S REGULATIONS ON THE PET. REFINING IND. VOL. 2, PTS 1 AND 2. IND. DESCRIPTION AND TECH. ANALYSIS,
Sobotka and Co., Inc., Stamford, Conn.
For primary bibliographic entry see Field 5G.
W77-09452

ECONOMIC IMPACT OF EPA'S REGULATIONS ON THE PETROLEUM REFINING INDUSTRY. VOL. 3, PT. 3. ECONOMIC IMPACT ANALYSIS,
Sobotka and Co., Inc., Stamford, Conn.
For primary bibliographic entry see Field 5G.
W77-09453

RESTORING THE WILLAMETTE RIVER: COSTS AND IMPACTS OF WATER QUALITY CONTROL,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5G.
W77-09455

THE ECONOMIC IMPACT OF ENVIRONMENTAL PROGRAMS.
Council on Environmental Quality, Washington D.C.
For primary bibliographic entry see Field 6B.
W77-09457

A STUDY OF DISPOSAL OF CAMPGROUND WASTES ADJACENT TO WALDO LAKE, OREGON,
Pacific Northwest Environmental Research Lab, Corvallis, Oreg.
J. R. Tilstra, K. W. Malueg, and C. F. Powers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 331. Price codes: A03 in paper copy, A01 in microfiche. Working Paper No 7, February 1973. 24 p, 7 fig, 3 tab, 2 ref.

Descriptors: *Camp sites, *Septic tanks, *Soil disposal fields, Recreation facilities, *Waste disposal, *Oregon, Pacific Northwest U.S., Analytical techniques, Effluents, Base flow, Groundwater, Water pollution, Nitrogen, Phosphorus.
Identifiers: *Waldo Lake(Ore).

Methods for characterizing a groundwater flow regime in areas considered, or actively used for disposal of septic tank effluents by soil absorption and to determine the effectiveness of a rocky volcanic soil for the breakdown and retention of nitrogen and phosphorus from septic effluent were introduced at a new campground septic tank treatment and disposal system at Islet Campground, adjacent to Waldo Lake, Oregon. Water level elevations, well logs, phosphorus and nitrogen analyses, and tracers were used to define the hydrology of the drainfield. Results indicate that septic tank effluents incorporated with natural groundwater did not enter the lake during the June to September study period, suggesting that the main aquifer was not connected to the lake. It was concluded that: (1) the aquifer was of limited permeability, contained a highly fractured zone between two bedrock layers, so that the possibility exists that system failure could eventually lead to complete clogging of the fractures forcing the septic tank effluent into the lake, (2) because of the limited permeability of the aquifer, periods of high natural recharge would greatly reduce its capacity to accommodate effluents, and (3) since many recreational lakes in the Western U.S. are located in similar geologic conditions and of most of these lakes are fragile, special precautions are needed in the design and location of adjacent waste disposal systems. (Luedtke-Wisconsin)
W77-09471

ECONOMIC ASSESSMENT OF PROPOSED TOXIC POLLUTANT EFFLUENT STANDARDS FOR MANUFACTURERS AND FORMULATORS OF ALDRIN/DIELDRIN, DDT, ENDRIN AND TOXAPHENE.
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.

77-09478

SSESSMENT OF INDUSTRIAL HAZARDOUS ASTE PRACTICES: INORGANIC CHEMI-ALS INDUSTRY,
rsar, Inc., Springfield, VA.
r primary bibliographic entry see Field 5E.
77-09480

CSOURCES ALLOCATION TO OPTIMIZE NING POLLUTION CONTROL,
io State Univ. Research Foundation, Colum-s.
r primary bibliographic entry see Field 5G.
77-09481

ILORINE-CONTAINING STABLE OR-ANICS: NEW COMPOUNDS OF ENVIRON-ENTAL CONCERN,
r primary bibliographic entry see Field 5C.
77-09492

OLLUTION OF THE INTERSTATE AND IN-RASTATE WATERS OF THE UPPER MISSIS-PPI RIVER AND ITS TRIBUTARIES.
r primary bibliographic entry see Field 5G.
77-09529

CKAGE AERATION PLANTS.
izona State Dept. of Health Services, Phoenix. vironmental Health Services.
gineering Bulletin, No 15 (Supp to Eng Bulletin, 11), 1971. 5 p, 2 tab.

scriptors: *Solid wastes, *Sludge disposal, nvironmental sanitation, *Sewage disposal, dge, Disposal, Waste disposal, Municipal stes, Sludge treatment, Anaerobic digestion, lorination, Administration, Costs, Septic tanks, Vaste water treatment, Treatment, Domestic stes, Settling basins, Water pollution sources.

e extended aeration system simplifies the ac-ated sludge process by eliminating the primary tling tank and anerobic sludge digestion unit. e difficult sludge handling problem is minimized combining various tanks and other facilities o one structural unit called the 'package plant', is reducing the quantity of sludge generated. e extended aeration system will effectively treat vage from small installations so that effluents n be discharged into the environment with no ater health hazard than is associated with larger nventional treatment plants. General informa-n covered by the bulletin includes design teria, sludge handling and wasting facilities, ids control, holding and settling tanks, and data operations and costs. (Hadoulias-Florida)
7-09588

TIMAL CONTROL OF AN UNSTEADY ATE CONTINUOUS ACTIVATED SLUDGE STEM: A COMPARISON OF DIGITAL COM-TER SIMULATION VS PILOT PLANT SULTS,
edo Univ., Ohio.
B. Shahalam.
D Thesis, 1976. 192 p.

scriptors: *Model studies, *Sludge treatment, ctivated sludge, *Computer models, *Pilot nt, Sewage effluent, Performance, Control, ration, *Waste water treatment.
ntifiers: Sludge thickening.

lynamic model of the activated sludge process developed. This involved an aerator, a kner and sludge recycle. System variables re the microorganism and substrate concentra-ns. System control was by detention time in the ator and the sludge wastage rate. Analysis was le of continuous sinusoidal variations in in-fluent substrate and microorganism levels. A digital computer simulation was used to illustrate the effects of variable waste quality on effluent quality with and without optimal system control. A laboratory scale pilot activated sludge system employing synthetic glucose waste was studied to determine the unsteady state system responses. Comparisons of the pilot system and the model indicated a close correlation. It was determined that optimal control techniques would help to produce substantial effluent quality improvements. (Collins-FIRL)
W77-09597

POWDERED ACTIVATED CARBON ADDITION TO BIOLOGICAL REACTORS,
Delaware Univ., Newark.
F. L. Robertaccio.
Ph D Thesis, 1976. 349 p.

Descriptors: *Activated carbon, *Biological treatment, *Kinetics, *Tertiary treatment, *Waste water treatment, Mass transfer, Adsorption, Models, Microorganisms.
Identifiers: Biological reactors.

The addition of powdered activated carbon to biological reactors has proven an uncomplicated way to achieve tertiary treatment water quality. The kinetics of biodegradable substrate in a pure biological system and iin one with powdered activated carbon was investigated. Results indicated that the maximum utilization rate for adsorbable substrates was enhanced in direct proportion to the amount of activated carbon present. Non carbon-adsorbent substrates showed no enhancement and the effectiveness of activated carbon was lessened in a biological system. The adsorbency of a degradable substrate is a prime parameter in the determination of whether the presence of activated carbon in a biological system produces synergistic effects. The presence of activated carbon can overcme mass transfer constraints. Enhancement of substrate utilization in a carbon-biological system was independent of the assumed kinetic model. Batch system models which predicted substrate utilization could not describe gravimetrically determined biological solids growth. The presence of activated carbon was assumed to change the distribution of species in biological populations. Mass transfer at carbon-substrate-microbial interface was enhanced. (Collins-FIRL)
W77-09599

METALS IN THE AQUEOUS EFFLUENTS FROM MUNICIPAL INCINERATORS AND AN INCINERATOR-RESIDUE PROCESSING PLANT,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5A.
W77-09600

5E. Ultimate Disposal Of Wastes

OPTIMAL ARTIFICIAL AERATION POLICY FOR WATER QUALITY CONTROL OF STREAMS RECEIVING MULTIPLE THERMAL AND SEWAGE DISCHARGES,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W77-09147

AN OVERLAND FLOW - LAGOON RECYCLE SYSTEM AS A PRETREATMENT OF POULTRY WASTES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W77-09148

WASTE ALLOCATIONS IN THE BUFFALO (NEW YORK) RIVER BASIN,
Versar, Inc., Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-09168

MAY 1974 BASELINE INVESTIGATION OF DEEPWATER DUMPSITE 106.
National Oceanic and Atmospheric Administration, Washington, D.C.; and Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W77-09243

INVESTIGATION OF RADIOACTIVE WASTE DISPOSAL AT DEEPWATER DUMPSITE 106--SAMPLING PROGRAM MAY 1974,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5B.
W77-09246

LAND APPLICATION OF WASTE WATER, A BIBLIOGRAPHY.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5D.
W77-09265

MICROBIOLOGICAL STUDY OF FAUNAL RESPONSE TO SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT,
Pennsylvania State Univ., University Park. Dept. of Veterinary Science.
For primary bibliographic entry see Field 5C.
W77-09270

RENOVATION RESPONSE TO APPLICATION FREQUENCIES FOR GRASS FILTRATION TREATMENT OF SEWAGE EFFLUENT,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-09271

PROCEEDINGS OF THE EIGHTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
For primary bibliographic entry see Field 2L.
W77-09325

FINE-GRAINED SEDIMENT AND INDUSTRIAL WASTE DISTRIBUTION AND DISPERSAL IN NEW BEDFORD HARBOR AND WESTERN BUZZARDS BAY, MASSACHUSETTS,
Woods Hole Oceanographic Institution, Mass. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W77-09326

SEWAGE DISCHARGES FROM SHIPS TRANSITING COASTAL SALT WATERS,
David W. Taylor Naval Ship Research and Development Center, Annapolis, Md. Pollution Abatement Div.
For primary bibliographic entry see Field 5B.
W77-09333

SATELLITE AND CURRENT DROGUE STUDIES OF OCEAN-DISPOSED WASTE DRIFT,
Delaware Univ., Newark. Center for Remote Sensing.
For primary bibliographic entry see Field 5B.
W77-09358

DESIGN PARAMETERS FOR THE LAND APPLICATION OF DAIRY MANURE,
Cornell Univ. Agricultural Experiment Station, Ithaca, N. Y. Dept. of Agronomy.

For primary bibliographic entry see Field 5D.
W77-09397

LIVESTOCK AND THE ENVIRONMENT, A BIBLIOGRAPHY WITH ABSTRACTS--VOLUME III,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
For primary bibliographic entry see Field 5D.
W77-09398

CONVERSION OF CATTLE FEEDLOT WASTES TO AMMONIA SYNTHESIS GAS,
Texas Tech Univ. Lubbock. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W77-09401

SURVIVAL OF PATHOGENS IN ANIMAL MANURE DISPOSAL,
Minnesota Univ., St. Paul. Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5B.
W77-09402

SOME CONSIDERATIONS ON THE RECOVERY AND DISPOSAL OF PHOTOLAB WASTE,
For primary bibliographic entry see Field 5D.
W77-09411

REFINERY EFFLUENT IMPROVED BY GRAVITY-PRESSURE DEWATERING,
Ecodyne Corp., Union, N.J.
For primary bibliographic entry see Field 5D.
W77-09420

A STUDY OF DISPOSAL OF CAMPGROUND WASTES ADJACENT TO WALDO LAKE, OREGON,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5D.
W77-09471

ENVIRONMENTAL IMPACTS OF HIGH LEVEL RADIOACTIVE WASTE DISPOSAL,
Pittsburgh Univ., Pa.
For primary bibliographic entry see Field 5C.
W77-09473

ASSESSMENT OF INDUSTRIAL HAZARDOUS WASTE PRACTICES: INORGANIC CHEMICALS INDUSTRY,
Versar, Inc., Springfield, VA.
R. G. Shaver, L. C. Parker, E. F. Rissman, K. M. Slimak, and R. C. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 832, Price codes: A22 in paper copy, A01 in microfiche. Report No. EPA/530/SW-104c, March 1975. 501 p. 138 fig., 73 tab., 96 ref., 3 append. EPA 68-01-2246.

Descriptors: *Chemical industry, *Water pollution sources, *Industrial wastes, *Waste disposal, *Landfills, *Waste dumps, Inorganic compounds, Chlorine, Asbestos, Lead, Mercury, Chlorinated hydrocarbon pesticides, Fluorides, Arsenic compounds, Lagoons, Chemicals, Alkalies(Bases), Gases, Pigments, Dyes, Hazards.

The 1,067 U.S. plants manufacturing 112 million metric tons of various chemicals in 1974 also generated approximately 40 million metric tons (dry basis) of land-destined wastes, of which 2 million metric tons were considered potentially hazardous. The major industry groups involved in this waste discharge are the alkalies and chlorines processors, industrial gas producers, makers of inorganic pigments and manufacturers of industrial inorganic chamicals such as sulfuric acid, hydrofluoric acid, alum, sodium sulfide and phosphorus. Plants using the mercury cell process for the manufacture of chlorine are a prominent source of pollution from industrial water treatment systems. Some of the potentially hazardous constituents identified in the waste streams from inorganic chemical manufacturing operations are asbestos, lead, mercury, chlorinated hydrocarbons, fluorides, arsenics and antimony compounds. The prevalent disposal method is distribution on land, with about 85% of the wastes deposited in landfills, lagoons and dumps. The assessment includes a general discussion of the inorganic chemicals industry, characterizations of the sub-industries and their wastes, descriptions of treatment and disposal technologies, and cost analysis of disposal. (Harris-Wisconsin).
W77-09480

THE ECOLOGICAL BEHAVIOR OF PLUTONIUM AND AMERICIUM IN A FRESHWATER POND,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 5C.
W77-09501

PACKAGE AERATION PLANTS.
Arizona State Dept. of Health Services, Phoenix. Environmental Health Services.
For primary bibliographic entry see Field 5D.
W77-09588

DIGESTED SLUDGE: DELINEATION AND MODELING FOR OCEAN DISPOSAL,
California Inst. of Tech., Pasadena.
W. K. Faisst.
Ph D Thesis, 1976. 215 p.

Descriptors: *Computer models, *Sewage disposal, *Sludge digestion, *Sludge disposal, Ultimate disposal, Sedimentation, Metals, Trace elements, Analysis, Model studies, Sulfides.
Identifiers: Los Angeles County(Calif), Land disposal, Ocean disposal.

A study was conducted to gather data on digested sludge particles and related trace metals to develop a model of digested sludge discharge in ocean disposal. Digested sludge particles in the test area, Los Angeles County (California) Sanitation Districts, were measured for size. Ninety percent of these had diameters of less than 10 microns. Of nine trace metals studied, only manganese had a dissolved fraction greater than 1% of the total metal. Sedimentation velocities of this sludge decreased as the dilution factor increased. Sedimentation of chromium, copper, iron, nickel, lead, and zinc was approximately the same as that of sludge particles. About 10% of filterable solids dissolved or oxidized in oxic mixtures. A hydraulic computer simulation indicated that sludge effluent discharges at depths of 730 m rise no more than 120 m. Analysis showed that solids reach the sediments within 10 kilometers of the discharge point. Other data revealed that nearly anoxic waters would become wholly anoxic from the sludge discharges. Chemical-equilibrium models showed that trace metals, except chromium and manganese, would be controlled by metal sulfide solids precipitation at dilutions up to 3000. It was concluded that trace metals in sludge would be immobilized in anaerobic bottom sediments of the basins and no life forms higher than bacteria were in the area to be disrupted. Ocean discharge would eliminate potentially expensive land disposal alternatives. Ocean surface waters would also be protected. (Collins-FIRL)
W77-09596

EFFECTS OF ANAEROBICALLY DIGESTED SEWAGE SLUDGE ON ORGANIC MATTER IN SOIL AND SOIL WATER,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 5C.
W77-09598

5F. Water Treatment and Quality Alteration

SYSTEM DESIGN OF A TUBULAR REVERSE OSMOSIS PLANT,
California Univ., Los Angeles.
V. Goel, and J. W. McCutchan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 64 Price codes: A09 in paper copy, A01 in microfich Water Resources Center Desalination Report N 64, UCLA-ENG-7704, School of Engineering a Applied Science, University of California, L Angeles, January 1977. 186 p, 28 fig, 5 tab, 89 re 2 append.

Descriptors: *Water treatment, *Desalinatio plants, *Reverse osmosis, *Optimizatio Economic efficiency, Simulation analysi Dynamic programming, Computer model *Design, Colorado River, Irrigation wate Drainage, Equations, Systems analysis.
Identifiers: Cost minimization, Parametric pr gramming, Sensitivity analysis, Environmental i pact.

Presented is a system approach to design of a o inch diameter tubular module reverse osmo desalination plant. The total system is divided in relevant subsystems: pretreatment, reverse osm sis, energy recovery, post-treatment, and bri disposal. Dynamic programming is utilized minimize the unit cost of desalinized wat Product recovery is used as a parameter, and discrete values of product recovery between 5 and 95% are considered. For optimization of reverse osmosis subsystem, a parametric p gramming coupled with simulation model developed. A periodic flow-reversal valve is inc porated into the reverse osmosis unit, eliminat the need for varying membrane permeability alo the tube length. Seven values of operating pr sure between 200 psig and 1500 psig, and f values of membrane annealing temperat between 76 and 93 C are considered. Membra permeability coefficients for CA 400-25 cellul acetate membranes, and functional relationsh between operating parameters and membrane p formance, are derived from laboratory and fi tests. Performance data from field tests Colorado River water at Metropolitan Water D trict's treatment plant at LaVerne, California presented and minimum energy requirements c culated. The modes are programmed on the I 360-91 computer and used to design 1 million lon per day plants for two desalination appli tions. Optimal designs are presented and sensit ty analysis is carried out. Results show that reverse osmosis system can be designed to be effective process for desalting Colorado Ri water and irrigation drainage flows. (Bell-Corne W77-09319

BINGHAMTON WASTEWATER MANAG MENT STUDY: DESIGN AND COST APPEND
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09385

DO ECONOMIES OF SCALE EXIST IN WA UTILITY,
Illinois Univ. at Urbana-Champaign. Coll. of C merce and Business Administration.
H. Hinomoto.
Faculty Working Paper 290, November 197 tab, 13 ref.

Descriptors: *Treatment facilities, *Diseconom of scale, Water treatment, *Economies of sc Cost comparisons, Capital costs, Operating co Costs, Construction costs, *Utilities.
Identifiers: Plant capacity(Water treatment).

lationships between the capacity of 17 surface ter treatment plants and the construction costs their major components were analyzed to deter- ne if economies of scale existed. Based on cost a obtained from the original contractual docu- nts, the study indicated diseconomines of scale sted in each of the major components of the 1- mgd capacity plants. The most significant factor luencing the capital cost of the plant was the rce of the water treated. Because surface ter, in general, is more polluted and requires a her degree of treatment than groundwater, the ital cost of a surface water plant generally is stantially greater than that of the same capacity undwater treatment plant. Most large water atment plants use surface water sources. The le effects on the total unit cost of treatment, in- ding operating and capital costs, were not as clusive because of the lack of complete operat- cost data. However, based on available data, total unit cost first decreased, reaching the imum at about 6.0 mgd, and then increased in as the capacity moved from 1 to 12 mgd, sug- ting an optimum size of around 6 mgd. edtke-Wisconsin)
7-09450

. Water Quality Control

TIMAL ARTIFICIAL AERATION DESIGN IN LLUTED STREAMS RECEIVING THERMAL CHARGE,
nsas State Univ., Manhattan. Inst. for Systems sign and Optimization.
H. Lin, L. T. Fan, and C. L. Hwang.
nsas Water Resources Research Institute, Man- tan, Contribution Number 127, (1975). 32 p, 12 14 ref. OWRT B-030-KAN(10), 14-31-0001- 2.

scriptors: Water quality, *Water pollution con- , *Aeration, Thermal pollution, Design criteria, solved oxygen, Cooling water, Water quality ndards.
ntifiers: *Optimal artificial aeration scheme, ermal discharge, *Continuous maximum prin- e, *Organic waste discharges, Optimal control cy, Minimum DO concentration, Non-zero ar- ial aeration.

optimal artificial aeration scheme for a pol- d stream which receives additional thermal harge is studied. The continuous maximum ciple is employed to find the optimal control cy which minimizes the system objective func- and maintains an appropriate water quality in stream. The system objective function which sists of the DO violation penalty from the red value and the artificial aeration effort in- ses significantly with increasing amount of mal discharge in comparison with the isother- case. The system objective function also in- ses exponentially with increasing upstream O concentration. A design procedure is ented to find the optimal artificial aeration rol policy which is able to maintain the water ity at a minimum legal requirement.
-09146

TIMAL ARTIFICIAL AERATION POLICY WATER QUALITY CONTROL OF EAMS RECEIVING MULTIPLE THERMAL SEWAGE DISCHARGES,
sas State Univ., Manhattan. Dept. of Chemi- ngineering.
Lin, L. T. Fan, and C. L. Hwang.
lable from the National Technical Informa- Service, Springfield, VA 22161 as PB-269 347, codes: A03 in paper copy, A01 in microfiche.
sas Water Resources Research Institute, Man- n, Contribution Number 135. (1975). 38 p, 12 tab, 14 ref. OWRT Project B-037-KAN(3), -0001-4086.

Descriptors: *Thermal pollution, *Water quality control, *Aeration, Algorithms, *Design criteria, Cooling water, *Optimization, *Sewage outfalls, Sewage effluents, Water quality standards.
Identifiers: *Optimal artificial aeration, Thermal discharge, Sewage discharge, Objective function, Complex maximum principle algorithm.

The optimal artificial aeration design of a polluted stream is investigated in light of a criterion of the minimum cost which consists of the sum of the cost representing the penalty for the CO concentration deviation from the desired value and the cost of artificial aeration. The system considered is a reach of a stream containing multiple discharges of cooling water and sewage waste. The optimal artificial aeration control policies are determined by the modified maximum principle for different multiple-outfall configurations. The effects of the thermal and sewage discharges on the stream water quality as well as on the optimal artificial aeration control policy are examined. As the number of outfalls increases, the stream water quality is significantly improved. For the case where waste discharges are excessive, the multiple outfall system offers an additional advantage in minimizing localized severe pollution.
W77-09147

TECHNOLOGY AND ECONOMICS OF PACKED COLUMN WATER OXYGENATION IN STREAM AERATION,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Chemical and Biochemical Engineering.
F. W. Dittman, and M. Lothan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 336, Price codes: A02 in paper copy, A01 in microfiche. Delivered at VI Interamerican Congress of Chemical Engineering, Caracas, Venezuela, July 13-16, 1975. 19 p, 4 fig, 2 tab, 10 ref. OWRT B-010-NJ(3), B-011-NJ(2), B-022-NJ(8).

Descriptors: *Reaeration, *Water pollution control, Water quality control, *Oxygenation, Biochemical oxygen demand, *Economics, *Technology, *Aeration.
Identifiers: *Instream aeration.

Work on oxygen absorption in water in a packed column began because of the need, in some cases, for an alternative to instream aeration devices. Instream aeration devices, such as surface aerators or diffuser pipes with air compressors, are economically feasible and are being used routinely for the aeration of polluted streams in a number of places. They are subject to a number of disadvantages, however, which are enumerated. Stream aeration in a packed column results in a power consumption per unit of oxygen absorbed equal to, or less than, those required for surface aerators or diffusers. The capital costs of absorption column systems would benefit from the economies of scale as the size of the unit increases, while economies of this type are difficult to achieve with surface aerators.
W77-09149

ENVIRONMENTAL MODELING AND SIMULATION, PROCEEDINGS OF THE CONFERENCE ON.
Environmental Protection Agency, Washington, D. C. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W77-09154

FUTURE ENVIRONMENTAL QUALITY MANAGEMENT USING MODELS,
Environmental Research Lab., Athens, Ga.
D. W. Duttweiler.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 10-13, July 1976. 23 ref.

Descriptors: *Environmental control, *Management, *Mathematical models, Water quality control, Pollution abatement, Social aspects, Simulation analysis, Decision making, Systems analysis.

The purpose of this paper is threefold: (1) to show environmental pollutional control officials and managers the potential of models for enhancing the efficiency and effectiveness of their efforts; (2) to suggest to modelers that their products can be more useful in environmental protection; and (3) to outline a future mode of action for environmental protection that could be superior, in its accomplishments and costs, to the present approach which is highly limited in scope. The concept of the environment as a system is outlined and 'pollution control' is compared to 'environmental quality management.' Steps to realize environmental quality management through use of models are described and the potential benefits of instituting environmental quality management are discussed. A modeling approach to solving society's pollution problems, employing a holistic view of both the environment and society, would allow the environment to be managed to achieve the objectives society chooses. The systems approach forces recognition of the interconnectedness of environment and society and provides the means for evaluating the impact of projected social changes on the environment and of environmental changes on society. (See also W77-09154) (Bell-Cornell)
W77-09155

A SYSTEMATIC APPROACH TO REGIONAL WATER QUALITY PLANNING,
Systems Control, Inc., Palo Alto, Calif.
G. P. Grimsrud, and E. J. Finnemore.
In: Proceedings of the EPA Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 14-19, July 1976. 2 fig, 2 tab, 9 ref.

Descriptors: *Water quality control, *Regional analysis, *Methodology, Alternative planning, Computer models, Management, *Washington, River basins, Economics, Costs, Sewage, Runoff, Flow, Systems analysis.
Identifiers: Cost-effectiveness, Snohomish River basin(Wash), Stillaguamish River basin(Wash).

Described are various methodologies developed for regional water quality management planning on the Snohomish and Stillaguamish River Basins in Washington. These methods were specifically designed to be responsive to future changes in state and federal legislation, land use, economics, population, employment, geographical and political boundaries, technological development, and changes in the natural or man-made conditions of the water bodies. Computer models were developed and utilized to project future sewage and runoff flows, determine the assimilative character of water bodies, plan and cost various alternative wastewater management plans and provide other information on the cost-effectiveness of alternatives necessary for completing the Water Quality Management Plans. The modeling and programming elements are the principal factors allowing the development of a dynamic and easily updated Water Quality Plan. Considered herein are: planning procedure; flow regimes; determination of alternatives; wasteload allocation; assimilation analysis; wasteload forecasts; coasts of alternatives; cost-effectiveness comparisons; and time-phased facility schedule. (See also W77-09154) (Bell-Cornell)
W77-09156

RIBAM, A GENERALIZED MODEL FOR RIVER BASIN WATER QUALITY MANAGEMENT PLANNING,
Raytheon Co., Portsmouth, R.I. Environmental Systems Analysis.
R. N. Marshall, S. G. Chamberlain, and C. V. Beckers, Jr.

In: Proceedings of the EPA Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 45-49, July 1976. 3 fig, 1 tab, 4 ref.

Descriptors: *Simulation analysis, *Water quality control, *Computer models, Planning, Management, River basins, Chemical properties, Analytical techniques, Wastes, Streams, Ohio, Pennsylvania, Equations, Systems analysis.

To meet water quality objectives in streams and rivers, a need arises for systematic analysis of alternative pollution abatement strategies. The computerized mathematical model, RIBAM (River Basin Model), predicts water quality for 17 constituents, including DO, carbonaceous BOD, and parameters that represent nitrification and photosynthetic processes. RIBAM is suited for determining the waste load allocations necessary for achieving water quality standards in rivers. A unique calibration method, based on open-channel hydraulic equations, for an exponential relationship between stream velocity and flow is presented. Basic assumptions of the computer simulation model are that steady-state conditions exist and that the concentrations of water quality parameters are well mixed, varying only in the longitudinal direction of the stream. Application of RIBAM to the Beaver River Basin, including the Mahoning River, in Ohio and Pennsylvania is discussed. It is concluded that RIBAM is useful for river basin quality planning and management. Predicted water quality profiles for different basin conditions can be analyzed to aid in determining the waste load conditions that are most suitable to the water quality objectives of the basin. (See also W77-09154) (Bell-Cornell)
W77-09158

COMPARISON OF EUTROPHICATION MODELS,
Environmental Protection Agency, Atlanta, Ga. Technical Support Branch.
For primary bibliographic entry see Field 5C.
W77-09159

PLANNING IMPLICATIONS OF DISSOLVED OXXYGEN DEPLETION IN THE WILLAMETTE RIVER, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 5B.
W77-09160

PLANNING MODELS FOR NON-POINT RUNOFF ASSESSMENT,
Environmental Protection Agency, Athens, Ga. Ambient Monitoring Section.
For primary bibliographic entry see Field 5B.
W77-09162

A MATHEMATICAL MODEL OF DISSOLVED OXYGEN IN THE LOWER CUYAHOGA RIVER,
Cleveland State Univ., Ohio.
For primary bibliographic entry see Field 5B.
W77-09163

A WATER RESIDUALS INVENTORY FOR NATIONAL POLICY ANALYSIS,
National Academy of Sciences, Washington, D.C.
E. H. Pechan, and R. A. Luken.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 106-110, July 1976. 2 tab, 10 ref.

Descriptors: *Water pollution control, *Water policy, Effects, Effluents, Costs, Standards, Water quality, Waste discharge, Computers, Industries, Technology, Pollution abatement, Simulation analysis, Systems analysis.
Identifiers: *Residuals control, *Residuals discharge, Alternative policies, National policy.

A computer-based water residuals generation and discharge inventory was developed to assist in the evaluation of regional and national implications of the uniform effluent requirements of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) and in the evaluation of alternative residuals control policies. The completed system, termed the National Residuals Discharge Inventory (NRDI), has been used to examine the effects of various abatement policies at the regional level. The model is unique in its capability to simultaneously estimate costs, residuals discharge, and residuals dilution effects of alternative policies. This article discusses the application of the model to evaluate three alternative policies' residuals dilution effects in terms of national uniform effluent standards. Major limitations of the system include its omission of some important sources, i.e., silviculture, and its narrow coverage of residuals. (See also W77-09154) (Bell-Cornell)
W77-09164

STREAM MODELING AND WASTE LOAD ALLOCATION,
Indiana State Board of Health, Indianapolis. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5B.
W77-09169

SIMULATION OF AGRICULTURAL RUNOFF,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5B.
W77-09173

AN ENVIRONMENTAL RESIDUAL ALLOCATION MODEL,
Energy Resources Co. Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W77-09179

WATER QUALITY MODELING IN TEXAS,
Texas Water Quality Board, Austin. Engineering Analysis and Modeling Section.
For primary bibliographic entry see Field 5B.
W77-09181

A DYNAMIC WATER QUALITY SIMULATION MODEL FOR THE THAMES RIVER,
Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5B.
W77-09182

DISPERSION MODEL FOR AN INSTANTANEOUS SOURCE OF POLLUTION IN NATURAL STREAMS AND ITS APPLICABILITY TO THE BIG BLUE RIVER (NEBRASKA),
Nebraska Natural Resources Commission, Lincoln.
For primary bibliographic entry see Field 5B.
W77-09183

SELECTING THE PROPER REAERATION COEFFICIENT FOR USE IN WATER QUALITY MODELS,
Texas Water Quality Board, Austin. Administrative Operations.
A. P. Covar.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 340-343, July 1976. 3 fig, 16 ref.

Descriptors: *Water quality, *Mathematical models, *Equations, *Reaeration, Environmental engineering, Systems analysis, Streams, Flow, Natural streams, Laboratory tests, Oxygen, Turbulent flow, Atmosphere, Forecasting.
Identifiers: Field studies.

The arbitrary selection of an equation to predic the reaeration coefficient can significantly bias th results of an analysis. Reviewed are variou methods for calculating atmospheric reaeratio coefficients for use in mathematical water qualit models; among those methods considered are th of Streeter and Phelps, of O'Connor and Dobbin and of Churchill, Elmore, and Buckingham. I view of these existing methods, a rational en gineering methodology is developed to guide th engineer in the selection of the appropriate predic tive equation. It is concluded that equation derived from very shallow laboratory flume da should not be applied to natural streams whic probably have entirely different hydraulic chara teristics. Equations derived from field studies a best applied in instances where stream conditio are similar to those from which the equations we derived. (See also W77-09154) (Bell-Cornell)
W77-09184

RECEIV-II, A GENERALIZED DYNAMI PLANNING MODEL FOR WATER QUALIT MANAGEMENT,
Raytheon Co., Portsmouth, R.I. Oceanograph and Environmental Services.
For primary bibliographic entry see Field 5B.
W77-09185

A RESOURCE ALLOCATION MODEL FO THE EVALUATION OF ALTERNATIVES SECTION 208 PLANNING CONSIDERING E VIRONMENTAL, SOCIAL AND ECONOM EFFECTS,
Grumman Ecosystems Corp., Bethpage, N.Y.
D. Hill.
In: Proceedings of the Conference on Enviro mental Modeling and Simulation, April 19-2 1976, Cincinnati, Ohio. Report EPA 600/9-76-01 U.S. Environmental Protection Agency, Washi ton, D.C., p 401-406, July 1976. 1 fig, 5 tab, 11 re

Descriptors: *Resource allocation, *Evaluatio *Model studies, *Alternative plannin *Environmental effects, *Social impa *Economic impact, Land use, Water quality, W lands, Linear programming, Decision maki Systems analysis, Estuaries.
Identifiers: *Quantitative model, *Qualitati model, *Multiple objectives, Tradeoffs, Enviro mental modeling, Costs minimization, Enviro mental quality.

Modeling for 208 planning should be designed facilitate participation by planners and represen tives of the affected public. Intangibles and inco mensurables must be considered, and the ultima need for value judgments to assess the importan of environmental, social, and economic effe must be accomodated without abscuring the f tual analysis. Ideally, population groups that affected differently should be accounted separately. Model building should therefo proceed in successive stages of greater precisi An initial qualitative analysis leads to a concept model that identifies the differential impacts of alternatives, making only the judgment that impacts are beneficial or detrimentl. With land decisions among the alternatives for satisfy water quality goals, a resource allocation mode useful to acount for other costs and benefits. T can be solved for the minimum dollar cost mix activities as a datum; alternative plans can then generated by assigning additional importance to tangible and incommensurable values, with plan selection informed by knowledge of its inc mental dollar cost. (See also W77-09154) (B Cornell)
W77-09192

REGIONAL RESIDUALS-ENVIRONMENT QUALITY MANAGEMENT MODELS: APP

TION TO EPA'S REGIONAL MANAGE-
ENT PROGRAMS,
sources for the Future, Washington, D. C.
ality of the Environment Program.
O. Spofford, and C. N. Ehler.
Proceedings of the Conference on Environ-
ntal Modeling and Simulation, April 19-22,
6, Cincinnati, Ohio. Report EPA 600/9-76-016,
S. Environmental Protection Agency, Washing-
, D.C., p 407-413, July 1976. 1 fig, 19 ref.

scriptors: *Regional analysis, *Environmental
trol, *Optimization, Water quality, Air pollu-
, Ecosystems, Mathematical models, Con-
ints, Standards, Evaluation, Linear pro-
mming, Cost analysis, Research, Systems anal-
s.
ntifiers: *Residuals, *Environmental quality,
anagement programs, *Lower Delaware Val-
, Public policy, Treatment plants, Cost
imization.

s paper describes the elements of a regional in-
rated residuals-environmental quality manage-
nt model developed at Resources for the Future
ssist governments in establishing public policy
regional environmental quality--air, water and
d-through the explicit analysis of the linkages
ong gaseous, liquid and solid residuals, and
ong the various environmental media. Within
optimization framework, the model evaluates a
e number of residuals management options in-
ling non-treatment alternatives, so that least-
ways of achieving various levels of ambient
ironmental quality, subject to constraints on
geographic distribution of costs of achieving
se levels, can be identified. The overall
nagement model consists of three parts: a linear
gramming model of regional residuals genera-
and discharge, environmental models (air
ersion and aquatic ecosystem models), and an
ironmental evaluation section. A summary of
lts from a test appliction of the model in the
ver Delaware Valley is presented. Lessons
ned from the development of the Delaware
el are related to the objectives and analytic
irements of EPA's current regional manage-
nt programs. Air Quality Maintenance and
awide Waste Treatment (208) plans. (See also
7-09154) (Bell-Cornell)
7-09193

ESTABLISH VIABLE METHODS OF MAIN-
NING WASTE TREATMENT FACILITY EF-
IENCIES WITH REFERENCE TO FLOW
RIATIONS, VOLUME II.
Laren (James F.) Ltd., Toronto (Ontario).
primary bibliographic entry see Field 5D.
-09214

GRADING OF SEWAGE LAGOON EF-
ENTS,
ario Ministry of the Environment, Toronto.
ution Control Branch.
primary bibliographic entry see Field 5D.
-09218

EARCH PROJECTS IN GLACIOLOGY -
artment of the Environment, Ottawa
ario). Water Resources Branch.
primary bibliographic entry see Field 2C.
-09220

EARCH, DESIGN, AND DEVELOPMENT
THE U.S. COAST GUARD HIGH SEAS OIL
TAINMENT SYSTEM,
elle Columbus Lab., Ohio.
Tierney.
lable from the National Technical Informa-
Service, Springfield, VA 22161 as AD-A025
Price codes: A14 in paper copy, A01 in
ofiche. U. S. Coast Guard Office of Research
Development, Washington, D. C., Report No.
CG-D-42-76, September 1975. 305 p, 56 fig, 9 tab, 42 ref, 5 append. DOT-CG-23223-A.

Descriptors: *Oil pollution, *Barriers, *Water pollution control, *Oil spills, *Pollution abatement, *Water quality control, Testing procedures.
Identifiers: *Outer Continental Shelf, *Oil recovery systems, Oil containment.

The objective of this program was to develop a lightweight airdeliverable oil barrier system, capable of containing significant quantities of oil at sea states to 5-foot waves and 1-knot currents, and in winds up to 20 knots, and of sustaining with minimal damage 10-foot waves, 2-knot currents, and 40-knot winds. An inflatable-supported curtain barrier, a self-floating airdeliverable barrier-storage/deployment container, and barrier moorings were developed from initial concept stages to full-scale usable equipment. Model and field tests were conducted and modifications were made as required. An at-sea test of the interfaced subsystems demonstrated the validity of the final design and the viability of the air-delivery methods. The program resulted in a usable air-deliverable oil-containment system and in the specifications for manufacturing barriers, air-delivery/sea-deployment containers, and ship- and air-deliverable barrier moorings. (Sinha - OEIS)
W77-09226

USERS MANUAL - OIL AND HAZARDOUS MATERIALS SPILL INFORMATION RETRIEVAL SYSTEM.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 662, Price codes: A02 in paper copy, A01 in microfiche. Environmental Protection Agency Report No. EPA/DF-75-001a, April 1975. 15 p.

Descriptors: *Oil spills, *Oil pollution, *Hazards, Water pollution, *Information retrieval, Baseline studies, Environmental effects, Resources development.

This manual is designed to provide guidance to those who prepare reports on spill episodes to the Division of Oil and Special Materials Control, and who expect to access the system for developing Regional analytical studies. The increasing number of spills reports and the need for more accurate statistical analysis of episodes, make it imperative that Regions report promptly and in accordance with this manual in order that data are available to the Congress, EPA top management, the Office of Management and Budget, and the Public. Even more important is the need for a capability to fully support the Spill Prevention program and assess its effectiveness. (Sinha-OEIS)
W77-09229

THE ENVIRONMENTAL QUALITY MONITORING REPORT.
National Oceanic and Atmospheric Administration, Washington, D.C. Outer Continental Shelf Task Force.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 020, Price codes: A04 in paper copy, A01 in microfiche. February 1976. 66 p, 11 fig, 3 tab.

Descriptors: *Environmental control, *Baseline studies, *Pollution abatement, *Monitoring, Water quality control, Water pollution control, Oil pollution, Trace elements, Pollutant identification, Metals.
Identifiers: *Outer Continental Shelf, Trace metals.

The general requirements for environmental quality monitoring is defined, including strategies, certain general methodologies, management coordination with the program as well as with other programs, necessary research and development, and required resources. The monitoring program is designed to inform users and be reactive to their needs. The basic strategy behind the monitoring program begins with identifying critical species, habitats, and processes in the course of the baseline investigations. Special studies will yield further understanding of the effects of oil and associated contaminants on various species and increase knowledge of the role of these species in the entire ecosystem. The studies will yield data in the location of OCS oil operations; on water mass circulation downcurrent from the potential pollutant sources; on living natural resources in jeopardy from possible oil contamination; and regarding the tolerance of these species to oil and associated trace metal concentrations. (Sinha-OEIS)
W77-09231

ASSEMBLY AND TESTING OF THE MARK I SHIPBOARD SEPARATOR SYSTEM,
Foster-Miller Associates, Inc., Waltham, Mass.
A. R. Guzdar, A. C. Harvey, and W. M. Mack, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 948, Price codes: A04 in paper copy, A01 in microfiche. U.S. Coast Guard Office of Research and Development, Washington, D.C., Final Report No. CG-D-18-76, December 1975. 66 p, 21 fig, 10 tab, 1 ref, append.

Descriptors: *Water pollution control, *Pollution abatement, *Oil pollution, *Separation techniques, Testing.
Identifiers: *Outer Continental Shelf, *Oil-water separation, Bilge water.

Assembly and testing of a prototype oil-water-solids separating system is described. The system is designed to process ships' bilge water at a rate of 50 gpm and provide water effluent containing less than 15 ppm of oil. Results of the system testing indicates that the system is capable of continuously processing 50 gpm of bilge water containing concentrations up to 20% No. 2 fuel oil and discharging water effluent with less than 7 ppm oil. Higher inlet oil concentrations are handled satisfactorily by the automatic recirculation feature of the system. (Sinha-OEIS)
W77-09234

ANALYSIS OF RISK IN THE WATER TRANSPORTATION OF HAZARDOUS MATERIALS.
National Academy of Sciences, Washington, D.C. Committee on Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 298, Price codes: A06 in paper copy, A01 in microfiche. U.S. Coast Guard Office of Research and Development, Washington, D.C. Final Report No. CG-D-39-76, January 1976. 118 p, 17 ref, 6 append.

Descriptors: *Transportation, *Hazards, *Water pollution control, *Risks, Pollution abatement, Model studies, Management, Decision making.
Identifiers: *Outer Continental Shelf, *Risk analysis modeling, *Hazardous materials transport.

The Risk Analysis and Hazard Evaluation Panel of the Committee on Hazardous Materials, Office of Chemistry and Chemical Technology, Assembly of Mathematical and Physical Sciences prepared this report in response to a request from the U.S. Coast Guard for an assessment of the utility and feasibility of risk analysis as a set of techniques for assisting management decisions regarding the regulation of water transportation of bulk hazardous materials. The Panel surveyed a number of risk analysis studies, selected barge transportation on inland waterways for special study, and selected a probabilistic model of risk. In the course of the Panel's ongoing review of risk analysis, it became apparent that to develop a completely general risk model would require an impractical amount of time and resources. The Panel concluded that the greatest utility of the

methodology, and perhaps the only practical one, lies in answering specific questions with output of a specific pre-determined nature. (Sinha-OEIS)
W77-09235

THE EVALUATION OF THE TEST PROCEDURE FOR HAZARDOUS BINARY COMBINATIONS OF MATERIALS IN MARINE TRANSPORTATION,
Coast Guard Academy, New London, Conn.
A. T. Wehman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A007 915, Price codes: A05 in paper copy, A01 in microfiche. U.S. Coast Guard Office of Research and Development, Washington, D.C., Final Report No. CG-D-85-75, August 1974. 82 p, 6 fig, 3 append.

Descriptors: *Water pollution control, *Hazards, *Transportation, Chemicals, Chemical reactions, *Testing procedures, Evaluation, Pollutant identification.
Identifiers: *Binary combinations, *Hazardous materials transport.

The proposed test procedure for the evaluation of binary combinations of hazardous materials encountered in marine transportation was checked and verified to be safe, easy to perform, and to give valid and meaningful data. Present data agrees well with that previously published in a Dow report and a recent Norwegian publication. Approximately 100 new binary combinations have been tested, and a reproducibility study was performed. An abbreviated study of variables was undertaken. (Sinha-OEIS)
W77-09236

AT SEA TESTING OF A HIGH SEA OIL RECOVERY SYSTEM,
Ocean Systems, Inc., Reston, Va.
T. N. Blockwick, R. L. Beach, F. A. March, and L. S. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A006 938, Price codes: A06 in paper copy, A01 in microfiche. U.S. Coast Guard Headquarters, Washington, D.C., Final Report No. CG-D-57-75, July 1974. 125 p, 32 fig, 2 append. DOT-CG-32, 781-A.

Descriptors: *Water pollution control, *Pollution abatement, *Skimming, Barriers, Resources development, Environment, *California, *Testing.

The at-sea tests of the 2000 gpm Ocean Systems, Inc., Weir-Basin Oil Recovery System (ORS) conducted at Port Hueneme, California, and at Point Conception, California, during the period of 7 August 1973 to 22 August 1973 are summarized. These tests were conducted without oil, with the purpose being to qualify the ORS with respet to strength, stability, operational functions, ease of handling, compatability with the Coast Guard lightweight oil containment barrier, and compatibility with Coast Guard buoy tenders. The tests showed that the 2000 gpm ORS was compatible with the barrier in both of the deployment configurations tested. Conformance to waves was very good, indicating that a high probability of obtaining high oil recovery efficiencies (Percent oil in the recovered stream) could be expected. Launch and recovery from a buoy tender were successful, although a shorter length for the ORS was indicated to be desirable. Design modifications to minimize fabric wear and to increase the structural adequacy in certain areas are recommended. (Sinha-OEIS)
W77-09237

OIL TRANSPORTATION BY TANKERS: AN ANALYSIS OF MARINE POLLUTION AND SAFETY MEASURES.
Office of Technology Assessment, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 457, Price codes: A14 in paper copy, A01 in microfiche. Report to Committee on Commerce, U.S. Senate, July 1975. 311 p, 6 fig, 16 tab, 7 attachments.

Descriptors: *Water pollution control, *Oil pollution, *Safety factors, International law, Jurisdiction, Transportation.
Identifiers: *Outer Continental Shelf, *Tankers, Supertankers, *Oil transportation.

A factual background on tankers is presented and a discussion of issues related to the safety of tanker operation and the potential presented by tankers for introducing polluting oil into the marine environment is given. The report focuses on technical alternatives concerning the design, construction and operation of tankers in U.S. waters as these relate to safety and pollution prevention. Supertanker operations are given emphasis when they present particular or unusual problems. (Sinha-OEIS)
W77-09238

VULNERABILITY MODEL: A SIMULATION SYSTEM FOR ASSESSING DAMAGE RESULTING FROM MARINE SPILLS,
Enviro Control, Inc., Rockville, Md.
For primary bibliographic entry see Field 5C.
W77-09239

A CHEMICAL MONITORING PROGRAM OF THE EXPLOSION PRODUCTS IN UNDERWATER EXPLOSION TESTS,
Naval Surface Weapons Center, White Oak Lab., Silver Spring, Md.
M. G. Lai.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-015 964, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No. NSWC/WOL/TR 75-35, 4 April 1975. 62 p, 10 fig, 5 tab.

Descriptors: *Explosion, Water quality, *Monitoring, Testing, Program, Water pollution control, Pollutant identification.
Identifiers: *Underwater explosions, *Chemical monitoring programs.

A chemical monitoring program of the explosion products in underwater explosition tests is described. The objective of the program is to monitor water quality chemically after underwater explosion tests. The program consists of sampling and preservation of water and sediment samples, separation, concentration, and determination of various explosion products. General concepts, procedures, and equipment needed for each phase of the program are presented. Guidelines and recommendations for the overall program are also given. (Sinha-OEIS)
W77-09242

WAMIS ABSTRACTS, NO 2,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 10C.
W77-09256

INFLUENCE OF VEGETATION MANAGEMENT ON YIELD AND QUALITY OF SURFACE RUNOFF,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 4C.
W77-09266

URBAN WATER RUNOFF AND WATER QUALITY CONTROL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-09267

MEASURES FOR REDUCING RETURN FLOW FROM THE WELLTON-MOHAWK IRRIGATION AND DRAINAGE DISTRICT, ANNUAL REPORT FOR FY 1976.
Bureau of Reclamation, Washington, D.C. Wellton-Mohawk Irrigation and Drainage District.
For primary bibliographic entry see Field 4A.
W77-09276

THE ROLE OF SYSTEMS ANALYSIS IN THE USE OF AGRICULTURAL WASTES,
Manitoba Univ., Winnipeg Dept. of Agricultural Engineering.
D. D. Schulte, and E. J. Kroeker.
Journal of Environmental Quality, Vol 5, No 3, 221-227, July-September 1976. 4 fig, 21 ref.

Descriptors: *Systems analysis, Model studies, Simulation analysis, Linear programming, Dynamic programming, *Farm wastes.
Identifiers: Agricultural waste management, Interdisciplinary roles.

Agricultural waste management is a multidisciplinary field which has grown in an attempt to solve problems of agricultural by-product utilization and disposal. Development of meaningful solutions to agricultural waste management problems will be much simpler if practitioners and researchers educate one another and together work to solve the different problems of the producer. Many disciplines have already become involved in the problem-solving process; yet, there is a need for a generalist in agricultural waste management who can bridge disciplinary gaps and promote effective cooperation between specialists in various fields of study. Systems analysis can serve a useful purpose in agricultural waste management by providing a focal point for cooperation between disciplines working on various aspects of the problem. Systems analysis has been used to: (I) provide a common structure for comparison of agricultural waste management strategies; (II) identify processes of links within waste-utilization systems which are costly or sensitive to operating conditions; (III) predict effects of external constraints such as government policy, fertilizer taxed, and prices on the effectiveness of waste utilization strategies; (IV) yield information to predict where research funds would be spent most effectively; and (V) assist in technology transfer from researchers to practitioners through the use of computer-based education models. (Skogerboe-Colorado State)
W77-09282

ANTI-POLLUTION BEHAVIOR: A FUNCTION OF PERCEIVED OUTCOME AND LOCUS OF CONTROL,
For primary bibliographic entry see Field 6G.
W77-09378

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PREVIEW.
Army Engineer District, Baltimore, Md.
(June 1976), 12 p.

Descriptors: *Long term planning, *Waste water treatment, *Water quality, *Short term planning, costs, *Federal Water Pollution Control Act, Environmental effects, Sludge disposal, Stormwater, Septic tanks, *Management.
Identifiers: *Binghamton(NY), Wastewater management, *Susquehana River Basin(NY), Broom County(NY), Tioga County(NY).

The major elements of the 9-volume Binghamton Wastewater Management Study Report are synthesized in this preview. The study's purpose was to prepare an areawide wastewater management plan for Broome and Tioga counties as required by the Federal Water Quality Act Amendments of

L 29-500). Short-range plans to the mid-1990's d longrrange plans to the year 2020 were veloped. Alternatives were systematically com-red, but the detailed design data necessary for nstruction of a specific project were not oduced. The study's findings should serve as an l for evaluating cost-effective and environmen-ly acceptable methods of water quality control. e study area was divided into two parts, one an and the other made up of outlying communi-s. The outlying communities were found to have le impact on water quality. The major problems ntified in the study include: the likelihood of pulation levels exceeding the capacity of exist-treatment works; combined sewer overflows ring storms that violate water quality standards; certainty regarding appropriate sludge disposal thods; and the need to sewer certain suburbs ere septic systems are inadequate. The planning mework and citizen participation element are scribed, as is the plan alternative ultimately ected for implementation. (See also W77-09380 u W77-09388) (Nessa-NC)
77-09379

NGHAMTON WASTEWATER MANAGE-ENT STUDY: SUMMARY.
my Engineer District, Baltimore, Md.
e 1976. 97 p, 29 tab, 45 fig.

scriptors: *Long term planning, *Waste water atment, *Water quality, *Decision making, ethodology, *Social participation, nvironmental effects, *Management, Institu-ns, Social aspects, Costs, Stormwater, Sludge posal, Septic tanks, Projections, Combined vers, Social impacts, Federal Water Pollution ntrol Act.
ntifiers: *Binghamton(NY), *Susquehana er Basin(NY), Wastewater management, ome County(NY), Tioga County(NY).

is report summarizes the nine volume Bingham-Wastewater Management Study. The study a's climatic, topographic, hydrographic, nomic and demographic characteristics are scribed, as are existing water supply and waste-ter management systems. Future wastewater ws are projected. The major problems ntified in the study are: the likelihood of popu-on levels exceeding the capacity of existing atment works; combined sewer overflows dur-storms that violate water quality standards; un-tainty regarding appropriate sludge disposal thods; and the need to sewer certain suburbs ere septic systems are inadequate. The struc-e and process of citizen participation efforts are ailed. The planning methodology is explained consisting of three stages in which successive ges are more detailed and consist of fewer alter-ives. Stormwater and sludge management op-s are summarized, their impacts evaluated, their costs analyzed. A preferred option is cted. The political and institutional arrange-nts necessary for plan implementation are lyzed according to a set of criteria set forth in report. Four alternative plans were developed. h integrated a full range of services. The effect he environment of each plan is assessed and n the impacts of each plan are compared. The austive comparison process resulted in selec-of the most acceptable plan. (See also W77-79) (Nessa-NC)
7-09380

GHAMTON WASTEWATER MANAGE-NT STUDY: BACKGROUND INFORMA-N APPENDIX.
y Engineer District, Baltimore, Md.
e 1976. 187 p, 48 tab, 24 fig, 1 plate.

criptors: *Comprehensive planning, thodology, *Ecosystems, *Projections, ter quality, Climatic data, Geology, Hydrolog-spects, Biota, Population, Economics, Water ly, Waste water treatment, Land use, Growth s, Agriculture, Social aspects.

Identifiers: *Binghamton(NY), *Susquehana River Basin(NY), Waste water management, Tioga County(NY), Broome County(NY).

This Appendix, part of the 9-volume Binghamton Study, provides information on all phases of the Study. The study area includes those portions of Broome and Tioga Counties drained by the Susquehana River. The natural characteristics of the region, including climate, geology, water resources and the biotic environment are described, as are the demographic and economic characteristics. Water supply and wastewater management, including industrial systems, are identified and described. Existing water and related land resources problems are identified and assessed. The population projections of various agencies are analyzed for their applicability to this study area. Population projections are broken down by county, municipality and wastewater management areas. Economic projections are presented and analyzed. Desired patterns of growth, land use, environmental quality, agriculture, transportation, housing, and health are discussed with particular reference to the region's overall General Plan. The study provides a range of urban water resource plans that are compatible with Federal, State, and local objectives. The broad Federal policies that guided the study are considered and the Study's specific objectives are presented. At the completion of the Study, alternative plans were compared and evaluated in light of the goals and objectives the planning effort was directed to achieve. (See also W77-09379) (Nessa-NC)
W77-09381

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PLAN FORMULATION APPENDIX.
Army Engineer District, Baltimore, Md.
June 1976. 499 p, 105 tab, 48 fig, 6 plates, 143 ref.

Descriptors: *Alternate planning, *Environmental effects, *Waste water treatment, *Water quality, *Management, *Short-term planning, *Long-term planning, Social impact, Economic impact, Design, Institutions, Social participation, Evaluation, Decision making.
Identifiers: *Binghamton(NY), *Susquehana River Basin(NY), Wastewater management, Broome County(NY), Tioga County(NY).

This Appendix is one volume in the nine volume Binghamton Study. The product of the study was the development of alternative long- and short-range plans for the protection and enhancement of water quality and associated resources of the Susquehana River Basin within Broome and Tioga Counties, New York. This Appendix documents all significant events and decisions involved in the formulation, evaluation, and selection of wastewater management plans. As such, it provides a sequential summary of progress throughout the study. The first step in the planning process was to determine Federal, State and local problems, issues, and objectives of wastewater management. To meet these objectives, alternative plans were formulated through an iterative process consisting of systems design, an assessment of all pertinent impacts, and an evaluation of the plan's effectiveness in fulfilling the objectives. The final alternative plans were compared by displaying all significant environmental, economic, and social impacts. Also contained in this Appendix is a summary of the institutional analysis which suggested arrangements for implementation of each of the final plans, and a summary of the public interaction in the planning process. A complete description of the final recommended plan is presented. (See also W77-09379) (Nessa-NC)
W77-09382

BINGHAMTON WASTEWATER MANAGEMENT STUDY: COMMENTS APPENDIX.
Army Engineer District, Baltimore, Md.
June 1976. 83 p, 4 fig.

Descriptors: *Social participation, *Waste water treatment, *Water quality, Management, Institutions, Decision making, Long range planning, Short range planning, Federal Water Pollution Control Act.
Identifiers: *Binghamton(NY), *Susquehana River Basin(NY), Wastewater management, Broome County(NY), Tioga County(NY).

The nine volume Binghamton Wastewater Management Study was a joint Federal, State, and local planning effort to develop alternative plans for protection and enhancement of water quality and associated resources of the Susquehana River Basin within Broome and Tioga Counties, New York. The short range and long range plans developed in the study were formulated to complement the existing water quality programs of the State of New York while assisting local communities in achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500). The study focused on water quality and wastewater management problems. It did not concentrate on other water resource needs and problems such as flood control, water supply, or recreation. This Appendix presents a verbatim account of the written review comments of various Federal, State, and local agencies, as well as interested citizens. These comments were taken into account before the final version of the study was written. The comments generally assess the adequacy of the plan in meeting its goals and objectives, and the extent to which the plan complies with relevant State and Federal laws and regulations. (See also W77-09379) (Nessa-NC)
W77-09383

BINGHAMTON WASTEWATER MANAGEMENT STUDY: SPECIALTY APPENDIX.
Army Engineer District, Baltimore, Md.
June 1976. 272 p, 54 tab, 26 fig, 12 ref.

Descriptors: *Waste water treatment, *Environmental effects, *Management, *Water quality, COsts, Recreation, Sludge disposal, Industrial wastes, Non-structural alternatives, Zoning, Building codes, Taxes, Social impact.
Identifiers: *Binghamton(NY), *Susquehana River Basin(NY), *Non-point sources, *Historical impacts, *Wastewater management, Broome County(NY), Tioga County(NY), Prehistorical impacts.

This Appendix is one of nine volumes aimed at developing alternative plans for the protection of water quality and associated resources of the Susquehana River Basin within Broome and Tioga Counties, New York. This Appendix reports on several issues that required special investigation because they covered topical areas broader than the limits of the study areas covered in other volumes. The importance of wastewater management in outlying communities is discussed. The costs and basic steps for planning of a small wastewater treatment system are outlined. Non-point sources of pollution are evaluated. It is concluded that the region does not have any serious wide-ranging non-point source pollution problems. The river-oriented recreational potential associated with the various wastewater management plans is analyzed. The possibility of applying effluent to the land from secondary sewage treatment works is investigated. Industrial wastewater management, including present practices and guidelines for future discharges, are analyzed. Non-structural flow reduction measures such as pricing, zoning, building codes and industrial surcharges are examined. The preliminary costs and effectiveness of these measures are assessed. The historic and prehistorical impacts associated with the various projects proposed in the Binghamton Study are evaluated. (See also W77-09379) (Nessa-NC)
W77-09384

BINGHAMTON WASTEWATER MANAGEMENT STUDY: DESIGN AND COST APPENDIX.
Army Engineer District, Baltimore, Md.

June 1976. 639 p, 240 tab, 151 fig, 6 plates, 65 ref.

Descriptors: *Waste water treatment, *Management, *Cost analysis, *Design criteria, *Water quality, Projections, Methodology, Model studies, Sludge disposal, Storm water, Storm runoff, Alternate planning, Interstate rates.
Identifiers: *Binghamton(NY), *Susquehana River Basin(NY), Wastewater management, Broome County(NY), Tioga County(NY).

This Appendix is one of nine volumes aimed at developing alternative plans for the protection of water quality and associated resources of the Susquehana River Basin within Broome and Tioga Counties, New York. This Appendix presents the documentation of the engineering analyses which formed the basis of the designs and costs of wastewater management systems. The design criteria discussion summarizes the population and wasteflow projections used as the framework for the technical design of alternatives. The analyses performed in the development of these projections are presented. The economic analytical framework deals with cost estimating procedures and elements of the cost-effectiveness analysis. The methodology used in developing the components of the alternative plans is presented. It details the manner in which the various planning criteria were incorporated into the technical design. The development of the water quality model for the Susquehana River is also presented. The major technological design analyses for wastewater facilities, sludge management and stormwater management are detailed. The design and cost of the four final plans is documented. An in-depth presentation is made of the design, construction schedule, costs, and performance features of each plan. These analyses are based on an interest rate of 6-1/8 percent. (See also W77-09379) (Nessa-NC)
W77-09385

BINGHAMTON WASTEWATER MANAGEMENT STUDY: IMPACT ASSESSMENT AND EVALUATION APPENDIX.
Army Engineer District, Baltimore, Md.
June 1976, 306 p, 39 tab, 31 fig.

Descriptors: *Waste water treatment, *Baseline studies, *Environmental effects, *Water quality, *Management, Alternate planning, Social impact, Economic impact, Methodology, Planning.
Identifiers: *Binghamton(NY), *Susquehana River Basin(NY), *National Environmental Policy Act(1969), Wastewater management, Broome County(NY), Tioga County(NY).

This Appendix is one of nine volumes aimed at developing alternative plans for the protection and enhancement of water quality and associated resources of the Susquehana River Basin within Broome and Tioga Counties, New York. This Appendix is intended to fulfill the requirements of the National Environmental Policy Act. The impact assessment was accomplished by a comparison of expected effects associated with a particular alternative to the expected conditions in the study area in the absence of any wastewater management plan. This no action alternative assumed that no further wastewater management decisions would be made in the study area except those already budgeted. This methodology provided a baseline condition against which the alternative plans were compared. In this way, the impacts of an alternative or plan were identified as those effects which differed in some way from the conditions associated with the future baseline. These differences were then either qualitatively or quantitatively measured and their location and timing were identified. Evaluation was accomplished from interpretation of these impacts and comparison of the impacts between alternatives. The degree of beneficial or adverse effects to the environmental and social setting was considered in relation to the baseline and other alternatives. (See also W77-09379) (Nessa-NC)
W77-09386

BINGHAMTON WASTEWATER MANAGEMENT STUDY: INSTITUTIONAL ANALYSIS APPENDIX.
Army Engineer District, Baltimore, Md.
June 1976. 239 p, 50 tab, 22 fig.

Descriptors: *Institutional constraints, *Political constraints, *Social aspects, *Waste water treatment, *Water quality, Administration, Management, Alternate planning, Legal aspects, Governments, Planning.
Identifiers: *Binghamton(NY), *Susquehana River Basin(NY), Wastewater management, Broome County(NY), Tioga County(NY).

This volume is one of nine in the Binghamton Study, and presents a description of Federal and State interests in wastewater management. An institution is defined as a formal or informal organization which uses certain administrative, political, and social processes to implement and control wastewater management systems. The Study's purpose is to analyzze the existing institutional arrangements for wastewater management in Broome and Tioga Counties, New York, and to assess their capability for implementing recommended technical plans. The Study is limited to existing institutions concerned with water supply and wastewater management. Where shortcomings in the existing institutional arrangements are identified, the Study either suggests ways in which the institutions can be modified, or it suggests new institutional arrangements to provide the needed direction. This report is an information document rather than a decision document. Its objective is to provide a base of information as well as to suggest means which may be utilized to evaluate institutional forms. The Study examines the ability of existing institutions to implement the recommended alternative plans. The plans are then evaluated when various additional management schemes are involved. The relationship of a plan to the Federal planning, design, and construction grant procedures administered by the Environmental Protection Agency is detailed. (See also W77-09379) (Nessa-NC)
W77-09387

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PUBLIC INVOLVEMENT APPENDIX.
Army Engineer District, Baltimore, Md.
June 1976. 88 p, 7 tab, 15 fig, 14 ref.

Descriptors: *Decision making, *Waste water treatment, *Attitudes, *Social participation, Social aspects, Planning, Water quality, Management, Governments, Institutions, Social impacts.
Identifiers: *Citizen participation, *Binghamton(NY), Susquehana River Basin(NY), Broome County(NY), Tioga County(NY), Wastewater management.

This appendix, one of 9 volumes reporting on the Study, describes the public involvement element of the Study. The public was defined as any person or agency outside the Corps of Engineers. The purpose of the public involvement program was: to promote full public understanding of the manner and means by which water resource problems and needs were investigated and solutions proposed; to keep the public fully informed regarding the status and progress of the Study and the results and implications of planning activities; and to solicit from the public their opinions and perceptions of problems, issues, concerns, and needs, and their preferences regarding water resource use and plan development, and any other information and assistance relevant to the planning process. The public involvement structure is explained, including the purpose and rationale behind the several advisory committees. The Federal, State, and local agencies involved in the study are identified, as are their water resource programs. The sequence of events occurring during the study are identified, and the important decisions made at public meetings and advisory committee sessions are documented. Written material presented at public meetings and during the course of the study is presented. The public involvement program is analyzed, and recommendations for improvements are made. (See also W77-09379) (Nessa-NC)
W77-09388

DAIRY MANURE CAN BE USED SAFELY,
California Univ., Davis.
J. L. Meyer, R. S. Rauschkolb, and E. H. Olson.
California Agriculture, V. 30, No 11, p 10-11, Nov 1976. 1 fig.

Descriptors: Waste storage, *Water pollution, Groundwater, Salts, Nutrients, Leaching, Liquid wastes, Solid wastes, *Farm wastes.
Identifiers: *Dairy manure, Waste management, Land application, Nitrogen release.

University of California research has established that potential environmental problems in fertilizing croplands with dairy manure can be avoided with proper management. Recent University of California research has shown: (1) the kinds and amounts of salts and plant nutrients in dairy manure, (2) what happens to salts and plant nutrients during storage in manure piles and manure storage ponds, and (3) the amount of salts seeping downward below the soil surface in fields heavily treated with manure. In a continuous cropping system, providing enough nitrogen for satisfactory yield without excessively concentrating salts (which may pollute groundwater and surface waters) depends upon: methods of handling, storing, and applying manure; rate of application and the amount and rate of nitrogen release in the soil. Taking these factors into account, different management systems are used for dry manure and holding pond manure. For dry manure, once the nitrogen percentage is established (either through laboratory analysis or through an assumed percentage), average expected rates of nitrogen release - called 'decay series' - may be used to determine what annual applications are needed to release the nitrogen to the soil on a year to year basis. The 'decay series' means that, with continued annual applications to the same land, a smaller amount of added manure is needed each year to provide the same amount of available nitrogen in the soil. For liquid manure, equations are given for calculating the amount of manure in storage and the number of acres on which a pondful of liquid manure can be spread each year. (Merryman-East Central)
W77-09389

CONTROL OF WATER POLLUTION FROM CROPLAND: VOLUME II--AN OVERVIEW.
Agricultural Research Service, Washington, D.C.
Prepared as a joint publication of Office of Research and Development, EPA, and Agricultural Research Service, USDA. June, 1976, 189 p, 51 fig, 35 tab, 612 ref.

Descriptors: *Agricultural runoff, *Water pollution sources, Sedimentation, Erosion, Nutrients, Pesticides, Economics, Pollutant identification, *Pollution abatement, *Farm wastes.
Identifiers: Cropland management.

Engineering and agronomic techniques to control sediment, nutrient, and pesticide losses from cropland are identified, described, and evaluated. Methodology is developed to enable a user to identify the potential sources of pollutants, select a list of appropriate demonstrated controls, and perform economic analyses for final selection of controls. The basic principles on which control of specific pollutants is founded are reviewed, and supplementary information is provided, and some of the documentation used in Volume I is presented. (Volume I (Report No. EPA-600/2-75-026a) available from NTIS as report no. PB-249 [illegible]. (See W77-06097) (East Central)
W77-09390

ATER MANAGEMENT ASPECTS OF THE GRICULTURAL UTILIZATION OF LIQUID ANURE AND PRELIMINARY EXPENDITURE TANDARDS, (IN GERMAN),
stitut fuer Wasserwirtschaft, Berlin (East Germany).
. Kruger, and W. Hirte.
Vasserwirtschaft-Wassertechnik, V 22, No 6, p 01-204, June, 1972. 6 fig, a tab.

escriptors: Groundwater, Liquid wastes, eaching, Bacteria, Nitrates, Phosphates, Separaon techniques, Cattle, *Waste water treatment, Vater quality standards, *Water pollution, arm wastes.
entifiers: Field spreading, *East Germany.

eld and laboratory tests on the possible conmination of the groundwater with liquid manure farmlands are described, and recommendations the intensity of the use of liquid manure are rived. The germ count in liquid manure may be to 10 times that in domestic effluent. The duced germ count in the liquid phase of liquid nure following phase separation indicated that e bulk of the germs is adsorbed by solids organic rticles. Correlation between the nitrate content the leachate and the liquid manure expenditure, pecially at per-hectare expenditures correspondg to the manure production by 8 or more steers, as established. The intensity of the use of liquid nure had, however, no effect on the phosphate ntent of the leachate. The contamination of the chate is dependent on the nutrient extraction by e plant, thus on the time when the liquid manure applied, and on the soil type. Hygienic and bacriological investigations revealed that infections soil layers deeper than 60 cm with coliform bacia are exceptional when manure produced by ximum of 8 steers is used per hectare. When the nure from at least 4 steers is used per hectare, it ould be applied in fractionated doses over an exded period of time. The use of large amounts of uid manure at one time may cause serious undwater contamination, especially during the nter period. (Solid Waste Information Retrieval stem)
7-09391

ATER MANAGEMENT PROBLEMS INOLVED IN THE TREATMENT AND UTILIZAON OF LIQUID MANURE, (IN GERMAN),
titut fuer Wasserwirtschaft, Berlin (East Gerny).
r primary bibliographic entry see Field 5D.
7-09392

ANURE HARVESTING PRACTICES: EFCTS ON WASTE CHARACTERISTICS AND NOFF,
lorado State Univ., Fort Collins.
primary bibliographic entry see Field 5D.
7-09396

IMAL WASTE MANAGEMENT IN THE RTHERN GREAT PLAINS,
uth Dakota State Univ., Brookings. Water ources Research Inst.
primary bibliographic entry see Field 5D.
7-09399

E EFFECTS OF THERMAL DISCHARGE D ARTIFICIAL AERATION ON STREAM TER QUALITY,
nsas State Univ., Manhattan. Inst. for Systems ign and Optimization.
. Lin, L. T. Fan, and C. L. Hwang.
RRI Contribution No 124. Reprint of a paper sented at the 5th International Heat Transfer ference September 3 - September 7, 1974, yo, Japan. p 134-138. 5 fig, 21 ref. OWRT B-KAN(9). 14-31-0001-3592.

Descriptors: *Water quality control, Dissolved oxygen, Thermal pollution, *Aeration, Water pollution control, Biochemical oxygen demand, Model studies.
Identifiers: *Thermal discharge, *Artificial aeration, *Stream water quality, *Transient plug-flow model, *Computer simulation and optimization, Power generating plant, Organic waste discharge, Modified Streeter-Phelps equations.

The purpose is to investigate (1) the effect of thermal discharge from power generating plants on stream water quality, and (2) the installation of artificial aerators for water quality control of a stream which receives thermal and organic waste discharges by means of computer simulation and optimization. An energy balance equation is formulated to describe the temperature distribution along the stream which receives thermal discharge. The equation is based on heat transfer mechanisms which include short-wave and long-wave radiation, evaporation, and convective heat transfer. The water quality of a stream, as characterized by variations of DO and BOD concentrations, is represented by modified Streeter-Phelps equations. The temperature dependency of BOD removal coefficient, saturation DO concentrations, time-smoothed photosynthesis minus respiration, and natural reaeration coefficient is considered.
W77-09407

INDUSTRIAL EFFLUENT SURCHARGING: A CASE STUDY OF KITCHENER, ONTARIO,
Toronto Univ. (Ontario). Dept. of Geography.
H. Garai.
Journal Water Pollution Control Federation, Vol 49, No 4, p 539-548, April, 1977. 3 fig, 7 tab, 9 ref.

Descriptors: *Water quality standards, *Water rates, Waste treatment, *Industrial wastes, Discharge(Water), Foods, Water policy, Regulation, Treatment facilities, Suspended solids, Biochemical oxygen demand, Waste water treatment, Costs, *Pollution taxes(Charges).
Identifiers: Meat packing industry, Food processing industry.

The effect of surcharging on the reduction of industrial effluent discharges to the Kitchener, Ontario, waste water treatment plant was investigated. The city has introduced a surcharge for waste discharges with more than 350 mg/liter of suspended solids and 30 mg/liter of BOD. This was based on the amount of discharge and the costs of its treatment. The meat packing and food processing industries produced most of the treatment plant's organic loading. An example of the meat packing plant showed that these charges had little effect. A primary in-plant treatment system had been in operation for several years. During the 1972-73 period, operating costs for the pollution control equipment were $50,000. Another $10,000 was paid as surcharge. Without the equipment, charges would be $110-120,000. Variable costs of pollution control were 0.27% of total annual variable costs. Pollution control capital investment was 2% of the total plant investment. The surcharge was a minute portion of plant costs and has not been an incentive to further effluent improvements. Data collected for all industries indicated that there was no relationship between the surcharge and effluent quantity or quality. BOD and suspended solids values could be reduced below surcharge levels by increasing effluent volumes. The use of clean cooling water to dilute effluents was prohibited by water costs and a sewer rebate scheme. Several questions of cost equity between industrial plants were considered. A new charging scheme which was not considered negative to the goals of discharge reduction was developed. (Collins-FIRL)
W77-09413

ECONOMIC IMPACT OF EPA'S REGULATIONS ON THE PETROLEUM REFINING INDUSTRY. VOLUME 1. EXECUTIVE SUMMARY,
Sobotka and Co., Inc., Stamford, Conn.
D. Hart, S. Sobotka, and W. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 759, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-230/3-76-004-1, April 1976. 37 p. 1 fig.

Descriptors: *Pollution abatement, *Oil industry, *Air pollution, *Water quality standards, *Economic impact, Regulation, Prices, Annual costs, Investment, Economics, Capital mobility, Analysis.
Identifiers: *Oil refining industry.

Petroleum industry physical plant expansions in the U.S. petroleum refining industry brought about by EPA regulations on air emissions, water effluent standards and product quality (lead in gasoline and residual fuel oil desulfurization) during the nine-year period 1974-1983 will require capital investments of 1.1 billion dollars to meet these standards. Annual costs, including capital charges, will be about 0.5 billion dollars, all of which will be recovered by price increases averaging about one cent per gallon of product manufactured. This same study, which undertook to project the economic impact of new EPA regulations, forecasts that refinery capacity that existed in 1973 will be required to invest 4.8 billion dollars to meet the regulations. Annual cost to these plants will increase by about 1.4 billion dollars. However, price change associated with the EPA regulations for refinery expansion will, by 1983, increase the sales revenue of existing-in-1973 capacity by 2.0 billion dollars. This net improvement in cash flow reflects the large investment to meet EPA's regulations already made in existing refineries, most of which is not now being recovered. (See also W77-09452 and W77-09453) (Harris-Wisconsin).
W77-09451

ECONOMIC IMPACT OF EPA'S REGULATIONS ON THE PET. REFINING IND. VOL. 2, PTS 1 AND 2. IND. DESCRIPTION AND TECH. ANALYSIS,
Sobotka and Co., Inc., Stamford, Conn.
D. Hart, S. Sobotka, and W. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 760, Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA-230/3-76-004-2, April 1976. 193 p. 7 fig., 40 tab., 64 ref., 1 append. EPA 68-01-2830.

Descriptors: *Pollution abatement, *Oil industry, *Air pollution, *Water quality standards, *Economic impact, Regulation, Prices, Annual costs, Investment, Capital mobility, Demand, Supply, Technology, Competitive prices.
Identifiers: *Oil refining industry.

The economic impacts on the U.S. petroleum industry brought about by EPA regulations on air emissions, water effluent standards and product quality (lead in gasoline and residual fuel oil desulfurization) during the nine-year period 1974-1983 will be slight. This study finding is posited on the assumptions that (1) price controls will lapse according to the currently-legislated schedule and that (2) consistent with current policy, continured tariff protection adequate to insure the growth of petroleum product consumption will be furnished to domestic refineries. In this description and technical analysis section of a three-volume study, petroleum industry demand and supply factors are analyzed, with details given for products, the market and distributing system, government influences on the market, industry operations, financial structures and trends, refinery technology and technological trends, industry utilization rates, and competition. An executive summary of the study and an economic impact analysis are treated in separate volumes. (See also W77-04451 and W77-09453) (Harris-Wisconsin).
W77-09452

ECONOMIC IMPACT OF EPA'S REGULATIONS ON THE PETROLEUM REFINING INDUSTRY. VOL. 3, PT. 3. ECONOMIC IMPACT ANALYSIS,
Sobotka and Co., Inc., Stamford, Conn.
D. Hart, S. Sobotka, and W. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 761, Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA-230/3-76-004-3, April 1976. 207 p. 43 tab., 3 append. EPA 68-01-1830.

Descriptors: *Oil industry, *Pollution abatement, *Air pollution, *Water quality standards, *Economic impact, Regulation, Prices, Annual costs, Investment, Capital mobility, Model studies, Simulation analysis, Forecasting, Economic justification, Effluents.
Identifiers: *Oil refining industry, Economic sensitivity analysis.

Only slight economic impacts to the U.S. petroleum industry will be brought about by EPA regulations on air emissions, water effluent standards and product quality (lead in gasoline and residual fuel oil desulfurization) during the nine-year period from 1974-1983; but this finding assumes that price controls will lapse according to the currently-legislated schedule and that, consistent with current policy, continued tariff protection adequate to insure growth of petroleum product consumption will be furnished to domestic refineries. In this economic impact analysis section of a three-volume study, methodology and data are given for five subtopics; (1) price effects of EPA regulations (including description of alternative models for application of regulations and non-application); (2) impact on sales and output of refineries; (3) aggregate industry impacts; (4) differential impacts due to refinery size and configuration; and (5) sensitivity analyses. An executive summary of the study and an industrial description and technical analysis are treated in the first two volumes. (See also W77-09451 and W77-09452) (Harris-Wisconsin).
W77-09453

ENVIRONMENTAL CHANGES IN LAKE ERIE AND THEIR FUTURE IMPACT ON LAKE RESOURCES.
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-09454

RESTORING THE WILLAMETTE RIVER: COSTS AND IMPACTS OF WATER QUALITY CONTROL,
Oregon State Univ., Corvallis.
E. S. Huff, P. C. Klingeman, H. H. Stoevener, and H. F. Horton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 907, Price codes: A08 in paper copy, A01 in microfiche. Socioeconomic Environmental Studies Series EPA-600/5-76-005, September 1976. 174 p. 24 fig., 27 tab., 97 ref., 3 append. 1BA030, EPA 68-01-2671.

Descriptors: *Rivers, *Water pollution treatment, *Water quality control, *Waste water treatment, *Flow augmentation, *Electric power costs, *Oregon, Input-output analysis, Construction costs, Operating costs, Fisheries, Economic impact, Social impact, Recreation, Cost-benefit analysis, Chlorination, Intangible costs, Wildlife, Associated costs.
Identifiers: *River restoration, *Willamette River(Ore).

How Oregon's heavily-polluted Willamette River has been almost totally rehabilitated by flow augmentation and point source waste water treatment is described and documented, with emphasis on the energy costs of the pollution control. Each pollution control strategy employed during the preceeding four decades and the contribution of each technology is documented, giving total and annual costs of construction and operation and maintenance and the total energy consumed by all facilities, including energy costs of constructing and operating dams as well as treatment facilities and control devices. Data are given for construction and operation of municipal collection and treatment systems, industrial waste water treatment facilities, and reservoirs. Input-output econometrics and a meteology for converting dollar costs to direct and total energy requirements were used to deal with construction and operating and maintenance costs. Energy needs for operating water quality control facilities are about 1/10th of 1% of total basin energy utilization; however, substantial energy savings are possible. The history and present status of the fisheries and wildlife of the basin are reviewed in relation to the enhanced water quality of the river. The potential biologic, economic and social impacts of the program are presented along with related adverse effects attributed to the techniques employed in the water quality improvement. (Auen-Wisconsin).
W77-09455

ENVIRONMENTAL POLICY-MAKING IN THE USSR: THE ROLE OF INDUSTRIAL AND ENVIRONMENTAL INTEREST GROUPS,
Mississippi State Univ., State College.
For primary bibliographic entry see Field 6E.
W77-09456

THE ECONOMIC IMPACT OF ENVIRONMENTAL PROGRAMS.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-09457

POTENTIAL ENVIRONMENTAL IMPACTS FROM THE PRODUCTION OF SYNTHETIC FUELS FROM COAL.
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 5B.
W77-09458

ENVIRONMENTAL IMPACTS FROM OFFSHORE EXPLORATION AND PRODUCTION OF OIL AND GAS.
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 6G.
W77-09460

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE FEDERAL REPUBLIC OF GERMANY.
Organisation for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 6E.
W77-09461

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN CANADA.
Organisation for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 6E.
W77-09462

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN FRANCE.
Organisation for Economic Co-Operation and Development Paris (France).
For primary bibliographic entry see Field 6E.
W77-09463

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE NETHERLANDS.
Organisation for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 6E.
W77-09464

TECHNICAL AND MICROECONOMIC ANALYSIS: ARSENIC AND ITS COMPOUNDS,
Versar, Inc., Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-09465

ECONOMIC ASSESSMENT OF PROPOSED TOXIC POLLUTANT EFFLUENT STANDARDS FOR MANUFACTURERS AND FORMULATORS OF ALDRIN/DIELDRIN, DDT, ENDRIN AND TOXAPHENE.
Little (Arthur D.), Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 67[illegible] Price codes: A04 in paper copy, A01 in microfich[illegible] Report No. EPA-230/3-76-016, May 1976. 65 p. [illegible] tab., 3 append. EPA 68-01-1902.

Descriptors: *Economic impact, *Water pollution control, *Pollution abatement, Abatement, *Pesticides, Aldrin, Dieldrin, DDT, Endrin, Federal Water Pollution Control Act, Effluent Standards, Chemical industry, Waste water treatment.
Identifiers: Toxaphene.

Effluent standards for aldrin/dieldrin, DDT, e[illegible] drin and toxaphene proposed under Section 307(of the Federal Water Pollution Control A[illegible] Amendments of 1972 are not expected to crea[illegible] significant adverse economic impacts on price[illegible] sales, profitability, employment or the end u[illegible] markets for these pesticides. In aggregate, co[illegible] pliance would require additional investment [illegible] treatment facilities of $800,000-$1 million with a[illegible] nualized total costs of $500,000-700,000. The [illegible] pact on prices will be potential increases of [illegible] greater than 2.3%. Separate data and analyses [illegible] provided for pesticide manufacturers and formu[illegible] tors. For the manufacturers, the economic conc[illegible] sions were reached following an examination [illegible] the additional cost of compliance, together wit[illegible] general assessment of the supply, demand, a[illegible] pricing for the products and business condition[illegible] the respective firms. For the formulators of [illegible] pesticides, the conclusions were based on a sur[illegible] of 16 companies operating 32 of the 145 pla[illegible] which currently formulate these chemicals. T[illegible] assessment includes descriptions of firms, pla[illegible] and markets for the pesticides, investment [illegible] operating costs for the abatement technologies [illegible] evaluation of pricing for these products and pot[illegible] tial adverse impacts. (Harris-Wisconsin).
W77-09478

METHODOLOGY FOR ASSESSING ENVIRONMENTAL IMPLICATIONS AND TECHNOLOGIES: NONFERROUS METALS INDUSTRIES
Battelle-Columbus Labs., Columbus, Ohio.
E. S. Bartlett, and R. A. Wood.
Available from the National Technical Infor[illegible] tion Service, Springfield, VA 22161 as PB-265 [illegible] Price codes: A05 in paper copy, A01 in microfi[illegible] Environmental Protection Technology Se[illegible] EPA-600/2-76-303, December 1976. 97 p. 1 fi[illegible] tab., 2 append. 54, EPA 68-02-1323.

Descriptors: *Environmental effe[illegible] *Methodology, *Industries, *Pollutant abatem[illegible] Information retrieval, Information excha[illegible] Bibliographies, Reviews, Publications, Me[illegible] Technology.
Identifiers: *Nonferrous metals indus[illegible] *Information transfer, Current awareness, I[illegible] mation needs, Technology assessment, Indus[illegible] pollution control.

lternative philosophies and methodologies for information collection, analysis, and presentation ere considered, and based upon this review, a ystem was designed for maintaining current vareness and assessing the environmental impli-tions arising from the technology of the nonfer-us metals industry. It is concluded that the basic ements of a preferred methodology to serve the vareness requirements of EPA were: (1) location d input of significant information, (2) selective lling, review, and analysis of input information, d (3) preparation and output of a periodic report the information in the form of an awareness bul-in. Input information was to be obtained from 60 rtinent periodicals, technical conferences, and gnizant government and industry specialists. In-rmation selection, preview, analysis, and output eration were to be conducted by senior chnologist with familiarity with both the industry d information systems operations. Subject tax-omy should be developed in an interactive, olutionary fashion to continuously serve EPA eds. Awareness bulletin output should be brief t comprehensive and be amenable to a continu-s filing system. In-depth topical reports and quiry answering services were not considered cessary to the basic task. It was estimated that e outlined program could be accomplished with annual funding of approximately one technical an-year of effort. (Luedtke-Wisconsin).
77-09479

CSOURCES ALLOCATION TO OPTIMIZE NING POLLUTION CONTROL,
io State Univ. Research Foundation, Colum-s.
S. Shumate, E. E. Smith, V. T. Ricca, and G. Clark.
ailable from the National Technical Informa-n Service as PB-264 185, Price codes: A21 in per copy, A01 in microfiche. Environmental otection Technology Series EPA-600/2-76-112, vember 1976. 492 p, 71 fig, 40 tab, 67 ref, 4 ap-nd. 68-01-0724.

scriptors: *Mine drainage, *Mine acids, ollution abatement, *Model studies, Acid mine ter, Coal mines, Strip mines, Mine wastes, Strip ne wastes, Water quality control, Optimization, cision making, Watersheds(Basins), Computer dels, Water pollution treatment, Efficiencies, source allocation, Costs.
ntifiers: Deep mines.

comprehensive simulation model for mine inage and optimal resource allocation to control e acid pollution in a watershed is described. e overall model is quite detailed, encompassing ydrologic model, an acid generation model, two lutant source models--the deep mine source and combined refuse pile-strip mine source, a basin del, a cost-effectiveness model, and basin op-zation models. Emphasis is on the develop-nt of the source models and the optimization dels. The source models provide a means of cribing and predicting the complex time-depen-t acid production phenomena which occur in ing environments. The optimization models, zing flow and load data and appropriate cost rmation, provide a cost optimization algorithm able of determining the least-cost set of pollu-control decisions for an array of acid sources, the option of either drainage treatment or tement at each acid source with a specific er quality standard. In addition, it can deter-e the distribution of pollution control decisions r the total array of acid sources which will lt in the most desirable water quality obtaina-within a set dollar limit. The model has not yet n fully tested or compared to real systems. edtke-Wisconsin)
7-09481

AL AND HYPOLIMNETIC AERATION OF ES IN WISCONSIN,
consin Dept. of Natural Resources, Madison.
. Wirth, D. R. Knauer, and S. A. Smith.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p 1960-1970, 1975. 8 fig, 7 ref.

Descriptors: *Oxygenation, *Hypolimnion, Equipment, *Aeration, *Wisconsin, Air entrainment, Destratification, Density, Seasonal, Oxygen demand.
Identifiers: *Lake rehabilitation, *Mirror Lake(Wis), *Larson Lake(Wis), *Silver Lake(Wis), *Aerators.

A 'Helixor' Hypolimnion aerator was used to eliminate anoxic conditions by means of reoxygenation in three Wisconsin lakes. The main component of the unit is a polyethylene tube with an internal longitudinal plate dividing the tube in half in the form of a helix. Its application and efficiency in hypolimnetic aeration of Silver and Larson Lakes, and hypolimnetic and total aeration of Mirror Lake, during summer, fall and winter are discussed. In lakes that do not mix thoroughly or long enough to satisfy oxygen demands, total compressed air mixing in spring and fall was an easy means of providing the maximum quantity of dissolved oxygen available to withstand oxygen demands during summer and winter periods of stagnation. Hypolimnetic aeration without destratification was feasible during summer stratification. During winter, density gradients are small, so that destratification of most of the water column is certain. Enriching compressed air with pure oxygen provided better flow of water and oxygen transfer than using either alone. Almost all of the oxygen transfer took place in the lower half of the 12.2 m 'Helixor' component of the aerator. (Auen-Wisconsin)
W77-09495

NEW MEDIUM FOR ISOLATING IRON-OXIDIZING AND HETEROTROPHIC ACIDOPHILIC BACTERIA FROM ACID MINE DRAINAGE,
Environmental Monitoring and Support Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5B.
W77-09511

LAKE DRAWDOWN AS A METHOD OF IMPROVING WATER QUALITY,
Florida Univ., Gainesville.
J. L. Fox, P. L. Brezonk, and M. A. Keirn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 909, Price codes: A02 in paper copy, A01 in microfiche. Ecological Research Series EPA-600/3-77-005, January 1977. 103 p. 38 fig., 20 tab., 36 ref., 1 append. EPA R-800305.

Descriptors: *Drawdown, Laboratory tests, Feasibility, Eutrophication, *Lakes, Lake sediments, Bottom sediments, Nutrients, Turbidity, Dissolved oxygen, Temperature, Muck soils, Chara, Cattails, *Florida.
Identifiers: *Lake restoration, *Lake Apopka(Fla), Sediment drying, Macrophytes.

Results of pilot scale investigations to determine if radical drawdown at Lake Apopka, Florida, would effectively restore the lake by reducing algal blooms and increasing the population of desirable macrophytes are described. Sediments were dredged from the lake bottom, placed in aquaria, columns, tanks, and pools, dewatered and dried over varying periods, and then refilled. Monitoring of a large number of physical, chemical, and biological parameters before, during, and after sediment drying revealed that drawdown improved subsequent refill water quality. In the muck sediments at Lake Apopka, drying caused significant water loss and shrinkage with minimal loss of organic material. During and following refill, the sediment was colonized by two macrophytes, Typha and Chara. Only minor chemical changes occurred in the muck sediments. Refill water in the pool test simulations had the same or lower nutrient content, lower turbidity, higher dissolved oxygen, lower temperature, fewer algae, and a more diverse benthic invertebrate population. Based on these laboratory scale investigations, it was concluded that drawdown would be an effective restoration technique for Lake Apopka, but that drawdown was not a cure-all by itself and should be coupled with other measures such as the removal of dried muck from shore areas. (Luedtke-Wisconsin).
W77-09516

THE USE OF WETLANDS AS NUTRIENT REMOVAL SYSTEMS,
Virginia Inst. of Marine Science, Gloucester Point.
M. E. Bender, and D. L. Correll.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 002, Price codes: A02 in paper copy, A01 in microfiche. Report No NSF-RA-E-74-033, June 1974. (Chesapeake Research Consortium Report No 29). 14 p, 4 fig, 1 tab, 3 ref. GI-38973.

Descriptors: *Wetlands, *Nutrient removal, *Marshes, Nitrogen compounds, Phosphorus compounds, Salt marshes, Tidal marshes, *Chesapeake Bay, Cycling nutrients, Nutrients, Sewage treatment.

Two different methodologies were used to investigate the effectiveness of marshes as nutrient removal systems in Chesapeake Bay. The first method employed fertilization or loading experiments in combination with tracers, while the second measured natural flux at two undisturbed study sites. Results showed that regularly flooded tidal marshes should not be considered as sinks for nitrogen or phosphorus forms. Although incoming particulate nitrogen was transformed in the marsh and exported to the estuary as ammonia and dissolved organic nitrogen, there was little, if any, net loss of available nitrogen or phosphorus in the marsh. The highest exports of dissolved inorganic phosphorus and ammonia occurred during the summer. High irregularly flooded salt meadow hay (Spartina patens) marshes appear to have some capacity for phosphorus removal. However, it was estimated that a loading of 29,000 gallons of secondary sewage per day would saturate the capacity of an acre of high marsh in 45 days, and once loaded to the capacity the acre could not be expected to be reused for many years. It is concluded that utilization of marshes of any type as nutrient removal systems is highly questionable. (Luedtke-Wisconsin)
W77-09520

COLORADO RIVER WATER QUALITY IMPROVEMENT PROGRAM (FINAL ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Washington, D.C.
FES 77-15, May 19, 1977, 2 vols. Volume I: Statement and Appendices; Vol II: Public Comment.

Descriptors: *Desalination, *Saline water, *Colorado River Basin, *Water management(Applied), Groundwater, Subsurface waters, Water quality, Rivers, Colorado River, Interstate rivers, Water utilization, Water resources, Water supply, Water supply development, Irrigation, Water distribution(Applied), Agriculture, Colorado, Salinity.
Identifiers: *Environmental impact statement, Colorado River Basin Salinity Control Act.

The Colorado River Basin Salinity Control Act of 1974 provides for the construction and operation of facilities in the Colorado River Basin to control the salinity of the water. The final Environmental Impact Statement (EIS) for the project discusses the effects of the project as proposed and also the effects of alternatives such as retiring the irrigated land or declaring a moratorium on future water resources development in the area. A two-volume document serves as the environmental statement for all authorized and proposed salinity control works in the Colorado River Basin, and specifically for two units pending construction at the time

of the statement. The major beneficial effect of the full program would be the removal of an estimated 1,589,000 tons of salt from the river system each year, resulting in improved water quality for over 1,000,000 acres of farmland and over 17,000,000 people. The adverse effects would include increased use of energy resources, a water loss from the river system affecting approximately 8500 acres of range lands, and some vegative biological and aesthetic impacts at the project sites proper. (Sloan-Florida)
W77-09527

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN.
Environmental Protection Agency, Washington, D.C. Water Quality Office.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 311, Price codes: A13 in paper copy, A01 in microfiche. Proceedings of Conference, Third Session, March 24-25, 1971, Chicago, Illinois, March 1971, 266 p.

Descriptors: *Lake Michigan, *Thermal pollution, *Water quality standards, Water pollution, Heated water, Governmental interrelations, Nuclear power plants, Water pollution control, Thermal power plants, Water pollution sources, Water temperature, Electric powerplants, Power plants, Michigan, Wisconsin, Illinois, Indiana, Administrative agencies, Water quality, Water pollution.
Identifiers: *Environmental Protection Agency(EPA), *National Environmental Policy Act, Waste heat, Once-through cooling, Heat discharges.

The Administrator of the Environmental Protection Agency (EPA) is authorized to call a conference when requested by the governor of a state and when there is reason to believe that pollution subject to abatement under the National Environmental Policy Act (NEPA) is occurring. Such a conference was held for the purpose of discussing pollution in Lake Michigan; this document is the verbatim transcript of the proceedings of the reconvened third session of the conference. The primary topic was the problem of heat discharges and consequent thermal pollution in the Great Lakes. Twenty-six electric power generating facilities use Lake Michigan waters for cooling, and other industrial and municipal sources contribute heat discharge into the lake. The biological effects of this thermal discharge are discussed, as are possible solutions to the problem. Participants to the conference were representatives of federal, state and local environmental agencies; members of Congress; and representatives of conservation groups and concerned industries. (Sloan-Florida)
W77-09528

POLLUTION OF THE INTERSTATE AND INTRASTATE WATERS OF THE UPPER MISSISSIPPI RIVER AND ITS TRIBUTARIES.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 694, Price codes: A15 in paper copy, A01 in microfiche. Proceedings of the Federal Water Pollution Control Administration, February 28, March 1 and 20, 1967. Minneapolis, Minnesota. 313 p, 6 fig.

Descriptors: *Mississippi River Basin, *Minnesota, *Wisconsin, *Waste water treatment, Rivers, Interstate rivers, River systems, Mississippi River, Tributaries, Bodies of water, Water pollution sources, Water pollution control, Abatement, Lake Superior, Abatement, Lake Superior, State government, Governmental interrelations, Watershed management.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Point sources, Non-point sources, Pre-treatment standards.

When there is reason to believe that pollution of interstate water is occurring, the Federal Water Pollution Control Act (FWPCA) provides that the Secretary of the Interior may call a federal-state enforcement conference upon the request of the governor of any state. At the request of the governors of Minnesota and Wisconsin, such a conference was held in two sessions, the first in 1964 and second in 1967. The result of the first session was a recommendation that an intensive survey of the Mississippi River be undertaken by state and federal agencies. The purpose of the second session was to evaluate the survey and recommend a program for abatement of the numerous kinds of pollution which the survey had revealed. Classifications and standards for industrial and muncipal waste water treatment were discussed, as well as methods for enforcing the standards. The conference report consists of the statements of Governor Knowles of Wisconsin, Senator Nelson of Wisconsin, two officials of the Federal Water Pollution Control Administration, and one official of the Minnesota Water Pollution Control Commission. (Sloan-Florida)
W77-09529

FEDERALISM AND THE DEVELOPMENT OF OUTER CONTINENTAL SHELF MINERAL RESOURCES,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 6E.
W77-09531

SECTION 1424(E) OF THE SAFE WATER DRINKING ACT: AN EFFECTIVE MEASURE AGAINST GROUNDWATER POLLUTION,
J. B. Hemphill.
Environmental Law Reporter, Vol 6, p 50121-27, 1976.

Descriptors: *Surface-groundwater relationships, *Aquifer management, *Groundwater resources, Federal Water Pollution Control Act, Aquifers, Groundwater, Water quality, Groundwater recharge, Water sources, Water supply, Potable water, Water pollution, Aquifer characteristics, Water management(Applied), Grants, Government finance, Legislation, Projects, Water law, Water quality standards.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Environmental impact statement, *Groundwater management, *Safe Water Drinking Act.

Groundwater aquifers, an important source of drinking water, received partial regulatory protection under section 1424(e) of the Safe Water Drinking Act. This section enables the Administrator of the Environmental Protection Agency (EPA) upon his own initiative, or upon petition, to make a preliminary determination that an aquifer is in need of protection from contamination. To qualify for this determination it must be shown that an aquifer is the principal drinking water source for the area, and that contamination of the aquifer would create a significant hazard to public health. After preliminary determination has been made, the Administrator must publish it in the Federal Register. After publication, the Administrator may block federal funding commitments to any projects which would contaminate the aquifer. Although section 1424(e) provides the EPA with the tools for protecting some underground water supplies, a significant number of groundwater aquifers are outside of its protective scope because of the sole or principal drinking water source limitation. Another problem is that 1424(e) provides no time requirement for corrective action. In addition, 1424(e) is directed only to sole source aquifers threatened by contamination from federally funded projects. (Petruff-Florida)
W77-09536

ANALYTIC VARIABILITY: IMPLICATIONS FOR PERMIT COMPLIANCE,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 48, No 7, p 1876-80, August 1976.

Descriptors: *Federal Water Pollution Control Act, *Permits, *Analytical techniques, *Water pollution sources, Analysis, Water pollution, Effluents, Flow, Variability, Pollutants, Legal aspects, Legislation, Methodology, Water quality, Biochemical oxygen demand, Oil, Phenols, Chemical oxygen demand, Discharge measurement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *National Pollutant Discharge Elimination System, Analytic precision, Grease, Parameters, Effluent flow.

The attainment of accurate measurements of flow and concentration of the effluent stream is becoming increasingly important as the July 1, 1977 deadline approaches. These measurements are used in determining compliance with the National Pollutant Discharge Elimination System (NPDES) permit program. When issuing permits, parameters such as biochemical oxygen demand (BOD), chemical oxygen demand (COD), phenolic compounds, and oil and grease are commonly used despite the fact that difficulties exist with their analytic precision. The most commonly encountered limitation of the BOD test involves the acclimation of the biological seed. An insufficient acclimation period results in a low estimate of the oxygen demand. In the COD test the precision of the analysis is affected by the types of organic compounds present. Phenolics are measured by the use of the extraction or the direct photometric technique. A graph shows the variability of the two methods. With oil and grease the impediment to accurate measurement is a result of the difficulty of obtaining a representative sample. The measurement of these parameters is also affected by the effluent flow. In determining compliance with NPDES standards, it is apparent that analytical variability must be taken into account. (Petruff-Florida)
W77-09538

NEW OPPORTUNITIES FOR STATE PARTICIPATION IN THE CONTROL OF RADIOACTIVE POLLUTION,
J. R. Fabrizio.
Chicago-Kent Law Review, Vol 52, No 1, p 15-68, 1975.

Descriptors: *Water pollution control, *Radioactive wastes, *Nuclear wastes, *Federal Water Pollution Control Act, Federal jurisdiction, Nuclear energy, Nuclear power plants, State jurisdiction, Legislation, Waste disposal, Legal aspects, State governments, Standards, Pollution abatement, Environmental control.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

State governments have expressed a strong desire to regulate the environmental aspects of atomic energy production, but have been prevented from assuming any role by the belief that the Atomic Energy Act of 1954 pre-empted the states' power in this area. Even though Congress has the power to preclude the states from exercising any control over atomic waste disposal, it has never expressly done so; rather, the courts have imputed this intent to Congress. The author reviews two developments which may open the door to state regulation. The first is the passage of the 1972 Amendments to the Federal Water Pollution Control Act (FWPCA), which seemingly takes from the Atomic Energy Commission (AEC) and gives to the Environmental Protection Agency (EPA) the responsibility for control of certain radioactive materials; also under the FWPCA, the states are expressly authorized to impose stricter performance standards than the EPA. The second development is the court decision upholding the interpretation that the FWPCA conferred jurisdiction on the EPA to regulate the discharge of radioactive waste materials into navigable waters. The author concludes that there is a small possibility that the states may be allowed to play a role in atomic energy pollution control, but their

ill depend upon further court and Congressional
ction. (JoneseFlorida)
77-09539

ETROLEUM LEGISLATION IN THE NORTH
EA COUNTRIES,
or primary bibliographic entry see Field 6E.
77-09542

LEAN AIR EQUALS DIRTY WATER,
os Angeles Dept. of Public Works, Calif.
C. Fillman, and R. S. Horii.
urnal of the Environmental Engineering Divi-
on (ASCE), Vol 101, No 1, p 87-90 (February
75). 2 ref.

escriptors: *Sewage treatment, *Waste water
eatment, *Projects, *Growth rates, *Air pollu-
n, Project planning, Air environment, Water
llution sources, Water pollution, Sewage, Waste
ter(Pollution), Water pollution control, Trans-
rtation, Land use, Zoning, Systems analysis,
wers, Environmental effects, Administrative
cisions.
entifiers: Emissions controls.

rrent Clean Water Grant practices may threaten
environment rather than aid it. There is great
ncern over the sizing of waste treatment facili-
s based upon the rationalization that this leads
growth, which in turn leads to new sources of
pollution. The Environmental Protection Agen-
requires all states to review air pollution effects
new development with the rationale that
velopment means more traffic and growth
ich in turn creates more smog. The solution of
ne air resource controls has been to delay or ac-
lly deny funds for water pollution projects in
er to slow down growth. Growth should be con-
led by proper zoning and land use, not by deny-
additional sewer capacity. The deprivation of
blic services creates a threat to the environment
ause of a lack of waste treatment facilities. The
mate responsibility for wastewater facilities
with the designer, constructor and plant opera-
and not the disperser of funds. The situation
s for a systems-integrated approach rather than
gular bureaucratic pursuits. A balancing of
nsportation controls, emissions controls and
tewater treatment facilities can result in clean
er as well as clean air. (Rieck-Florida)
7-09544

TER POLLUTION CONTROL FEDERA-
N SPEAKERS ZERO IN ON POLLUTION
NTROL LAW,
V. Heckroth.
er and Waste Engineering, Vol 10, No 12, p
5 (December 1973).

criptors: *Evaluation, *Federal Water Pollu-
Control Act, *Water Pollution Control
eration, *Financial feasibility, *Economic
ibility, Industries, Economic impact, Water
Regulation, Economics, Feasibility, Financ-
Organizations, Water pollution control,
slation, Control, Abatement, Grants, Ad-
strative decisions, Administrative agencies.
tifiers: *Federal Water Pollution Control Act
ndments of 1972, *Administrative regula-
.

keynote speaker of the 1973 Water Pollution
rol Federation (WPCF) Conference urged the
ration to get involved in national policy mak-
y offering plausible and constructive amend-
s to expedite water pollution control. He at-
d the economic impraticality of zero
arge, and the potential harm to air and land
h this standard implies. He praised the
anisms for defining best practicable control
ology, but urged the Environmental Protec-
Agency (EPA) to remain flexible. Lack of
ate financing was named as a critical view of
ederal imperatives characterizing the missed
deadlines, unrealistic assumptions, poor talent, overwhelming demands, continual adjustments and administrative mishandling as chaotic. He speculated that the EPA will be forced to rely on flexible standards to meet realities and that municipalities and industries will increasingly seek judicial interpretation of administrative decisions to further delaying compliance. Russell Train, EPA Administrator abstained from coming to the law's defense, and urged states to assume authority for issuance of wastewater discharge permits. Ralph Luken of the EPA outlined the Environmental Financing Authority and its power to purchase local bonds which finance the non-federal costs of waste treatment project construction. (Moorhouse-Florida)
W77-09546

REPORT TO CONGRESS ON ABNORMAL OCCURRENCES: JULY-SEPTEMBER 1975.
Nuclear Regulatory Commission, Washington, D. C.
For primary bibliographic entry see Field 6E.
W77-09549

BENEFIT-COST ANALYSIS: ITS USE (MISUSE) IN EVALUATING WATER RESOURCE PROJECTS,
For primary bibliographic entry see Field 6B.
W77-09550

WHAT ARE WE DOING ABOUT OIL SPILL,
M. P. Wilson, Jr.
Maritimes, Vol 20, No 3, p 7-9 (August 1976). 1 photo.

Descriptors: *Oil pollution, *Oil spills, *Cleaning, *Environmental effects, *Dispersion, Water pollution, Drilling, Exploration, Damages, Oily water, Energy, Pipelines, Beaches, Oil wastes, Planning, Research and development, Barriers, Navigable waters, Marshes, Intertidal areas, Water quality control.
Identifiers: *Environmental response team, *National Oil Spill Contingency Plan.

On May 26, 1967, President Johnson directed the Department of the Interior and the Department of Transportation to mobilize the resources of this nation against the pollution of water by spills of oil, or other hazardous substances. At that time, the United States was committed primarily to containment and mechanical clean-up devices. Today the United States leads the world not only in the capability of the various devices, but also in the number of devices situated at various strategic locations throughout the country. Under the National Oil Spill Contingency Plan the parties responsible for an oil spill are also resonsible for cleaning it up, with the Coast Guard functioning as a standby in the event that the responsible party does not take appropriate steps. When an oil spill occurs in water, the first reaction is to contain the spill by barriers or oil booms. Once the spill is contained, mechanical skimmers or adsorbents, are used to clean up the contained oil. Experience with the use of dispersants on beaches has not been favorable for many reasons. Other methods of treating oil spills such as agents that sink the oil, burn it or biologically degrade it, have been raher ineffective to date. In spite of these efforts, oil spills continue to affect beaches, the intertidal zone, and marshes. There is a long way to go in the area of preventing spills, and find new techniques to mitigate the damage. (Martin-Florida)
W77-09553

EFFLUENT STANDARDS: TRIALS AND TRIBULATIONS,
J. T. Sliter.
Journal Water Pollution Control Federation, Vol. 46, No. 2, p. 232-236, February, 1974.

Descriptors: *Federal Water Pollution Control Act, *Administrative decisions, *Regulation, *Administrative agencies, *Waste water, Waste treatment, Waste water(Pollution), Water pollution control, Water pollution sources, Water quality, Water quality standards, Federal government, Pollution abatement.
Identifiers: *FWPCA Amendments of 1972, *Administrative regulations, *Effluent limitations.

The Environmental Protection Agency (EPA) and the Effluent Standards and Water Quality Information Advisory Committee have attempted to develop standards to regulate the type and amount of pollutants that industries will be allowed to discharge into waterways under the 1972 Federal Water Pollution Control Act Amendments. The Committee was established under the Act to provide assistance to EPA but has been involved in several policy clashes with EPA concerning the standards' developmental stage. EPA's strategy entailed development of an industry standard which all plants in that industry would have to meet, while the Committee developed an alternative approach based on a mathematical model involving four variables. Difficulties between EPA and the Committee stem from a difference of opinion concerning the Committee's role. Probably all he standards are not based upon use of model but optimism is expressed for future development of workable effluent standards. (Welch-Florida)
W77-09554

THE NEED FOR A NATIONAL OCEAN PROGRAM AND PLAN.
For primary bibliographic entry see Field 6E.
W77-09555

EFFLUENT GUIDELINES AND STANDARDS, PULP, PAPER AND PAPERBOARD POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 42, No 4, p 1398-1426, January 6, 1977.

Descriptors: *Federal Water Pollution Control Act, *Pulp and paper industry, *Waste water treatment, *Water quality standards, *Regulation, Standards, Administrative agencies, Federal government, Industrial wastes, Toxicity, Effluents, Costs, Economic impact, Water quality control, Pollutants, Pollution, Pulp wastes, Wood wastes, Paper pulp wastes, Water pollution sources, Chemical wastes.
Identifiers: *Effluent limitation guidelines, Administrative regulations.

The Environmental Protection Agency (EPA) has established final amendments to the regulations setting guidelines and standards for effluent limitations for the pulp, paper, and paperboard point source category. The EPA has summarized the comments made on the regulations by members of the pulp and paper industry and has responded to the comments. The final regulations contain a number of significant changes from the interim final regulations. Factors considered in formulating the regulations include age and size of plant, raw materials, manufacturing processes, products produced, treatment technology available, energy requirements, and costs. Specific pollutants to be regulated include BOD5, TSS and pH. Various definitions and sub-category classifications were revised to provide clarity and consistancy between sub-category definitions. Costs of both internal and external controls were examined based upon the revised subcategory effluent limitations. The economic impact of the new regulations is not expected to differ from that which was anticipated for the interim final regulations. (Moorhouse-Florida)
W77-09556

EFFLUENT GUIDELINES AND STANDARDS, PHOTOGRAPHIC POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 41, No 136, p 29078-82, July 14, 1976.

Descriptors: *Photography, *Water pollution control, *Regulation, *Water pollution sources, Water quality standards, Films, Water law, Water quality, Wastes, Water pollution, Legal aspects, Pollution abatement, Federal government, Economic impact, Industrial wastes, Industrial plants, Standards, Costs.
Identifiers: *Cyanide, *Silver, *Administrative regulations, *Effluent limitations, Point sources(Pollution), Photographic industry.

The Environmental Protection Agency (EPA) herein reports the interim final form of effluent limitations for any point source discharges resulting from the development or printing of paper, prints, slides, negatives, enlargements, movie film, and other sensiting materials. Facilities processing less than 150 square meters per day are excluded as the economic impact of compliance would be prohibitive to them. Cost of compliance industry-wide is estimated to be $1.83 million initially and $0.43 million annually. Upon analysis of such factors as age and size of plants, raw materials, manfacturing processes, products produced, treatment technology available, energy requirements, and costs, the guidelines for the degree of effluent reduction attainable by application of the best practicable control technology currently available were established. The regulations are addressed solely to the control of total cyanides and silver. The methods used to reduces the harmful oxygen consuming properties of other photographic wastes. Detailed appendices are attached explaining the legal authority for the regulations, the methodology used in their promulgation, and summarizing public participation in their creation (Moorhouse-Florida)
W77-09557

EFFLUENT GUIDELINES AND STANDARDS STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 41, No 60, p 12694-97 March 26, 1976.

Descriptors: *Thermal pollution, *Water cooling, *Heat transfer, *Thermal capacity, Temperature, Thermal properties, Thermal power, Steam, Thermal powerplants, Electric power production, Steam turbines, Water temperature, Lakes, Cooling water, Cooling towers, Industrial water, Thermal stress, Administrative agencies, Federal government, Regulation, Control.
Identifiers: *Administrative regulations.

The Environmental Protection Agency (EPA) has promulgated the Steam Electric Power Generating Point Source Category regulations. The regulations provide that new sources may not discharge heat to navigable waters unless such discharge is from cooling towers or off-stream cooling ponds. The EPA now believes that cooling lakes may, in some cases, be preferable to other mthods of providing control of thermal discharges. Man-made lakes for thermal cooling will be permitted where such lakes are deemed the best available demonstrated technology. The regulations impose a three criteria test to be applied by the regional administrator in order to make this determination. First, a study must be made to assure that both the construction and operation of the impoundment or body of water will not adversely affect municipal water supplies, shellfish beds, fishery areas, wildlife, or recreational areas. Secondly, a determination must be made that the discharge from the water body contains no more than 2% of the waste condensor heat passed to the cooling water body. Finally, a recirculation requirement will be imposed establishing a flow restriction limiting the total discharges from the water body, on a long-term average annual basis, to no more than 100 cubic feet per second per thousand megawatt generating capacity of the facility. (Moorhouse-Florida)
W77-09558

EFFLUENT GUIDELINES AND STANDARDS, THE ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 41, No 2, p 902-13, January 5, 1976.

Descriptors: *Organic compounds, *Chemical industry, *Waste water treatment, *Effluents, Federal Water Pollution Control Act, Water quality standards, Water pollution sources, Chemicals, Chemical wastes, Federal government, Administrative agencies, Water pollution control, Industrial wastes, Industrial water, Water quality control, Industrial plants, Industrial production, Economic impact, Cost-benefit analysis, Public health, Costs.
Identifiers: *Administrative regulations, *Effluent limitations, *Effluent guidelines, *Point sources(Pollution).

The Environmental Protection Agency (EPA) has amended its regulations setting guidelines and standards for effluent limitations for the major organic products segment of the organic chemicals manufacturing point source category. The subcategories covered by the regulation include nonaqueous processes; processes with process water contact only as steam diluent, quench or vent gas absorbent; aqueous liquid-phase reaction systems; and, batch and semi-continuous processes. Twenty-seven products with a description of the process for each product are included in the regulation. Effluent limitations are established for the effluent characteristics of BOD5, TSS, pH, cyanide and copper. The EPA has summarized the comments made on the regulations by members of organic chemical manufacturing industry and has responded thereto. (Moorhouse-Florida)
W77-09559

PERMIT PROGRAM REGULATIONS FOR AGRICULTURAL ACTIVITIES, (NPDES), (PROPOSED).
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 6E.
W77-09560

OIL IN NEPTUNE'S KINGDOM: PROBLEMS AND RESPONSES TO CONTAIN ENVIRONMENTAL DEGRADATION OF THE OCEANS BY OIL POLLUTION,
Cummins Engine Co., Inc., Columbus, Ind.
S. S. Kalsi.
Environmental Affairs, Vol 3, No 1, p 79-108 (Winter 1974).

Descriptors: *International waters, *Oil pollution, *Treaties, *Oceans, *Canada, *International commissions, International law, Political aspects, Political constraints, Pollution abatement, Pollutants, Water pollution, Water pollution control, Water pollution sources, Oil spills, Oil wastes, Oil wells, Wastes, Water, Offshore platforms.
Identifiers: *Hazardous substances(Pollution).

Oil is one of the worst pollutants of the oceans because it is poisonous to marine life. Tankers, offshore oil drilling, and oil pumping by ships are significant sources of oil pollution. Another serious problem with oil pollution is its transnational character. International treaties relating to the control of oil pollution of the high seas have proven to be ineffective due to lack of enforcement and insufficient penalties. To fill the lega vacuum left by weak international treaties Canada, in 1970, took unprecedented unilateral ac tion in expanding its national contiguous zones fo control of oil pollution. Until effective treaties ar negotiated, other coastal states should also expan their contiguous zone jurisdictions. The autho discusses principles of prevention of oil pollutio including such preventive measures as onshore o residue reception facilities, ship construction stan dards, and navigation regulation, and such restora tive measures as clean-up after spill. Eventuall all intentional oil discharges should be prohibite and strict liability should be imposed for all o spills. (Josepher-Florida)
W77-09562

MORSHEAD V CALIFORNIA REGIONA WATER (WATER QUALITY STANDARD UPHELD AS A VALID EXERCISE OF POLIC POWER).
For primary bibliographic entry see Field 6E.
W77-09564

PITMAN V WASHINGTON SUBURBAN SAN TARY COMMISSION (ENVIRONMENTAL E FECTS REPORTS ONLY REQUIRED FO STATE ACTIONS).
For primary bibliographic entry see Field 6E.
W77-09573

LANSCO, INC. V DEPARTMENT OF ENVIRO MENTAL PROTECTION (INSUROR'S LIABIL TY FOR COST OF CLEAN UP OF OIL SPILLS
For primary bibliographic entry see Field 6E.
W77-09574

ALTERATION OF CHANNEL OF STREA (PERMIT SYSTEM).
For primary bibliographic entry see Field 6E.
W77-09575

TANNERS' COUNCIL OF AMERICA V TRA (REVIEW OF EFFLUENT LIMITATIONS FO TANNING INDUSTRY).
For primary bibliographic entry see Field 6E.
W77-09578

CPC INTERNATIONAL, INC V TRA (REVIEW OF EFFLUENT LIMITATIONS F THE CORN WET MILLING INDUSTRY).
For primary bibliographic entry see Field 6E.
W77-09579

DIGESTED SLUDGE: DELINEATION A MODELING FOR OCEAN DISPOSAL,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 5E.
W77-09596

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE UTILITY OF COMPUTERS IN LA SCAPE PLANNING, THE SELECTION AND PLICATION OF A COMPUTER MAPPING A ASSESSMENT SYSTEM FOR T METROPOLITAN LANDSCAPE MO (METLAND),
Massachusetts Univ., Amherst. Dept. of L scape Architecture and Regional Planning.
K. H. Ferris, and J. Gy. Fabos.
Available from the National Technical Infor tion Service, Springfield, VA 22161 as PB-269 Price codes: A06 in paper copy, A01 in microfi Research Bulletin No 617, December 1974. 1

fig, 5 tab, 57 ref, 4 append. Mass. Agricultural xperimental Station College of Food and Natural esources - UMass at Amherst. OWRT B-029-ASS(4), 14-31-0001-3897.

escriptors: *Planning, *Landscaping, Cities, apping, Computers, *Model studies, Computer odels, *Landuse, Evaluation.
entifiers: *Computer mapping, *METLAND odel.

is study was undertaken to select a computer apping and assessment system, using the image itizer, for incorporation into the METLAND odel. The specific study objective was to modify adopt an already developed system (consonant h METLAND study needs, requirements and ategy) to the METLAND study. The procedure the research was: (1) detail the general and ecific METLAND objectives and methodology order to establish the framework within which h a choice might be made; (2) conduct an analy- of the state of the art of geographic information tems and computer mapping systems to ascer- their capabilities; (3) select, and justify the ection or modification of, one of these systems; (4) apply the system to a preselect MET-ND variable to test its capabilities. (The water ply variable was selected.) Study results in- ated that the Computer Mapping for Land Use nning (COMLUP) system was tailored to MET-ND needs with only slight modification. COM-P could reproduce (in line format) detailed rce map virtually indentical to the originals. In ition the capability for mapped and plotted rlays was established even though graphic dence of this finding was not included in this lication. COMLUP prove satisfactory both in ns of the objectives of this research and the TLAND study in general.
7-09151

VIRONMENTAL MODELING AND SIMULA-ON, PROCEEDINGS OF THE CONFERENCE

ironmental Protection Agency, Washington, C. Office of Research and Development.
primary bibliographic entry see Field 5B.
7-09154

TURE ENVIRONMENTAL QUALITY NAGEMENT USING MODELS,
ironmental Research Lab., Athens, Ga.
primary bibliographic entry see Field 5G.
-09155

YSTEMATIC APPROACH TO REGIONAL TER QUALITY PLANNING,
ems Control, Inc., Palo Alto, Calif.
primary bibliographic entry see Field 5G.
-09156

AM, A GENERALIZED MODEL FOR ER BASIN WATER QUALITY MANAGE-T PLANNING,
heon Co., Portsmouth, R.I. Environmental ems Analysis.
rimary bibliographic entry see Field 5G.
09158

NNING MODELS FOR NON-POINT RU-F ASSESSMENT,
ronmental Protection Agency, Athens, Ga. ent Monitoring Section.
rimary bibliographic entry see Field 5B.
09162

ERALIZED METHOD FOR EVALUATING AN STORM WATER QUALITY MANAGE-T STORAGE/TREATMENT ALTERNA-S,
la Univ., Gainesville. Dept. of Environmen- gineering Sciences.

For primary bibliographic entry see Field 5D.
W77-09188

EVALUATION AND SELECTION OF WATER QUALITY MODELS: A PLANNER'S GUIDE,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5B.
W77-09191

A RESOURCE ALLOCATION MODEL FOR THE EVALUATION OF ALTERNATIVES IN SECTION 208 PLANNING CONSIDERING ENVIRONMENTAL, SOCIAL AND ECONOMIC EFFECTS,
Grumman Ecosystems Corp., Bethpage, N.Y.
For primary bibliographic entry see Field 5G.
W77-09192

REGIONAL RESIDUALS-ENVIRONMENTAL QUALITY MANAGEMENT MODELS: APPLICATION TO EPA'S REGIONAL MANAGEMENT PROGRAMS,
Resources for the Future, Washington, D. C. Quality of the Environment Program.
For primary bibliographic entry see Field 5G.
W77-09193

COMPUTER SIMULATION OF LONG-TERM SECONDARY IMPACTS OF WATER AND WASTEWATER PROJECTS,
Boyle Engineering Corp., Newport Beach, Calif. Environmental Studies.
For primary bibliographic entry see Field 5B.
W77-09195

ECONOMIC FORECASTING FOR VIRGINIA'S WATER RESOURCE PROGRAMS,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 6B.
W77-09197

SIMULATION AND MATHEMATICAL MODELING OF WATER SUPPLY SYSTEMS - STATE-OF-THE-ART,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 4A.
W77-09200

CAPACITY EXPANSION FOR MUNICIPAL WATER AND WASTEWATER SERVICES: INCORPORATION OF UNCERTAINTY,
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W77-09201

NEW MODELS FOR OPTIMAL SEWER SYSTEM DESIGN,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-09205

WATER SUPPLY SYSTEMS PLANNING, MANAGEMENT AND COMMUNICATION THROUGH AN INTERACTIVE RIVER BASIN SIMULATION MODEL,
Ohio River Div. Labs., Mariemont.
For primary bibliographic entry see Field 6B.
W77-09212

FUTURE DIRECTIONS IN URBAN WATER MODELING,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5D.
W77-09213

SIMULTANEOUS INVESTMENT-ALLOCATION: AN APPLICATION OF GENERALIZED BENDERS DECOMPOSITION TO WATER PLANNING,
Texas Univ., at Austin. Center for Cybernetic Studies.
R. D. Armstrong, and C. E. Willis.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-017 937, Price codes: A02 in paper copy, A01 in microfiche. Research Report CCS 243, August 1975. 22 p. 2 tab., 22 ref. NR 047-021, ONR NOOO14-75-C-0616;0569.

Descriptors: *Planning, *Investment, *Cost allocation, *Decision making, Economics, Mathematical models, Model studies, Computer models, Computer programs, Water allocation(Policy), Water distribution(Policy), Pricing water rates, California, *Water resources development.
Identifiers: *Benders decomposition analysis, Integer computer programming, Quadratic computer programming.

Models are described for water resources planning in which formal decision frameworks are simultaneous applied to the consideration of both water resource investment decisions for multiple supply sources and allocation (pricing) of the resultant water supplies over regions and uses. Previous works had addressed these problems separately, or had treated investment and allocation componenets simultaneously only at a conceptual level. The present study utilizes a model framework to demonstate the method for water resources planning in San Luis Obispo and Santa Barbara counties in California; this region presents a demand structure for residential, commercial, industrial and agricultural uses of supplemental water supplies with alternatives for costs of constructing an aqueduct to import water from another part of the state, for constructing a seawater desalting plant, or for various local reservoir possibilities. The quadratic discontinuous mathematical programming problems resulting from the use of such models are solved optimally by using generalized Benders decomposition, a partitioning procedure for solving mixed-variable programming problems. (Harris-Wisconsin).
W77-09466

6B. Evaluation Process

THE ENVIRONMENTAL IMPULSE AND ITS COMPETITORS: ATTITUDES, INTERESTS, AND INSTITUTIONS AT LAKE TAHOE,
California Univ., Davis. Dept. of Political Science.
E. Costantini.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 359, Price codes: A02 in paper copy, A01 in microfiche. California Water Resources Center, Report No. 32, April 1975, 17 p. (California Water Resources Center Project UCAL-WRC-W-299) OWRT A-037-CAL(4).

Descriptors: *Environmental effects, *Decision making, *Constraints, *Political constraints, *Institutions, Psychological aspects, *Attitudes, *California, Environment, Lakes.
Identifiers: *Lake Tahoe(Calif).

A summarized and updated version is presented of a Technical Completion Report (See W74-06843). Inevitably, the question of what constitutes unacceptable environmental conditions is a political one: Environmental policy cannot be an irresistible, simple unchallenged response to empirical or scientific fact alone. No matter how weighty the evidence of degradation may be, the environmental impulse inevitably confronts competing, perhaps stronger, impulses. As a consequence, what constitutes unacceptable environmental conditions and what to do about them are political questions, for it is in the political process that disagreement over significant social values and con-

flicting interests finds expression and seeks some form of resolution. The relationship between political institutions and institution building at Tahoe on the one hand, and the environmental impulse and its competitors on the other is explored. (Snyder-California, Davis)
W77-09145

THE UTILITY OF COMPUTERS IN LANDSCAPE PLANNING, THE SELECTION AND APPLICATION OF A COMPUTER MAPPING AND ASSESSMENT SYSTEM FOR THE METROPOLITAN LANDSCAPE MODEL (METLAND),
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional Planning.
For primary bibliographic entry see Field 6A.
W77-09151

FUTURE ENVIRONMENTAL QUALITY MANAGEMENT USING MODELS,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5G.
W77-09155

A SYSTEMATIC APPROACH TO REGIONAL WATER QUALITY PLANNING,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W77-09156

RIBAM, A GENERALIZED MODEL FOR RIVER BASIN WATER QUALITY MANAGEMENT PLANNING,
Raytheon Co., Portsmouth, R.I. Environmental Systems Analysis.
For primary bibliographic entry see Field 5G.
W77-09158

PLANNING IMPLICATIONS OF DISSOLVED OXXYGEN DEPLETION IN THE WILLAMETTE RIVER, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 5B.
W77-09160

A WATER RESIDUALS INVENTORY FOR NATIONAL POLICY ANALYSIS,
National Academy of Sciences, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-09164

COST-EFFECTIVE ANALYSIS OF WASTE LOAD ALLOCATIONS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W77-09167

JOINT USE OF SWMM AND STORM MODELS FOR PLANNING URBAN SEWER SYSTEMS,
Clinton Bogert Associates, Fort Lee, N.J.
For primary bibliographic entry see Field 5D.
W77-09172

WATER QUALITY MODELING IN TEXAS,
Texas Water Quality Board, Austin. Engineering Analysis and Modeling Section.
For primary bibliographic entry see Field 5B.
W77-09181

EVALUATION AND SELECTION OF WATER QUALITY MODELS: A PLANNER'S GUIDE,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5B.
W77-09191

ENVIRONMENTAL, FISCAL AND SOCIO-ECONOMIC IMPACT OF LAND USE POLICIES: TOWARD AN INTERACTIVE ANALYSIS,
Meta Systems Inc., Cambridge, Mass.
J. Kuhner, M. Shapiro, and R. J. deLucia.
In: Proceedings of the EPA Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 453-457, July 1976. 3 fig, 4 tab, 7 ref.

Descriptors: *Water quality control, *Simulation analysis, *Computer models, *Land use, *Economic impact, *Social impact, Storm water, Runoff, Evaluation, Sewers, Treatment facilities, Costs, Systems analysis
Identifiers: Environmental impact, Fiscal impact.

Effective implementation of recent environmental quality legislation requires planning tools which give quantitative estimates of the various impacts of land use and environmental controls. The literature reveals that no adequate comprehensive tools are available. However, three models have been developed by Meta Systems Inc., for EPA in a recent study. Via simulation, the models evaluate: (1) the impact of urban nonpoint sources on water quality--stormwater runoff model; (2) sewer and treament plant capacity--capacity evaluation model; and (3) the distribution of costs borne by different groups in response to new development and environmental controls--cost and fiscal impact model. In conclusion, there is a need to determine more specifically the relationship between land use and environmental quality; study results indicate the effectiveness of the three models presented in helping to clarify this relationship. (See also W77-09154) (Bell-Cornell)
W77-09196

ECONOMIC FORECASTING FOR VIRGINIA'S WATER RESOURCE PROGRAMS,
Virginia State Water Control Board, Richmond.
C. P. Becker, A. M. Griffin, Jr., and C. S. Lown.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 466-472. July 1976. 3 fig, 4 ref.

Descriptors: *Water resources, *Water quality, *Planning, *Economics, *Planning programs, River basins, Projects, Management, Virginia, Forecasting.
Identifiers: *Economic forecasting, *Economic data, Unemployment insurance (U.I.) statistics, Population projections, Value-added, Exponential forecasting, Manufacturing data, Bituminous coal mining.

Water resource and water quality management planning depend to a large degree on forecasts of industrial activity and population projections. A flexible economic data base is especially important where planning follows varying formats of geographical and industrial detail. Records of employment and payroll are collected in the administration of Unemployment Insurance (U.I.) programs and are available from State Employment Agencies. These statistics have been collected over a long period of record (35 years), many of which are available on punched-cards or magnetic tape and may be manipulated by computer. This basic approach has been followed in Virginia. Historical U.I. payroll and employment records for the period 1956 through 1970 were procured on magnetic tape. This data was arrayed by major hydrologic area and by regional planning district. Projections of manufacturing activity were then generated by fitting several exponential equations to annual payroll data in two-digit Standard Industrial Classifications. These exponentials were then extrapolated to provide a range of industrial projections. Other parameters of manufacturing activity were then correlated to payroll data to generate projections of indexes such as employment, value-added, and gross manufacturing output. U.I. payroll data is now being correlated to parameters in nonmanufacturing categories. Projections for industries such as trade and service will link extrapolated payroll data with benchmark correlations of payroll and sales receipts. (See also W77-09154) (Bell-Cornell)
W77-09197

THE COST OF WATER SUPPLY UTILITY MANAGEMENT,
Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
R. M. Clark, and J. I. Gillean.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-2 1976, Cincinnati, Ohio. Report EPA 600/9-76-01 U.S. Environmental Protection Agency, Washington, D.C., p 808-813, July 1976. 5 fig, 6 tab, 5 ref.

Descriptors: *Water supply, *Data collection *Cost analysis, Water quality, Management Capital costs, Operating costs, Pricing, Evalu tion, Labor, Environment.
Identifiers: Water utilities, Water delivery syste Depreciation analysis.

Passage of the Safe Drinking Water Act has int sified a growing awareness of problems related the supply of safe drinking water to the Americ public. Of major concern is the economic imp which might result from promulgation of regu tions under the 'Act.' In an attempt to understa these impacts, EPA's Water Supply Resea Division is conducting a study in which one more water utilities are being investigated in e of EPA's ten regions. Herein, representative c data which have been collected from these c studies are presented. These data will be usefu evaluating the economic impact of the Safe Dri ing Water Act. They should also lead to a grea understanding of the economic factors which fect the costs of the various components mak up a water supply system. (See also W77-09 (Bell-Cornell)
W77-09209

WATER SUPPLY SYSTEMS PLANNI MANAGEMENT AND COMMUNICATI THROUGH AN INTERACTIVE RIVER BA SIMULATION MODEL,
Ohio River Div. Labs., Mariemont.
R. A. Hahn.
In: Proceedings of the Conference on Envi mental Modeling and Simulation, April 19 1976, Cincinnati, Ohio. Report EPA 600/9-76- U.S. Environmental Protection Agency, Wash ton, D.C., p 824-828, July 1976. 1 fig, 3 ref.

Descriptors: *Water supply, *Planning, *W management(Applied), *River basins, *Simula analysis, Communication, Evaluation, Deci making, Alternative planning, Social aspects, vironmental effects, Hydrology, Streamf Mathematical models, Operations research.
Identifiers: Economic aspects.

The Washington Metropolitan Area Water Su Study initiated the development of a unique basin simulation model designed to be u porated into an open planning process. The m is a flexible, user oriented tool suitable f number of different purposes. It has been us educate Corps personnel in the intracacies o Washington Area water supply system and to uate a number of water supply device alterna Potential uses include public demonstration o complexity of the existing water supply sy evaluation of social, economic, or environm impacts of water supply alternatives, the mo of operational rules, and as a 'real-time' de tool to show the effects of operational ma ment decisions on all parts of the system. (Se W77-09154) (Bell-Cornell)
W77-09212

ANUFACTURING WATER USE SURVEY,
2 t A SUMMARY OF RESULTS,
partment of the Environment, Ottawa
ntario). Water Planning and Management
nch.
primary bibliographic entry see Field 3E.
7-09219

ASTAL ZONE MANAGEMENT FOCUS ON
W ENGLAND; AN ANNOTATED SELECTED
LIOGRAPHY,
ssachusetts Inst. of Tech., Cambridge.
assero, and M. J. Seale.
ilable from the National Technical Informa-
Service, Springfield, VA 22161 as PB-254 019,
e codes: A03 in paper copy, A01 in microfiche.
Grant Report No. MITSG 76-21, February
6. 43 p, 117 ref. SG-04-5-158-1; 04-6-158-44-007.

criptors: *Bibliographies, *New England,
sts, Ecosystems, Resources, Planning, Water
urces, Recreation demands.
tifiers: *Coastal Zone Management, Coastal
esses.

materials for this bibliography were chosen
two major sources: Dennis Ducsik's
ching Zone Management--An Introductory
rse Syllabus (MIT Sea Grant Program Publica-
No. MITSG 75-1) and the MIT Sea Grant Pro-
's collections. The bibliography is not
gned primarily for the beginning student,
ough the first section contains articles that in-
ce the complexities of coastal zone manage-
. Coastal planner, researchers, conserva-
sts, and other special groups might best
fit from the technical materials listed in the
seven sections. (Sinha-OEIS)
-09241

AN WATER PLANNING, A BIBLIOG-
HY, VOLUME 2.
e of Water Research and Technology,
hington, D. C.
lable from the National Technical Informa-
Service, Springfield, VA 22161 as PB-269 510,
codes: A09 in paper copy, A01 in microfiche.
r Resources Scientific Information Center,
rt OWRT/WRSIC 77-209, June 1977. 189 p.

riptors: *Urban hydrology, *Bibliographies,
planning, *Municipal water, *Water supply,
rnative planning, *Comprehensive planning,
gement decision making, Land use,
omics, Urbanization, Regional analysis,
ation analysis, Water resources develop-

eport, containing 181 abstracts, is another in
ies of planned bibliographies in water
ces produced from the information base
ising SELECTED WATER RESOURCES
RACTS (SWRA). At the time of search for
ibliography, the data base had 104,878 ab-
s covering SWRA through February 1977
ne 10, Number 4). Author and subject in-
are included. (See also W72-12921.)
9264

ICTING CHANGES IN LAND-USE PAT-
S RESULTING FROM WATER
URCE INVESTMENT USING A NON STA-
ARY MARKOV PROCESS,
oma State Univ., Stillwater. Dept. of
ltural Economics.
Drummond.
ble from the National Technical Informa-
rvice, Springfield, VA 22161 as PB-269 409,
odes: A07 in paper copy, A01 in microfiche.
oma Water Resources Research Institute,
ter, Completion Report, (1977). 121 p, 9 fig,
19 ref, append. OWRT B-030-OKLA(1),
001-5105.

Descriptors: Evaluation, *Post-impoundment, *Projections, *Land use, *Investment, *Markov processes, Forecasting, *Oklahoma, Reservoirs, *Pre-impoundment, Social change.
Identifiers: Keystone(Okla), Pine Creek(Okla).

Changes in land use patterns in the immediate vicinity of Keystone and Pine Creek reservoir projects in eastern Oklahoma are evaluated using stationary and non-stationary Markov chain procedures. The objective of the procedure is to estimate the net or differential change in land use patterns caused by the devlopment of the water resources development project. Pre-project growth patterns are extrapolated into the future to estimate what the land use pattern would have been if the project had not occurred. The difference between these estimates and observed land use patterns is the estimated net impact of the project. By evaluating both pre-project and post-project land use change patterns, it is possible to determine the future differential land use changes associated with the project development. In both study areas the project caused an abrupt shift in land use patterns immediately following construction of the reservoir. While most non-agricultural use categories showed net increases, the greatest increases immediately after the project are in the infrastructure categories of roads, business, etc. In the Keystone area, the initial net increase in non-agricultural uses is projected to continually expand; while in Pine Creek, the initial net increase is projected to dissipate such that by 2000 little net change is estimated.
W77-09268

RECREATION USAGE IN THE KISSIMMEE RIVER BASIN, FLORIDA,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
M. Behar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 514, Price codes: A05 in paper copy, A01 in microfiche. Master's Thesis, 1972. 79 p, 4 fig, 17 tab, 14 ref, 2 append. OWRT B-007-FLA(2), 14-31-0001-3267.

Descriptors: *Water allocation(Policy), Water utilization, Water demand, Decision making, *Florida, *Recreation, *Recreation, *Recreation demand, Estimating, Regression analysis, *Model studies, *Social values, Temperature, Wind velocity, Water levels.
Identifiers: *Kissimmee River basin(Fla).

The purpose was to illustrate a methodology to determine the total recreational use of the Kissimmee River Basin. In order to estimate the number of recreationists at the river basin, a sample of three lakes was chosen. Once the estimate was established for the sampled area, it was projected for the entire river basin. The total number of visitors, to the Kissimmee River Basin in 1970 was estimated to be 813,750. The estimated total net value of recreation was 16.275 million dollars per year. A multiple linear regression equation was established for each lake sampled in order to examine the influence of water level and certain physical variables used to estimate the recreational use of any lake in the Kissimmee River Basin. The results derived from the regression equation indicate that recreational use of a lake varies inversely with the physical variables temperature and wind velocity and directly with the water level. Seasonality was accounted for when deriving the final results.
W77-09269

POTENTIAL WATER RECREATION OPPORTUNITIES AT MUNICIPAL AND PRIVATE FOREST MOUNTAIN RESERVOIRS,
Colorado State Univ., Fort Collins. Dept. of Recreation Resources.
R. Aukerman, and W. McLaughlin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 513, Price codes: A02 in paper copy, A01 in microfiche. Paper Presented at Society of American Foresters National Conference, 1974, New York City, Published in SAF Proceedings, 1974. 13 p, 3 fig, 6 tab, 13 ref. OWRT B-104-COLO(1).

Descriptors: *Management, *Recreation, *Reservoirs, Drawdown, Timing, Delivery, Storage, Surveys, *Colorado, Multiple-purpose projects, Decision making, Planning.
Identifiers: *Mountains of Front Range(Colo).

The objective is to provide managers with tools to create more meaningful recreation opportunities for the public. Water recreation managers are faced with increasing resource constraints, rapidly growing numbers of over-used sites, and a growing set of management strategies. Solutions to these problems are complex and often little is known about the spin-off effects that management decisions will create. This study attempts to provide the scientific rationale for recommending management practices which will lead to increased recreation use of high-mountain reservoirs. The study objectives are to: (1) inventory existing reservoir sites along Colorado's Front Range; (2) look at the physical capabilities of sites to provide a recreation experience; (3) survey present users in order to identify site and activity preferences; (4) design a model to evaluate the interactions between existing site management, user preferences, and physical capabilities of sites for providing recreation experiences; and (5) look at alternative management strategies to meet future types of recreation demand with minimal influence on the quality of present recreation experience. An overview is presented of an approach to evaluate the recreation potential of high-mountain reservoirs. The data presented represents a first generalized look at a complex and encompassing study. (See also W75-09894)
W77-09272

LAND MANAGEMENT IN THE LAKE ONTARIO BASIN,
Cornell Univ., Ithaca, N.Y.
J. M. Wolf.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-74-10336, Price codes: A03 in paper copy, A01 in microfiche. New York State Sea Grant Program, Great Lakes Management Problems Series, December 1973. 39 p, 7 fig, 2 tab, 28 ref. OWRT C-2145(No. 3370)(2).

Descriptors: *Land use, *Lake Ontario, *Planning, *Watershed management, *Land management, Land development, Population, Growth rates, Zoning, Taxes, Eminent domain, Regional development, Rural areas, Urbanization, International commissions, Future planning, *New York, *Canada.
Identifiers: Binational development, Buffalo-Rochester(NY), Toronto, Ontario.

Binational multiresource development is essential if the enormous water resources of Lake Ontario are to be properly utilized. Such development must place heavy emphasis on land use planning. The Lake Ontario region consists of a 15,200 square mile drainage basin in N. Y. and Pa., and a 12,000 sq. mile basin in the Province of Ontario. Rapid population growth and urbanizaton are apparent, especially on the Canadian side with an increase from 3.8 million in 1968 to a projected 4.6 million by 1976. Growth plans for Ontario were begun in 1966 with the Design for Development program which included the formulation of regional and local plans stressing environmental, development and economic performance. For example, a plan for the Toronto centered region comprised three concentric zones, a lakeshore urbanized area, a commutershed, and a peripheral area. While Canadian land use planning is more thorough than New York, it lacks the enforcement capabilities of the latter. Future urban growth must consider the rural land which is removed

from farm production for reasons of land speculation, housing, or commerce. Estimates from Canadian and American studies indicate that 382 rural acres are lost for every 1000 increase in population for Toronto and 193 for Buffalo-Rochester. Higher taxes, higher market value, and soaring prices are the main causes of this land loss. To prevent loss of productive land joint management by the U.S. and Canada of the Ontario River basin is required, including an information gathering system and enforcement capabilities. (LaPointe-North Carolina)
W77-09275

WATER RESOURCE AND LAND USE PROBLEMS IN WESTERN AUSTRALIA,
Perth Public Works Dept. (Australia). Planning Design and Investigation Branch.
For primary bibliographic entry see Field 4C.
W77-09296

THE CENTRAL ARIZONA PROJECT: AN INQUIRY INTO ITS POTENTIAL IMPACTS,
Arizona Univ., Tucson. Coll. of Business and Public Administration.
J. L. Barr, and D. E. Pingry.
Arizona Review, Vol. 26, No. 4, p 1-49, April, 1977. 3 fig, 13 tab, 34 ref, 10 append.

Descriptors: *Arizona, *Colorado River, *Colorado River Basin, *Economic impact, *Water policy, Arid lands, Water supply, Water supply development, Environmental effects, Social impact, Urban impact, Competing uses, Water law, Water allocation(Policy), Water resources, Water resources development.
Identifiers: *Central Arizona project.

The Central Arizona Project is evaluated in terms of water availability in Arizona and the problem of possession of title to Colorado River water is discussed. The background of the project is presented, as well as an assessment of its costs and overall impact. The problem of who has claim to the Colorado River water is evaluated. According to strict interpretation, the Central Arizona Project is not guaranteed any Colorado River water. Rather, it would be claimant to an amount of water each year determined as a residual to other claims that enjoy higher priority in the lower Colorado River Basin. There is a detailed discussion of the potential of the Colorado River for supplying water to Arizona. Four simulation experiments are presented to provide some indication of project delivery costs. Further study is suggested before a complete evaluation of the Central Arizona Project's potential impact can be made. Five policy options are presented. These include: (1) proceed with the presently designed CAP, (2) redesign the CAP, (3) delay the CAP, (4) scrap the CAP, or (5) package the CAP with requisite water use reform. (Jamail-Arizona)
W77-09298

WATER RECLAMATION: TECHNOLOGY AND PUBLIC ACCEPTANCE,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W77-09317

URBAN PLANNING TO MINIMIZE ENVIRONMENTAL IMPACT,
Illinois Univ. at Chicago Circle. Dept. of Systems Engineering.
D. Bammi, D. Bammi, and R. Paton.
Environment and Planning A, Vol 8, No 3, p 245-59, May 1976. 2 fig, 3 tab, 11 ref, 2 append.

Descriptors: *Environmental effects, *Land development, Urban land use, Natural resources, Computer models, *City planning, Cities.
Identifiers: *Environmental cost, *Natural resources, Environmental cost matrix, Environmental impact.

A linear programming model (OPTPLAN) that allocates land use to minimize environmental impact has been developed. This paper describes the model's natural resource objective function and constraints. The objective function minimizes the cost to the environment of land development. The cost is calculated by considering the natural features in each analysis region and assessing the effect of devoting a parcel of land with a specific combination of features to a specific land use. The environmental cost of a particular land use in a given region is obtained by the summation over all environmental conditions of the products of : (1) the acreage for a particular environmental condition in that region; (2) the environmental cost of a particular pair of environmental conditions and land use types; (3) the reciprocal of the net undeveloped acreage in the region. An environmental cost matrix that assigns numeric costs to a cross-tabulation of environmental conditions and land use types is explained. Four constraints were introduced: (1) open space acreage must be greater than acreage designated environmentally sensitive; (2) open space allocations must fall within accepted standards; (3) open space in each region must be greater than or equal to minor flood plain acreage; (4) land reservatiion for future open space needs must meet accepted standards. (Nessa-NC)
W77-09377

ANTI-POLLUTION BEHAVIOR: A FUNCTION OF PERCEIVED OUTCOME AND LOCUS OF CONTROL,
For primary bibliographic entry see Field 6G.
W77-09378

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PREVIEW.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09379

BINGHAMTON WASTEWATER MANAGEMENT STUDY: SUMMARY.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09380

BINGHAMTON WASTEWATER MANAGEMENT STUDY: BACKGROUND INFORMATION APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09381

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PLAN FORMULATION APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09382

BINGHAMTON WASTEWATER MANAGEMENT STUDY: COMMENTS APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09383

BINGHAMTON WASTEWATER MANAGEMENT STUDY: SPECIALTY APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09384

BINGHAMTON WASTEWATER MANAGEMENT STUDY: IMPACT ASSESSMENT AND EVALUATION APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09386

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PUBLIC INVOLVEMENT APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09388

INDUSTRIAL WATER USE,
Public Health Service, Washington, D.C. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 6D.
W77-09449

RESTORING THE WILLAMETTE RIVER COSTS AND IMPACTS OF WATER QUALITY CONTROL,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5G.
W77-09455

THE ECONOMIC IMPACT OF ENVIRONMENTAL PROGRAMS.
Council on Environmental Quality, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-239 77
Price codes: A03 in paper copy, A01 in microfich
December 1974. 29 p, 5 fig, 8 tab.

Descriptors: *Pollution abatement, *Economic
*Economic impact, Costs, Environmental contr
Environmental engineering, Capital costs, Inve
ment, Operating costs, Maintenance cos
Depreciation, Industries, Inflation(Economic
Projections, Forecasting, Air pollution, Water p
lution control, Industries.

Council of Environmental Quality analyses in 19
are given for the 10-year period 1973-1982, for
cremental abatement costs projected to meet
requirements of federal legislation enacted sin
the mid-1960's--beyond what the nation wo
have spent for the same purposes in the absence
this legislation. Three types of costs are project
(1) Investment costs--the estimated expenditu
which will be made on capital equipment for po
tion abatement by both public and private secto
(2) Capital costs--which include interest char
on pollution control investments and the depre
tion of the capital equipment; (3) Operation
maintenance costs created by the pollution ab
ment process. The report also summari
macroeconomic impacts of environmental exp
ditures on inflation, investment, productiv
economic growth, employment, governm
finances, foreign trade and income distribut
Impacts are also projected for eight indu
groupings which account for about 80% of
total estimated private pollution control inv
ments in 1974. These include electric utili
petroleum refining, iron and steel, pulp and pa
nonferrous metals, stone, clay, glass and cem
chemicals and food and kindred products. (Ha
Wisconsin)
W77-09457

SITING OF MAJOR ENERGY FACILITIES.
Organization for Economic Co-Operation
Development, Paris (France).
For primary bibliographic entry see Field 6G.
W77-09459

**STUDY ON ECONOMIC AND POLICY INST
MENTS FOR WATER MANAGEMENT. WA
MANAGEMENT IN THE FEDERAL REPU
OF GERMANY.**
Organisation for Economic Co-Operation
Development, Paris (France).
For primary bibliographic entry see Field 6E.
W77-09461

UDY ON ECONOMIC AND POLICY INSTRU-ENTS FOR WATER MANAGEMENT. WATER ANAGEMENT IN CANADA.
ganisation for Economic Co-Operation and velopment, Paris (France).
r primary bibliographic entry see Field 6E.
7-09462

UDY ON ECONOMIC AND POLICY INSTRU-ENTS FOR WATER MANAGEMENT. WATER ANAGEMENT IN FRANCE.
ganisation for Economic Co-Operation and velopment Paris (France).
primary bibliographic entry see Field 6E.
7-09463

UDY ON ECONOM. AND POLICY INSTRU-NTS FOR WATER MANAGEMENT. WATER NAGEMENT IN THE NETHERLANDS.
anisation for Economic Co-Operation and velopment, Paris (France).
primary bibliographic entry see Field 6E.
7-09464

ULTANEOUS INVESTMENT-ALLOCA-N: AN APPLICATION OF GENERALIZED NDERS DECOMPOSITION TO WATER NNING,
as Univ., at Austin. Center for Cybernetic Stu-
primary bibliographic entry see Field 6A.
-09466

ONOMIC INCENTIVES FOR LAND USE NTROL,
NSAD Research Corp., Pittsburgh, Pa.
. Rueter, and P. Kushner.
ilable from the National Technical Informa-Service, Springfield, VA 22161 as PB-265 468,
e codes: A16 in paper copy, A01 in microfiche.
ort No. EPA-600/5-77-001, February 1977. 369 ig., 1029 ref. 1HC619, EPA 68-01-2699.

criptors: *Land use, *Theoretical analysis, onomic efficiency, *Regulation, Methodology, l management, Evaluation, Economic impact, al impact, Zoning, Taxes, Legal aspects, ical constraints, Property values, Building s, Condemnation, Optimization, Social es, Political aspects.
ifiers: Externalities.

eoretical economic analysis of the incentives odied in a variety of regulatory land use poli-is developed to aid in understanding the ra-lity of the behavior patterns which have uced unanticipated and economically ineffi-impacts and to provide a conceptual basis for stablishment of improved land use controls. economic and legal relationships between al-tive assignments of property rights in the use sources and the levels of external effects of esource use are examined. Also investigated dministrative, economic, judicial, legal, and cal problems which arise in the application of ional land use control mechanisms such as cipal zoning, building codes, and eminent in condemnations. Basic concepts are oped for the evaluation of the potential mic efficiency and social desirability of any anism intended for the optimal control of ve externalities or the optimal provision of facilities. They are then utilized to assess tential economic efficiency, legal feasibility, istrative tractability, political acceptability, ocial desirability of implementing seven in-ve regulatory policies, including advalorem rty taxation with tax rates conditional upon se, and payment of annual externality fees perty owners who generate adverse external s. (Luedtke-Wisconsin).
9467

RESOURCES ALLOCATION TO OPTIMIZE MINING POLLUTION CONTROL,
Ohio State Univ. Research Foundation, Columbus.
For primary bibliographic entry see Field 5G.
W77-09481

BENEFIT-COST ANALYSIS: ITS USE (MISUSE) IN EVALUATING WATER RESOURCE PROJECTS,
P. E. Roberts.
American Business Law Journal, Vol 14, No 1, p 73-84 (Spring 1976). 1 tab.

Descriptors: *Cost-benefit analysis, *Economics, *Administrative agencies, *Costs, *Benefits, Economic justification, Planning, Economic prediction, Feasibility, Financial feasibility, Project feasibility, Social impact, Social aspects, Cost-benefit theory, Federal government, Market value, Cost-benefit ratio, Project planning, Political aspects.
Identifiers: *National Environmental Policy Act, *Environmental impact statement.

The National Environmental Policy Act (NEPA) was enacted to insure a balance between the developmental interests of federal agencies and environmental quality objectives. Explicit in NEPA is the requirement for economic analysis. Both the concept itself in relation to environmental matters and the manner in which economic analysis is used have proved troublesome. As to the concept itself, the major problem lies in the attempt to quantify natural resources. Necessary considerations for a determination of market value are buyer-seller transactions, divisibility of goods and services and immediate agreed-upon price. All these considerations are lacking in the environmental shpere. The requirements for economic analysis are explicit in NEPA. However, the integration of environmental factors with economic relationships has not occurred. NEPA requires the preparation of an Environmental Impact Statement (EIS) for any action of the federal government which may have a significant effect on the environment. This requirement does not include any judgemental implication concerning the merits of the issue, but merely an enumeration of effects, real and potential. The opinion is growing that economic data should be included in the EIS. While it is essential that economic data and assumptions be revealed, it is more important that these data be subjected to alternate analysis in order to test the reasonableness of assumptions and conclusions, and strengthen the entire administrative decision process. (Moorhouse-Florida)
W77-09550

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

MATHEMATICAL MODELS FOR CALCULATING PERFORMANCE AND COST OF WASTEWATER TREATMENT SYSTEMS,
Municipal Environmental Research Lab., Cincinnati, Ohio. Systems and Economic Analysis Section.
For primary bibliographic entry see Field 5D.
W77-09208

PREDICTING CHANGES IN LAND-USE PATTERNS RESULTING FROM WATER RESOURCE INVESTMENT USING A NON STATIONARY MARKOV PROCESS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-09268

BINGHAMTON WASTEWATER MANAGEMENT STUDY: DESIGN AND COST APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09385

INDUSTRIAL EFFLUENT SURCHARGING: A CASE STUDY OF KITCHENER, ONTARIO,
Toronto Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 5G.
W77-09413

DO ECONOMIES OF SCALE EXIST IN WATER UTILITY,
Illinois Univ. at Urbana-Champaign. Coll. of Commerce and Business Administration.
For primary bibliographic entry see Field 5F.
W77-09450

ECONOMIC IMPACT OF EPA'S REGULATIONS ON THE PETROLEUM REFINING INDUSTRY. VOLUME 1. EXECUTIVE SUMMARY,
Sobotka and Co., Inc., Stamford, Conn.
For primary bibliographic entry see Field 5G.
W77-09451

ECONOMIC IMPACT OF EPA'S REGULATIONS ON THE PET. REFINING IND. VOL. 2, PTS 1 AND 2. IND. DESCRIPTION AND TECH. ANALYSIS,
Sobotka and Co., Inc., Stamford, Conn.
For primary bibliographic entry see Field 5G.
W77-09452

ECONOMIC IMPACT OF EPA'S REGULATIONS ON THE PETROLEUM REFINING INDUSTRY. VOL. 3, PT. 3. ECONOMIC IMPACT ANALYSIS,
Sobotka and Co., Inc., Stamford, Conn.
For primary bibliographic entry see Field 5G.
W77-09453

TECHNICAL AND MICROECONOMIC ANALYSIS: ARSENIC AND ITS COMPOUNDS,
Versar, Inc., Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-09465

ECONOMIC INCENTIVES FOR LAND USE CONTROL,
CONSAD Research Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 6B.
W77-09467

ECONOMIC ASSESSMENT OF PROPOSED TOXIC POLLUTANT EFFLUENT STANDARDS FOR MANUFACTURERS AND FORMULATORS OF ALDRIN/DIELDRIN, DDT, ENDRIN AND TOXAPHENE.
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W77-09478

METHODOLOGY FOR ASSESSING ENVIRONMENTAL IMPLICATIONS AND TECHNOLOGIES: NONFERROUS METALS INDUSTRIES,
Battelle-Columbus Labs., Columbus, Ohio.
For primary bibliographic entry see Field 5G.
W77-09479

AN OPTIMAL STATE WATER LAW: FIXED WATER RIGHTS AND FLEXIBLE MARKET PRICES,
For primary bibliographic entry see Field 6E.
W77-09587

6D. Water Demand

RURAL WATER DISTRICTS IN KANSAS.
Kansas Water Resources Board, Topeka.
Bulletin 18, 1975. 95 p, 3 fig, 1 tab, 68 plate, 12 ref.

Descriptors: *Kansas, *Rural areas, *Cooperatives, *Water districts, Legislation, Flooding, Droughts, Organizations, Water users, Water distribution(Applied), Water works, Data collections, Water supply.
Identifiers: *Rural water districts(Kan).

This report was assembled in response to requests for information concerning the role which rural water districts play in meeting the water needs of Kansas citizens. The information contained herein updated a previous compilation which was published in 1967. The information was assembled in three sections. The first part, a brief text, contained information concerning the method of organization, the duties, and powers, and the financing of the rural water districts of Kansas. The second section was composed of a table which listed the rural water districts serving each county of Kansas. The third section of the report consisted of plates of each county which delineated the area of the county served by rural water districts. (Froehlich-ISWS)
W77-09135

CAPACITY EXPANSION FOR MUNICIPAL WATER AND WASTEWATER SERVICES: INCORPORATION OF UNCERTAINTY,
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W77-09201

ADAPTIVE SHORT-TERM WATER DEMAND FORECASTING,
Systems Control, Inc., Palo Alto, Calif.
D. H. Budenaers.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 646-650, July 1976. 8 fig, 2 tab, 7 ref. OWRT C-6198(5221)(4).

Descriptors: *Water demand, *Forecasting, *Model studies, *Weather, Estimating, Stochastic processes, Temperature, Hydrology, Simulation analysis, Systems analysis, Water distribution(Applied).
Identifiers: Principal components method, Time series modeling.

A dual set of short-term water demand models is described. These models have the feature of adptability to changing data: given changes in the data sequence, the models' parameters will self-adjust to provide a better model. The models also have the property of being real-time computer-implementable. The two models are a stochastic (or time series) model and weather component of demand model. The stochastic model is an extension of the Box-Jenkens type of modeling for time series. The weather model uses the method of principal components to identify the effective weather variables. The results of the application of these models to data from the San Jose, California Water Works are presented. (See also W77-09154) (Bell-Cornell)
W77-09202

HYDROLOGIC IMPACT STUDIES OF ALTERNATIVES TO MEET WATER NEEDS IN SOUTH CENTRAL PENNSYLVANIA,
Resource Analysis Inc., Cambridge, Mass.
D. H. Marks, J. V. Guillermo, B. M. Harley, and J. C. Schaake, Jr.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 651-656, July 1976. 3 fig, 4 tab, 9 ref, 2 append.

Descriptors: *Water supply, *Methodology, *Synthetic hydrology, *Streamflow, *Groundwater, *Simulation analysis, Water demand, Hydrologic data, Surface waters, Model studies, Equations, Systems analysis, *Pennsylvania.
Identifiers: *Impact assessment, Linear regression model.

This paper presents the use of several interrelated models to investigate the potential hydrologic impacts of several proposed water supply alternatives for the South Central Pennsylvania area. The major demand centers depend for the most part on local surface waters for their water supply with supplemental withdrawals from the Susquehanna River and from groundwater. Withdrawals from all of these sources could have an impact on the flows in the Susquehanna itself. Since this river is the main source of freshwater to Chesapeake Bay, it was important to assess the relative impact of each of the proposed alternatives on the outflow distribution of the Bay. The study scope was limited to the hydrologic aspects of the problem. The models used to evaluate the impacts of the alternatives were: (1) a synthetic streamflow augmentation and generation model to first augment the existing records upt to a full 80 years, and second to generate a set of 200-year synthetic records which resembled the historical records in their statistics; (2) a linear regression model relating monthly rainfall and evapotranspiration to streamflow in the tributaries used to evaluate the impact of groundwater withdrawals on surface water flows; and (3) a simulation model used as an accounting device to show the impact of the alternatives on the monthly flows at several locations in the area including the outflow of the Susquehanna to Chesapeake Bay. (See also W77-09154) (Bell-Cornell)
W77-09203

MATHEMATICAL MODELING OF DUAL WATER SUPPLY SYSTEMS,
Weston (Roy F.), Inc., West Chester, Pa.
A. K. Deb, and K. J. Ives.
In: Proceedings of the Conference on Environmental Modeling and Simulation, April 19-22, 1976, Cincinnati, Ohio. Report EPA 600/9-76-016, U.S. Environmental Protection Agency, Washington, D.C., p 814-818, July 1976. 4 fig, 4 tab, 5 ref.

Descriptors: *Water supply, *Water treatment, *Water distribution(Applied), *Water demand, *Economic feasibility, Water quality control, Domestic water, Potable water, Evaluation, Capital costs, Operating costs, Computers, Mathematical models, Systems analysis.
Identifiers: *Cost functions, Nonpotable water, Pumping mains, Gravity mains, Technical feasibility.

A small percent of total domestic water usage is usually required to be of potable water quality; the rest of domestic need may not warrent excellent quality. Dividing water supply into two portions, potable and nonpotable, mathematical models of conventional and dual supplies have been developed to evaluate the technical and economic feasibility of dual supplies under various conditions. Model sensitivity has been evaluated for various parameters. The econo-mathematical models for single and dual supply for 12 treatment systems of total present costs of treatment and distribution of water were solved using a high-speed computer for various potable/total flow ratios, interest rates, capital cost increase rates, operational cost increase rates for a-type (base population 100,000) and B-type (base population 500,000) towns. The computer output comprises total treatment costs, both capital costs and O and M costs, and total distribution costs for all the 12 systems. The cost advantage of dual supply over single supply, DEL, is expressed by the difference of total present value costs of single and dual systems in pounds sterling. (See also W77-09154) (Bell-Cornell)
W77-09210

MANUFACTURING WATER USE SURVEY, 1972 - A SUMMARY OF RESULTS,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
For primary bibliographic entry see Field 3E.
W77-09219

INDUSTRIAL WATER USE,
Public Health Service, Washington, D.C. Div. o Water Supply and Pollution Control.
W. G. Eichberger.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-245 73 Price codes: A07 in paper copy, A01 in microfich Report No 282028, February 1965. 130 p, 1 fig, 2 tab.

Descriptors: *Industrial water, *Water utilizatio *Industries, *Water demand, *Industrial waste Data collections, Waste water(Pollution), Baseli studies.

U.S. Public Health Service-compiled data on i dustrial water requirements, arranged according standard industrial classifications, is given alo with industrial waste water production based broad U.S. or regional averages up to 1959. Ca tion should be used when applied to local sit tions. Table 1 shows industrial water requireme per employee and per dollar value added. Tabl shows industrial water requirements by prod unit, for four-digit classifications. Table 3 gives formation on water intake and gross water use employee and per-dollar value added, of int water used for processing and cooling, and amo of water discharged per employee by two-digit specified four-digit industries by regions. Tabl presents data on water use by regions, subdivi by industrial categories. Table 5 compares ind trial water use per year among 42 selected ind tries. Table 6 presents industrial water requ ments for specific products. Table 7 summari waste discharges, by sewered popula equivalents of BOD and SS, for various indust wastes. Table 8 gives data on the volume characteristics of canning industry wastes. Ta 9 through 13 present waste generation specified industries. The waste production should be used with considerable discretion they are intended only as estimating guides. A ing of the standard industrial classificat defines the industries and products. (A Wisconsin)
W77-09449

STUDY ON ECONOMIC AND POLICY INST MENTS FOR WATER MANAGEMENT. WA MANAGEMENT IN THE FEDERAL REPU OF GERMANY.
Organisation for Economic Co-Operation Development, Paris (France).
For primary bibliographic entry see Field 6E.
W77-09461

WATER LAW - WELL PERMITS - U PROPRIATED WATER AND MAXI UTILIZATION, HALL V. KUIPER, 510 P.2 (COLO. 1973),
T. F. Cope.
Denver Law Journal, Vol 51, No 1, p 12 1974.

Descriptors: *Colorado, *Surface waters, * demand, *Water allocation(Policy), Water p Water shortage, Water users, Well permits, lation, Wells, Groundwater, Judicial deci Legal aspects, Groundwater availability, ties, Prior appropriation.

entifiers: *Ground Water Management Act, aximum utilization.

creased development in Colorado has led to in-eased demand for water, with surface water coming scarcer as a result. This growing scarcity s had two effects. The first is an increase in the mber of wells drilled in recent years which has l to conflicts between ground and surface water ers. Consequently, the Ground Water Manage-nt Act was developed to set up a permit system r wells. The second effect of the increasing scar-y is the articulation of the doctrine of maximum lization. The drive to make water available to as ny people as possible who will put it to a benefi-l use is the common factor in decisions dealing h maximum utilization. In a recent case the lorado Supreme Court redefined the require-nt of unappropriated water, thereby implicitly ecting one aspect of maximum utilization. other notable doctrine has evolved from the rcity of water, the doctrine of prior appropria-n. The doctrine of prior appropriation allocates ter while the doctrine of maximum utilization ures that water is efficiently used. (Rieck-rida)
7-09543

. Water Law and Institutions

RAL WATER DISTRICTS IN KANSAS.
nsas Water Resources Board, Topeka.
primary bibliographic entry see Field 6D.
7-09135

E ENVIRONMENTAL IMPULSE AND ITS MPETITORS: ATTITUDES, INTERESTS, D INSTITUTIONS AT LAKE TAHOE,
fornia Univ., Davis. Dept. of Political Science.
primary bibliographic entry see Field 6B.
7-09145

E CENTRAL ARIZONA PROJECT: AN UIRY INTO ITS POTENTIAL IMPACTS,
ona Univ., Tucson. Coll. of Business and ic Administration.
primary bibliographic entry see Field 6B.
-09298

ITITUTIONAL CONSTRAINTS ON WATER OURCE DEVELOPMENT IN ARID LANDS,
. Templer.
Social Science Research in the Dry Lands, pler, O.W. ed. Frontiers of the Semi-Arid d: An International Symposium, October 14-974, Lubbock, Texas. ICASALS Publication 6-6, Lubbock, 1976, p. 25-39. 2 fig, 35 ref.

riptors: *Arid lands, *Water supply, *Water *Water policy, *Water allocation(Policy), r demand, Water resources, Water resources opment, Water rights, Governments, ndwater, Riparian rights, Legal aspects, itutional constraints.

nost important consideration influencing oc-cy and land use in the world's most arid is the availablity of water. Water availability urn influenced not only by the physical en-nent, but also by the institutional or legal work controlling the allocation of existing supplies, or the question of water rights. e water rights in arid lands and water rights ns in various countries and societies are sed and the institutional constraints imposed ater law evaluated. The best solution for ing coordinated and efficient management er resources in the arid lands, or in any other where there is heavy water demand, would the appropriate jurisdiction to institute an lusive appropriation system for application er in whatever phase of the hydrologic cycle t exist. Although this has not yet been done in practice, and despite the fact that such implementation would be difficult, until such a system is put into opertation correlation and management of water rights in all phases cannot be achieved. (Jamail-Arizona)
W77-09316

WETLANDS-RELATED LEGISLATION IN THE UNITED STATES,
Miami Univ., Fla. School of Law.
W. P. Stepien, Jr., and S. J. Fernandez.
Miami University Sea Grant Special Report No. 11, May 1977. 64 p.

Descriptors: *Legislation, *Wetlands, Coasts, United States, *State governments, *Standards, *Administrative agencies.

Arranged in a state by state order, this publication identifies statutes, provides definition, explains briefly prohibited acts and/or authorizations, lists administrative schemes, and gives standards for use and development of wetlands both inland and coastal of the United States. (See also W75-11550) (NOAA)
W77-09324

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PREVIEW.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09379

BINGHAMTON WASTEWATER MANAGEMENT STUDY: SUMMARY.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09380

BINGHAMTON WASTEWATER MANAGEMENT STUDY: BACKGROUND INFORMATION APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09381

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PLAN FORMULATION APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09382

BINGHAMTON WASTEWATER MANAGEMENT STUDY: COMMENTS APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09383

BINGHAMTON WASTEWATER MANAGEMENT STUDY: INSTITUTIONAL ANALYSIS APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09387

BINGHAMTON WASTEWATER MANAGEMENT STUDY: PUBLIC INVOLVEMENT APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09388

ENVIRONMENTAL POLICY-MAKING IN THE USSR: THE ROLE OF INDUSTRIAL AND ENVIRONMENTAL INTEREST GROUPS,
Mississippi State Univ., State College.
D. R. Kelly.
Soviet Studies, Vol. XXVIII, No. 4, p 570-589, 1976. 56 ref.

Descriptors: *Decision making, *Pollution abatement, *Political aspects, *Political constraints, *Institution constraints, *Foreign countries, Local governments, Jurisdiction, Lakes, Pulp and paper industry, Pulp wastes, Public health.
Identifiers: *USSR, *Lake Baikal(USSR), *Environmental policymaking, *Public interest groups.

An examination of the issues, organized interests and underlying power relationships that provide a general background for environmental policymaking in the Soviet Union considers several new dimensions of interest group behavior including: (1) the role of non-institutionalized ad hoc environmental lobbies; (2) the critical and often-overlooked question of how new issues are created and politicized, and through what chanels; (3) the interrelationship of a number of decisional levels in a complex and multi-levelled policymaking milieu. The multi-level process of Soviet environmental policymaking is illustrated by a case study of a recent clash over pollution of Lake Baikal in Siberia. This policy struggle was fought out on one side by the Ministry of Timber, Paper and Woodworking whose cellulose mills represent a major threat to the lake, as opposed by a diverse coalition of conservationists, scientists, writers and other supporting the Ministry of Land Reclamation and Water Resources, the Hydrometeorological Service and the Ministry of Public Health. The actual policymaking process for Baikal, taking place in a complex and multi-levelled interagency and intergroup setting, eventually created stringent controls against the lakeside polluters. (Harris-Wisconsin)
W77-09456

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE FEDERAL REPUBLIC OF GERMANY.
Organisation for Economic Co-Operation and Development, Paris (France).
Environment Directorate 29400, 1976. 60 p, 15 fig, 16 tab.

Descriptors: *Foreign countries, *Water management(Applied), *Water policy, Federal-state water rights conflicts, Federal government, State governments, Water distribution(Applied), Water quality control, Water resources development, Regulation, Management, Water law, Water allocation(Policy), Administration, Pollution taxes(Charges), International commissions.
Identifiers: *West Germany.

As part of a study of national policies and systems for water management in eight member countries of the Organization for Economic Cooperation and Development, the policies, orientation and instruments of water management of West Germany are reviewed. Concentrating on water quality management, German water policy elements as described include federal/state relationships, water quality parameters, investments in waste water treatment, financial aids for water treatment facilities, descriptions of river basin management systems, effluent fees and water abstraction fees. General water management policy in Germany is established by a federal water act, under which all water use schemes must meet the demands on the available water resources with respect to quality and quantity by adequate management. Through directives issued by the federal government, general water schemes are drawn up for the entire country. The schemes are based on debit/credit water balances, take into account water pollution and control and flood protection, and are carried out by the state governments. On the working level, there are technical instructions issued with the directives, the German Industrial Standards relating to water management. Other rights are reserved to the individual states. (Harris-Wisconsin)
W77-09461

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN CANADA.
Organisation for Economic Co-Operation and Development, Paris (France).
Environment Directorate 29315, 1976. 62 p, 1 fig, 5 tab.

Descriptors: *Water management(Applied), *Canada, *Water policy, Water distribution(Applied), Water quality control, Water resources development, Regulation, Management, Water law, Water allocation(Policy), Administration, Economics, Pollution taxes(Charges), International commissions.

As part of a study of national policies and systems for water management in eight member countries of the Organization for Economic Cooperation and Development, the problems, management policy instruments and institutional framework of water management in Canada are analyzed. The study includes a description of Canada's principal hydrologic characteristics and enumerations of the provincial and federal water management policy instruments for water quality and quantity management, research and education, regulation and enforcement, economic water quality controls and water quality control by comprehensive management. Aside from the structural factors imposed by Canada's system of government, which gives extensive autonomy to the provinces, there is a wide diversity of public policy with regard to water which may also reflect continent-wide physical characteristics. The size of Canada and its varying topographic and hydrological characteristics make it difficult to conceive of unified, nationally applicable specific policies that would be practicable in more than a few areas of public concern. Evidence suggests, however, that a regulatory approach to water management is beginning to find favor; this is especially true at the municipal level in regard to water quality control through the use of economic charges. (Harris-Wisconsin)
W77-09462

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN FRANCE.
Organisation for Economic Co-Operation and Development Paris (France).
Environment Directorate 29313, 1976. 65 p, 14 fig, 16 tab.

Descriptors: *Foreign countries, *Water management(Applied), *Water policy, Water distribution(Applied), Water quality control, Water resources development, Regulation, Management, Water law, Water allocation(Policy), Administration, Economics, Pollution taxes(Charges), Use rates, International commissions.
Identifiers: *France.

As part of a study of national policies and systems for water management in eight member countries of the Organization for Economic Cooperation and Development, the problems, management and programs of the water management system of France is analyzed. Described in the report are: (1) regulatory aspects in terms of legal and institutional structures, including a description of the statutory framework, licensing procedures, enforcement and sanctions and governmental water management institutions; and (2) economic aspects, including water user charges, pollution charges and a description of the recent Sixth Plan (1971-1976). The functions of the Agencies Financieres de Bassin are enumerated; these agencies, the technical and economic management instrument for river basins in France, are empowered to levy charges on any water taken up in the country--both state and private-owned--and including both surface and ground water. In determining the base of the charge for water users, the agency makes a careful distinction between making use of the water then putting it back in the ground and permanently removing the water from the main supply. Using principles of scarcity management, the agency as a rule levies charges on surface waters only in periods of low availability. (Harris-Wisconsin)
W77-09463

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE NETHERLANDS.
Organisation for Economic Co-Operation and Development, Paris (France).
Environment Directorate 29314, 1976. 50 p, 3 fig, 5 tab.

Descriptors: *Foreign countries, *Water management(Applied), *Water quality control, *Water policy, *Pollution taxes(Charges), Water resources development, Regulation, Management, Water law, Water allocation(Policy), Administration, Economics, Sea walls, Shore protection, Saline water intrusion, International commissions.
Identifiers: *Netherlands.

As part of a study of national policies and systems for water management in eight member countries of the Organization for Economic Cooperation and Development, the problems, management policy instruments and institutional framework of water management in Netherlands are analyzed. The country is characterized as a whole by salt intrusion into the groundwater because of the unique below-sea level situation of the artifically-built polder system. Much of the nation's water planning involves continued work on the long-term project of reclaiming land from the sea around the IJssel-lake (the former Zuiderzee). Water quality control is conducted through the Surface Waters Pollution Act of 1969 which aims at reducing such pollution to negligible proportions by 1965. In the initial phase, attention is mainly focused on oxygen-consuming pollutants. To attain this aim, taxes are being raised by both the national government and by regional authorities. The former uses income from the levies to issue grants to regional authorities and industries. Local water boards charge the individual polluters the costs of using their treatment plants. As a result of the taxes, many polluters have significantly reduced their waste water discharges into surface waters. (Harris-Wisconsin)
W77-09464

POLLUTION OF THE INTERSTATE AND INTRASTATE WATERS OF THE UPPER MISSISSIPPI RIVER AND ITS TRIBUTARIES.
For primary bibliographic entry see Field 5G.
W77-09529

FEDERALISM AND THE DEVELOPMENT OF OUTER CONTINENTAL SHELF MINERAL RESOURCES,
Miami Univ., Fla. School of Law.
R. Breeden.
Stanford Law Review, Vol 28, p 1107-59, July 1976.

Descriptors: *Oil, *Federal government, *Political aspects, *Continental shelf, *California, State governments, Offshore platforms, Coasts, Oil spills, Oil fields, Exploitation, Oil industry, Water pollution, Submerged Lands Act, Environmental effects, Ecology, Nonstructural alternatives, Planning, Legal aspects, Legislation, Water law, Water policy, Constitutional law.
Identifiers: *Outer continental shelf, *National Environmental Policy Act, *Coastal Zone Management Act of 1972, *Federal Water Pollution Control Act Amendments of 1972, Minerals, Territorial seas(Jurisdiction), Territorial waters, Coastal zones, Environmental impact statement, Marine environment.

Development of the vast petroleum reserves of the Outer Continental Shelf (OCS) by oil lease sales generates great amounts of revenue for the federa government, but the states, as owners of many areas of the coastal land mass, bear the brunt o the problems of cost and of adverse environmenta effects. Local interests, to the extent they are de nied participation in planning the exploitation o offshore oil, can be expected to try to imped federal plans for rapid development of thes resources. The article analyzes the sources of stat power--proprietary, the police powers, and statu tory--in relation to the federal powers and e amines areas where the states can use court litig tion to obstruct federal plans. Reliance on the j diciary as a channel for political input and f redress would be unwise, as it would create checkerboard of conflicting adjudications, not mentuon the costs in terms of time and mone With the aim of achieving the dual national goa of energy production and protection of the coas lines, the author makes proposals which would i crease state decisionmaking at the initial stag and make the resource bureaucrats in the vario federal departments more accountable to t political process. (Jones-Florida)
W77-09531

FLOODPLAIN ZONING--AN ALTERNATI APPROACH TO LAND REGULATION FLOOD HAZARD AREAS: A CASE STUD KALAMAZOO, MICHIGAN,
For primary bibliographic entry see Field 6F.
W77-09532

LAND USE CONTROL IN THE COAST ZONE: THE DELAWARE EXAMPLE,
Natural Resources Law Inst. Portland, Oreg.
For primary bibliographic entry see Field 6F.
W77-09533

REGULATING DEVELOPMENT ALONG T CALIFORNIA COAST,
California Univ., Davis. Environmental Stu Program.
For primary bibliographic entry see Field 4A.
W77-09534

THE ROLE OF IRRIGATION IN FO PRODUCTION,
Food and Agriculture Organization of the Un Nations, Rome (Italy). Land and Water Deve ment Div.
For primary bibliographic entry see Field 3F.
W77-09535

SECTION 1424(E) OF THE SAFE WA DRINKING ACT: AN EFFECTIVE MEAS AGAINST GROUNDWATER POLLUTION,
For primary bibliographic entry see Field 5G.
W77-09536

FEDERAL COMMON LAW UNDER 13 (COMMENT ON ILLINOIS V CITY OF WAUKEE),
H. S. Abrahams.
Nebraska Law Review, Vol 52, No 2, p 3 1973.

Descriptors: *Common law, *Illinois, *Fede risdiction, *Wisconsin, Judicial decisions, pollution, Lake Michigan, Legal aspects, ties(Legal), Water law, State jurisdiction, ment, Legislation, Interstate, Lakes.
Identifiers: *Injunctive relief, *Federal Wate lution Control Act (FWPCA) Amendmen 1972, Nuisance(Water law), Federal commo Interstate waters.

In this casenote the author discusses the C holdng in the named case that there is a f common law of pollution, and that the feder trict courts have jurisdiction over suits under that common law. The holding was a

the state of Illinois' attempt to invoke the ginal jurisdiction of the Supreme Court to issue injunction against instrumentalities of the state Wisconsin. The allegation was that four cities d two local sewerage commissions of Wisconsin re unlawfully polluting Lake Michigan. The urt denied the motion to file but remitted the ties to an appropriate district court. The Court erves that Congress has enacted many statutes ulating the pollution of interstate waters, and soned that the pollution of ambient air or in- tate waters was an area where federal, not e, law would govern. The commentator con- ers that the application of the holding may be ited to suits involving governmental parties or uits in equity, but that such limitations would improper in view of the broadly stated nouncements in the Illinois opinion. (Jones- rida)
7-09537

ALYTIC VARIABILITY: IMPLICATIONS R PERMIT COMPLIANCE,
primary bibliographic entry see Field 5G.
7-09538

V OPPORTUNITIES FOR STATE PAR- IPATION IN THE CONTROL OF RADIOAC- E POLLUTION,
primary bibliographic entry see Field 5G.
7-09539

OLUTION OF COASTAL STATE JURISDIC- N: A CONFLICT BETWEEN DEVELOPED DEVELOPING NATIONS,
tingen Univ. (West Germany). Institut fuer kerrecht.
. Martens.
ogy Law Quarterly, Vol 5, No 3, p 531-553 5).

riptors: *Treaties, *United Nations, *Law of sea, *Continental shelf, United States, ernments, Oceans, Fisheries, International International waters, Jurisdiction, Naviga- Marine fisheries, Oil, Straits, Bodies of r, Foreign countries.
ifiers: *Coastal states, *Marine resources, itorial seas, *Mineral resources, *Seabed.

more than 300 years commentators have ed whether oceans or parts of them may be priated or reserved for the exclusive use of ular nations. The generally accepted limit for orial waters was three miles, with some na- claiming as much as a 12 mile limit, until l War II, when the United States, followed veral Latin American nations, extended terri- control of marine resources to the limits of ntinental shelf. Successive declarations of states extended their own coastal claims n distance and scope. At this time some na- claim sole sovereignty over 'territorial seas' 0 miles, despite the efforts of the United Na- to establish uniform jurisdictional limits for stal states. Three conferences on the law of ea have failed to arrive at a workable nism for enforcement and adjudication of ational law, or even a consensus as to what w should be. Prospects of reaching agree- among the numerous states involved are cated considerably by the disparity of in- between the developed nations and the ping nations; the author summarizes the of the law of the sea as of the end of the Conference. (Sloan-Florida)
9541

OLEUM LEGISLATION IN THE NORTH OUNTRIES,
Brenscheidt.
International Law Journal, Vol 11, No 2, p (1976).

Descriptors: *Foreign countries, *Oil fields, *International waters, *Exploration, Oil, Oil industry, Exploitation, Legal aspects, Boundary disputes, Boundaries(Property), Water law, Water rights, Off-shore platforms, Pipelines, Legislation, Continental shelf, Oceans, Drilling, Oil wells, Jurisdiction.
Identifiers: *North Sea, Denmark, Netherlands, Norway, Great Britain, Licenses.

The most recent developments in the field of exploitation of treasures of the sea have occurred in the offshore mining of minerals. This offshore mineral extraction has raised national and international legal, political, economic and technological problems. The author discusses the petroleum legislation and licensing policies of five North Sea countries: Denmark; the Federal Republic of Germany; the Netherlands; Norway; and the United Kingdom. Despite the short twelve year history of West European off-shore petroleum legislation, both legislative and licensing policies have been subject to variations and remarkable changes, particularly in countries with a high probability of success in producing oil. While the boundary disputes in the North Sea have been settled, new international legal questions have recently arisen. For the first time a giant oil field has been discovered which extends across an international boundary in the sea. The plans for this well, which stretches from Norwegian to British waters, must be determined in a spirit of cooperation by the countries involved. (Rieck-Florida)
W77-09542

WATER LAW - WELL PERMITS - UNAPPROPRIATED WATER AND MAXIMUM UTILIZATION, HALL V. KUIPER, 510 P.2D 329 (COLO. 1973),
For primary bibliographic entry see Field 6D.
W77-09543

CLEAN AIR EQUALS DIRTY WATER,
Los Angeles Dept. of Public Works, Calif.
For primary bibliographic entry see Field 5G.
W77-09544

WATER POLLUTION CONTROL FEDERATION SPEAKERS ZERO IN ON POLLUTION CONTROL LAW,
For primary bibliographic entry see Field 5G.
W77-09546

THE LEGAL IMPLEMENTATION OF COASTAL ZONE MANAGEMENT: THE NORTH CAROLINA MODEL,
North Carolina Univ. at Chapel Hill. School of Law.
T. J. Schoenbaum, and R. H. Rosenberg.
Duke Law Journal, Vol 1976, No 1, p 1-37 (March 1976).

Descriptors: *North Carolina, *Land use, *Zoning, *Land management, Legal aspects, Regulation, Local governments, State governments, Federal government, Administrative agencies, Project planning, Land, Land classification, Land development, Land resources, Parks, Recreation, Conservation, Land appraisals, Governmental interrelations, Permits, Political aspects, Social aspects.
Identifiers: *Coastal Zone Management Act, *North Carolina Coastal Area Management Act, *North Carolina Environmental Policy Act, Transferable development rights, Land banking, Land conservancy trust, Planned unit development, Coastal zone management.

North Carolina has recently developed a coastal zone management program in response to the federal Coastal Zone Management Act of 1972. The problems in North Carolina's program are typical, even though its program is more advanced than most states. New costal management laws will founder if the legal mechanisms for implementation are inadiquate. Implementation requires a land use guidance system which incorporates the concept of carrying capacity of natural resources with the more traditional planning tools, with an eye toward coordination and efficient use. Zoning regulations should consider environmental consequences. No variances should be granted unless it can be demonstrated that such variance would not be detrimental to the environment. A system of planned unit development should also be implemented, allowing the clustering of all structures zoned out of other areas. Before projects are begun, the developer should submit an environmental impact statement. This will allow the zoning commission to ascertain the total impact, and thereby plan more predently for the future. Presently developers must comply with federal, state and local law, and often obtain a permit from each. A coordinated effort by all levels of government would aid in comprehensive planning. Finally, preferential tax treatment could be utilized to discourage development in certain areas and encourage it in others. (Moorhouse-Florida)
W77-09547

SOME LEGAL ASPECTS OF THE ATLANTIC LOBSTER INDUSTRY,
North Carolina Univ. at Chapel Hill. School of Law; and North Carolina State Univ., Raleigh. Sea Grant Coll. Program.
E. L. Winn, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 878, Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Program, North Carolina State University, Raleigh, Publication UNC-SG-75-07, July 1975. 15 p.

Descriptors: *Federal government, *Lobsters, *Regulation, *International waters, Shellfish, Commercial shellfish, Treaties, Maine, Massachusetts, North Carolina, Governments, Fishing, Commercial fishing, Trawling, Fishing gear, Nets, Boundary disputes, Continental shelf, Continental slope, New England.
Identifiers: *Lobster pots, *Coastal zone.

Lobsters are the second most valuable species in the United States fishing industry, and there is evidence that the world market is increasing. Lobster fishing is regulated by each state within its three mile limit, but there are no restrictions on the exploitation of the off-shore catch, which has been developing since the late 1950's. The offshore lobster fishery is found largely on the continental shelf and slope, up to over one hundred miles out. There is little recongnized law in the area, and as a result a significant lack of restrictions for the offshore industry. A major problem for United States lobster fishermen is the extensive damage which occurs to 'fixed gear'- stationary lobster pots - when trawling vessels, often from foreign nations, drag their weighted nets through lobster grounds while seeking free-swimming schools of fish. There are some agreements in force between the United States and other countries whose vessels travel in the lobster grounds of the U.S. continental shelf in regard to damages done to lobster pots, but for the most part, the aggrieved lobsterman must prove tortious conduct on the part of the trawling vessel in order to recover for damaged gear. (Sloan-Florida)
W77-09548

REPORT TO CONGRESS ON ABNORMAL OCCURRENCES: JULY-SEPTEMBER 1975.
Nuclear Regulatory Commission, Washington, D. C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 033, Price codes: A02 in paper copy, A01 in microfiche. March 1976, 15 p.

Descriptors: *Nuclear powerplants, *Nuclear energy, *Administrative agencies, *Accidents,

*Hazards, Safety, Federal government, Legislation, Social aspects, Public health, Radioactivity effects, Radioactivity, Industrial plants, Permits, Regulation, Management, Nuclear engineering, Nuclear reactors, Safety factors, Nuclear physics.
Identifiers: *Abnormal occurrences, *Energy Reorganization Act of 1974, Atomic Energy Act of 1954, Licenses.

The Energy Reorganization Act of 1974 established the Nuclear Regulatory Commission. Section 208 of the Act required the Commission to submit to Congress each quarter a report listing any abnormal occurrences at, or associated with, any facility which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954 or the Energy Reorganization Act of 1974. An abnormal occurrence is an unscheduled incident or an event which the Commission determines is significant from the standpoint of public health or safety. Each report must include the date and place of the occurrence, nature and probable consequence, cause or causes and any action taken to prevent recurrence. This is the second report to Congress on abnormal occurrences. It includes the results of a review of events at nuclear power plants for the third quarter of 1975 and the results of a review for overexposure to radiation at all licensed facilities for a nine-month period. Results indicate that there were no abnormal occurences at licensed nuclear power plants during the period and additionally no abnormal occurrences involving exposure to radiation were detected from January 1 to September 30, 1975. Consequently, the report focuses mainly on information concerning events reported to Congress in the first report dated October, 1975. (Moorhouse-Florida)
W77-09549

BENEFIT-COST ANALYSIS: ITS USE (MISUSE) IN EVALUATING WATER RESOURCE PROJECTS,
For primary bibliographic entry see Field 6B.
W77-09550

ARTIFICIAL WATER REGULATION OF LAKE SUPERIOR--A TAKING,
Washington Coll. of Law D. C.
D. Palmer.
Environmental Law, Vol 6, No 2, p 357-86 (1975).

Descriptors: *Lake Superior, *Great Lakes Region, *Water control, *Flood damage, *Regulated flow, Damages, Regulation, Water storage, Water management(Applied), Water injury, Water levels, Flooding, Water distribution(Applied), Lakes, Great Lakes, High water mark.
Identifiers: *Taking, *Artificial water regulation.

The shorelines of Lake Superior experienced severe inundation and erosion damages due to record high water levels caused by extreme amounts of precipitation between 1971 and 1975. In an effort to mitigate damages in the lower Great Lakes, the United States and Canada requested the International Joint Commission (IJC) to store water in Lake Superior by reducing its discharge thus allowing less water to escape from Lake Superior through he lower lakes. Consequently, near all-time high water levels of Lake Superior have caused impairment and erosion of portions of private shoreline property. This situation presents complex legal problems: first, the fith amendment to the United States Constitution prohibits the government from an uncompensated deprivation of private property. The author suggests that injured Lake Superior property owners may, therefore, be entitled to compensation of their loss under the theory of eminent domain. Second, an international law issue is whether the IJC violated the Boundary Waters Treaty by allowing the United States to raise the water levels without first approving an adequate compensation plan. After analyzing these issues, the author concludes that the possibilities are slight that a litigant could successfully vindicate his or her rights in court because the costs would be prohibitive and the Great Lakes present such a unique controversy. The only solution to the problems now under consideration is an amendment to the Coastal Zone Management Act of 1972, but it represents an incomplete resolution. (Josepher-Florida)
W77-09551

NEW ROLES FOR THE OLD DAM BUILDERS,
National Wildlife Federation, Washington, D. C. General Counsel Office.
For primary bibliographic entry see Field 6F.
W77-09552

WHAT ARE WE DOING ABOUT OIL SPILL.,
For primary bibliographic entry see Field 5G.
W77-09553

EFFLUENT STANDARDS: TRIALS AND TRIBULATIONS,
For primary bibliographic entry see Field 5G.
W77-09554

THE NEED FOR A NATIONAL OCEAN PROGRAM AND PLAN.
GAO Report to Congress, The Need for a National Ocean Program and Plan, 75 p, October, 1975. 1 fig, 2 chart, 11 append.

Descriptors: *Oceans, *Federal government, *Resources, *Administrative agencies, Ecology, Ecosystems, Oceanography, Marine geology, Fish, Natural resources, Transportation, Energy, Recreation, Economics, Costs, Benefits, Resources development, Oil.
Identifiers: *Marine resources, *Ocean policy, *Interagency Committee on Marine Science, Engineering and Resources, Minerals.

The oceans play a vital role in the Nation's welfare, economic self-sufficiency, and national security. Consequently, a concerted effort should be made to establish a comprehensive national ocean program. The urgent need for such a program is the focus of this report. Included are discussions of: The National Ocean Study Policy; the establishment of the National Oceanic and Atmospheric Administration; other federal agencies' participation in marine sciences and oceanic affairs; numbers and kinds of projects undertaken; amounts of funds allocated to these activities for various years; and an evaluation of these activities. Although Congress formally recognized the need for a national ocean program with the passage of the Marine Resources and Engineering Development Act of 1966, there is still no comprehensive ocean program. Three agencies have been created to consider national policy in this area, but none have been given the authority to see that is recommendations were implemented. One of these, the Interagency Committee on Marine Science, Engineering, and Resources, has been unable to determine (in the eight years since its creation) whether federal resources have been used effectively or efficiently in the areas of marine sciences and ocean affairs. (Sloan-Florida)
W77-09555

EFFLUENT GUIDELINES AND STANDARDS, PULP, PAPER AND PAPERBOARD POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-09556

EFFLUENT GUIDELINES AND STANDARDS, PHOTOGRAPHIC POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-09557

EFFLUENT GUIDELINES AND STANDARDS STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-09558

EFFLUENT GUIDELINES AND STANDARDS THE ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-09559

PERMIT PROGRAM REGULATIONS FOR AGRICULTURAL ACTIVITIES, (NPDES) (PROPOSED).
Environmental Protection Agency, Washington, D. C
Federal Register, Vol 41, No 36, p 7963-6, February 23, 1976.

Descriptors: *Permits, Agriculture, *Agricultural runoff, *Regulation, Federal Water Pollution Control Act, Rainfall-runoff relationships, Surface runoff, Forest management, Federal government, Administrative agencies, Legal aspects, Water pollution sources, Water pollution control, Legislation, Water pollution, Forestry, Forests, soils, Pollutants, Pollution, Surface waters, Irrigation canals, Irrigation, Irrigation ditches.
Identifiers: *Administrative regulations, National Pollutant Discharge Elimination System, Certification, Point sources(Pollution), Non-point sources(Pollution)

The Environmental Protection Agency (EPA) has proposed regulations applying the National Pollutant Discharge Elimination System (NPDES) permit program to point source discharges in agriculture and silviculture categories. Discharges of pollutants into navigable waters through discrete conveyances which results from the controlled application of water are considered agricultural activity point sources. Irrigation return flow ditches are the most common example. Discharges are to be governed by general permits which will be issued following notice and an opportunity for a hearing. The intent of the regulations is to exclude from the permit program natural runoff from agricultural land which results from precipitation events and is therefore non-point in nature. The agricultural and silviculture point source regulations are issued in compliance with a court order in NRDC v. Train. The EPA has taken an appeal of this case and therefore the final status of the proposed regulations is as yet unknown. (Moorhouse-Florida)
W77-09560

COUNTY OF ORANGE V. CHANDLER-SHERMAN CORPORATION (IMPLIED PUBLIC DEDICATION OF PRIVATE LAND THROUGH SUBSTANTIAL AND CONTINUOUS USE).
126 Cal. Rptr. 765-70 (Cal. App. 1976).

Descriptors: *California, *Public rights, *Implied benefits, *Recreation demand, *Beaches, Public access, Right-of-way, Recreation, Recreational facilities, Legal aspects, Land use, Adverse possession, Real property, Competing uses, Shore, Relative rights.
Identifiers: *Public use, *Public dedication, *Implied dedication, *Implied use, Landowner.

The county brought suit to establish public rights to a strip of beach under the implied public dedication doctrine. The doctrine allows public use of privately-owned land if, for a five-year period, there has been such continuous and substantial use of the property in question that the owners should have realized that their acquiescence amounted to an implied gift to the public. Although no

ty to the action attempted to dispute the vailidi-
of the public dedication doctrine, the owners
med that the use had not been substantial nor
tinuous enough for the doctrine to operate. To
port this contention, they presented evidence
how that generally there were never more than
people on the beach because of the beache's
tive isolation, and there was only casual as op-
ed to continuous use of the beach for public
eational activities. In addition, access to the
ch was by means of ill-defined paths which
forced the owner's contention that there was
a continuous volume of public traffic. The trial
ge refused to find that a public dedication had
en place and the appellate court affirmed.
nker-Florida)
7-09561

**IN NEPTUNE'S KINGDOM: PROBLEMS
) RESPONSES TO CONTAIN ENVIRON-
NTAL DEGRADATION OF THE OCEANS
OIL POLLUTION,**
mins Engine Co., Inc., Columbus, Ind.
primary bibliographic entry see Field 5G.
-09562

**TE WATER RESOURCES CONTROL
RD V FORNI (RIPARIAN RIGHTS DOC-
NE MODIFIED BY CONSTITUTIONAL
VISION).**
Cal Rptr 851-58 (Cal App 1976).

criptors: *California, *Riparian rights, *River
lation, *Water rights, Rivers, River flow,
t, Diversion, Pumping, Beneficial use, Regu-
n, Water allocation(Policy), Reservoirs, Ap-
riation, Riparian waters, Legislation, State
rnments, Relative rights, Administrative
cies.
tifiers: *Property interests, *Injunctive relief,
aratory judgment, Napa Valley.

tiff board brought action for injunction
or declaratory relief against defendant
vardists. Plaintiff sought to enjoin defendants
drawing water directly from the Napa River
otect the vineyards from frost. The plaintiff
ed that the direct diversion of water during a
period constituted an unreasonable use since
g this time the river flow is insufficient to
y the needs of all who are entitled to water.
ndants claimed that because they were ripari-
vners the plaintiff had no authority to prohibit
nit their use of water. The lower court gave
nent on the pleadings to the defendants. The
late court reversed, holding that because of a
itutional provision modifying the riparian
ine, the complaint was sufficient to state a
of action. The present doctrine requires a
nable use between riparian owners and
s, including appropriators. The appellate
held that the judgment on the pleadings was
icient to determine the question of reasona-
r unreasonable water use. In addition, the
noted that while defendants' argument that
d property rights cannot be taken without
ompensation was correct, the vested rights
y was not applicable to the present case.
ff-Florida)
09563

**SHEAD V CALIFORNIA REGIONAL
ER (WATER QUALITY STANDARDS
LD AS A VALID EXERCISE OF POLICE
ER).**
l Rptr 586-90 (Cal App 1975).

iptors: *California, *Water pollution,
ge disposal, *Water quality control, Legal
s, Administrative agencies, Sewage dis-
Sewage treatment, Sewage, Water pollution
s, Disposal, Waste disposal, Governments,
rge(Water), Water law, Waste treatment,
nment, Public rights, State governments,
l decisions.

Identifiers: Inverse condemnation, *Water codes, *Effluent guidelines, Environmental policy, Evidence, Notice, Property interests, Administrative regulations.

Plaintiffs brought an action for mandamus to restrain the enforcement of certain cease and desist orders issued by the defendant Board. Pursuant to section 13263 of the Water Code, the defendant adopted water quality requirements for waste discharges which are pumped indirectlty into the San Francisco Bay. These discharges are placed into the bay by district or municipal dischargers who operate sewage treatment plants. Cease and desist orders were issued by the defendant to three municipal dischargers who were found in violation of the water quality requirements. The defendant ordered the dischargers to refrain from further violations and prohibited the districts from authorizing any further connections to their sewage treatment facilities pending corrective measures. As a result the plaintiffs were prohibited from using their properties in a manner which would require a sewer connection. The lower court rendered judgment for the defendant. The appellate court affirmed, finding that the plaintiffs had been given sufficient notice of the hearing, had an opportunity to cross-examine and refute the defendant's evidence, and that the issuance of the order was a reasonable exercise of the state's police power. In addition, the orders were held not to constitute inverse condemnation of the properties. (Petruff-Florida)
W77-09564

NAVAJO TERMINALS, INC V SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION (SHORELINE REGULATORY PLAN DID NOT CONSTITUTE A TAKING OF PROPERTY).
120 Cal Rptr 108-10 (Cal App 1975).

Descriptors: *California, *Administrative agencies, *Boundary disputes, *Shores, State governments, Legal aspects, Judicial decisions, Condemnation, Boundaries(Property), Legislation, Planning, Project planning, Water law, Administrative decisions, Canals, Local governments, Coasts.
Identifiers: *Tidal canal, *Coastal zone management, Inverse condemnation, Coastal zones, Property, Property interests, McAteer-Petris Act.

Plaintiff property owner brought action against defendant commission alleging that defendant's resolution establishing portions of plaintiff's property as a waterfront park constituted inverse condemnation. The lower court sustained defendant's demurrer and dismissed the action. The plaintiff appealed. The defendant commission was created by the McAteer-Petris Act. This Act contemplates adoption of a general plan to analyze, plan, and regulate the San Francisco Bay and its shoreline. Pursuant to the Act the defendant adopted a resolution fixing and establishing within the shoreline band the boundaries of the water-oriented priority land uses. Portions of the plaintiff's property fronting on the US Tidal Canal was designed for use as a waterfront park in this resolution. Plaintiff contends that the resolution constituted a taking because the defendant had no authority to modify the plan. The appellate court affirmed the decision of the lower court because the plan was modifiable by the legislature, hence there had not as yet been a taking. (Petruff-Florida)
W77-09565

COASTAL ZONES.
Oregon Rev. Stat. secs. 191-110 thru -180 (1973).

Descriptors: *Oregon, *Legislation, *Comprehensive planning, *Administrative agencies, Future planning(Projected), Long-term planning, State governments, Competing uses, Local governments, Governmental interrelations, Water resources development, Management, Natural resources, Regional development, Social aspects, Economic impact.
Identifiers: *Coastal zone management, *Oregon Coastal Conservation and Development Commission, Comprehensive studies, Coastal waters.

The Oregon Legislative Assembly has recognized the state's coastal zone as a valuable part of the natural resources of the state. Additionally, the legislature has recognized a conflict among differing interests over the use of the coastal zone. Consequently, the Oregon Coastal Conservation and Development Commission has been established to manage Oregon's coastal zone. The Commission consists of representatives of four newly created coastal zone regions. The Governor shall appoint two members from each district as well as two at-large members. The remaining posts will be filled by two elective county, city and port district officials from each district. The Commission will study the natural resources of each coastal zone and recommend the highest and best uses of such resources. More specifically, the Commission will be charged with submitting a report to the Governor outlining a comprehensive plan for the preservation and development of the natural resources of the coastal zone. In preparing such a plan the Commission shall consider the quality, quantity, and movement of water, existing local land use plans and zoning ordinances, and all available economic, ecological and scientific information. (Moorhouse-Florida)
W77-09566

ISRAEL V MORTON (RESTRICTIONS ON RIGHTS OF CONVEYANCE OF PROPERTY WITHIN A FEDERAL RECLAMATION PROJECT).
549 F2d 128-33 (9th Cir 1977).

Descriptors: *Federal Reclamation Law, *Grand Coulee Dam, *Washington, *Real property, Land reclamation, Property values, Judicial decisions, Water contracts, Reclamation states, Irrigation districts, Columbia River, Water rights, Legal aspects, Water law, Farm units.
Identifiers: *Property interests, *Real property law.

Appellants, landowners within the Columbia Basin Project, sought judicial declaration of their right to sell excess land within the federal reclamation project without restriction on price and with the right for the land to receive water. The Project Act provided that for a period of five years from the time water became available for the lands covered, no conveyance of land could be made in excess of its appraised value, and if made, the right of the estate to receive water from the project works could be cancelled. The restriction was no longer in effect when appellants acquired their excess land, but later amendments to the Project Act revived the restriction. Appellants' claim was that applying the amendment to them would be a deprivation of property without due process. In holding against the landowners, the court distinguished between natural-flow water and project water with the right to the latter dependent upon the terms fixed by the United States. At the time appellants acquired their land it was subject to the terms of future amendments and supplements, so that their rights did not vest at the time of acquisition. (Jones-Florida)
W77-09567

CAMPBELL RANCH, INC. V WATER RESOURCES DEPARTMENT (GOVERNMENT AGENCY MUST COMPLY WITH NOTIFICATION PROCEDURES BEFORE DECLARING CRITICAL GROUND WATER AREA).
558 P2d 1295-98 (Or Ct App 1977).

Descriptors: *Groundwater, Administrative agencies, *Water allocation(Policy), *Irrigation wells, *Oregon, Water rights, Appropriation, Legal

aspects, Legislation, Judicial decisions, Water resources, Water law, Prior appropriation, Preferences(Water rights), Groundwater availability, Groundwater resources, Wells, Irrigation.
Identifiers: *Groundwater management, Notice, *Administrative Procedures Act(APA), Ground Water Act of 1955, Critical ground water area, Water appropriators.

Plaintiffs were water appropriators in an area which was declared by the defendant Water Resources Department to be a critical ground water area. The defendant, after making this determination, imposed restrictions on the area. These restrictions included placing a moratorium on construction of new irrigation wells and a limitation on the removal of water from existing irrigation wells. Plaintiffs appealed the order claiming that the proceedings were initiated without proper notice. The defendant relying on the Ground Water Act of 1955 claimed that notification by ordinary mail was sufficient. This Act does not stipulate that notification by registered mail is required. However, the plaintiffs claimed that the defendant is also subject to the Administrative Procedures Act. This Act (APA) requires notification by registered mail in all contested cases. A contested case is one in which individual legal rights are decided. The court found that the agency proceeding came within the meaning of a contested case and that the APA procedure should have been followed. Therefore, the court reversed and remanded the order. (Petruff-Florida)
W77-09568

WIMMER V COMPTON (ASSESSMENT OF FLOODWATER DAMAGES IN CASES INVOLVING ADJACENT LANDOWNERS).
560 P2d 626-32 (Or Sup Ct 1977).

Descriptors: *Oregon, *Flood damage, *Drainage, *Adjacent land owners, *Landfills, Floodwater, Damages, Flooding, Flood flow, Flood discharge, Flood control, Water control, Water law, Water rights, Water courses(Legal aspects), Drainage area, Drainage water, Drainage practices, Culverts.
Identifiers: *Injunction.

Plaintiff landowner sought an injunction and damages against defendant, an adjacent landowner. Defendant maintained a land fill operation on his property and plaintiff claimed that it blocked the usual course of runoff of ordinary flood waters which annually followed a natural course across defendant's land. Plaintiff claimed that defendant's landfill raised the elevation of his property and the raised elevation was the cause of flood damages to plaintiff's land. The trial court granted the injunction but refused to award damages, labelling them 'speculative'. Defendant appealed the injunction and plaintiff cross-appealed on the issue of damages. Plaintiff argued that the same rules that apply to upper and lower riparian owners (that they cannot unreasonably interrupt the natural flow of water to the detriment of the other) should apply to adjacent owners on opposite sides of a flood water course. The appellate court accepted plaintiff's premise, but affirmed the trial court's ruling because plaintiff was unable to carry his burden of proof in view of the numerous other factors (substitution of culverts for bridges, deposits of silt preventing drainage and accumulation of debris in ditches) contributing to flood conditions. (Denker-Florida)
W77-09569

PAYNE V WHITING (UPPER RIPARIAN OWNER RESPONSIBLE FOR SURFACE RUNOFF DAMAGES).
231 SE2d 796-8 (Ga Ct App 1976).

Descriptors: *Georgia, *Riparian rights, Surface runoff, *Ponding, Judicial decisions, Legal aspects, Water law, Water policy, Runoff, Puddling, Surface waters, Non-navigable waters, Streams, Water rights, Prescriptive rights, Streamflow, Flow, Sedimentation.
Identifiers: *Property interests, *Evidence, Sediment pond.

The defendants, upper riparian owners of a non-navigable stream, appealed from a jury verdict awarding damages to the plaintiff, the lower owner. In the original action, the plaintiff alleged that the negligent manner in which the defendants had graded and cleared their land allowed surface water to concentrate and flow onto plaintiff's property in an unnatural manner. This runoff water contaminated the plaintiff's pool with large amounts of sediment filling it to the point where it became virtually unusable. To clear the water and prevent further damage, plaintiff built a sediment pond. Plaintiff then initiated a suit to recover damages. The jury found that the defendant builders were negligent and awarded plaintiff damages in the amount of money expended to clear the pond. Defendants appealed from this verdict alleging that the wrong measure of damages was used, that inadmissible evidence was admitted, and that the trial judge erred in not giving two requested instructions to the jury. The appellate court found no reversible error and affirmed the judgement of the lower court. (Petruff-Florida)
W77-09570

CABAL V KENT COUNTY ROAD COMMISSION (REASONABLE USE OF AN EXPRESS EASEMENT).
250 NW2d 121-23 (Mich Ct App 1977).

Descriptors: *Michigan, *Right-of-way, *Overburden, *Reasonable use, Legal aspects, Judicial decisions, Real property, Littoral, Recreational facilities, Recreation, Water law, Water rights, Legal review, Riparian rights, Prescriptive rights, Lakes.
Identifiers: *Quiet title, Easements, *Adverse possession, Privileges, Exclusive use, Permissive use, Nonpermissive use.

Plaintiffs, owners of lots fronting on a road which parallels the coastline of a lake, brought suit to quiet title to a strip of land between the road and the lake's edge. The lakeside strip was used by defendants, adjacent lot owners, for boating, maintaining a dock, sunbathing and parking cars. Defendants based their argument on three theories: express easement (legal right of access on another's land), prescriptive rights through adverse possession (rights gained through open, continuous non-permissive use for a statutory period), and littoral (riparian) rights. The Michigan Court of Appeals held that plaintiffs could not claim exclusive rights in the strip and that defendants could maintain their dock and enjoy boating pursuant to their express grant of easement. It dismissed defendant's other two theories. However, the court went on to hold that defendants could only enjoy those privileges which were reasonably connected to the easement, and could not overburden the easement by using the strip for sunbathing or picnicking or parking cars. In short, defendants were only entitled to reasonable use of the easement. (Denker-Florida)
W77-09571

CAINE V CANTRELL (PRIVATE INDIVIDUALS NOT ALLOWED TO OBSTRUCT PUBLIC LANDS).
369 A2d 56-61 (Md Ct App 1977).

Descriptors: *Maryland, *High water mark, *Low water mark, *Permits, Judicial decisions, Local governments, State governments, Oceans, Legislation, Legal aspects, Water law, Building codes, Jurisdiction, Public access, Public rights, Sea level, Water levels.
Identifiers: State policy, *Property interests, *Public trust doctrine.

Appellant property owners appealed from a tria court order which declared that a parking structur erected in the bed of a public street adjacent to a ocean front lot and a house erected on the lo should be abated as public nuisances. The lowe court held that the agents of the local governmer were without authority to grant a permit allowing private individual to obstruct a public street. Th appellate court affirmed. The lower court also co cluded that the ownership of land lying betwee the mean high water mark and the mean low wat mark is vested in the state and held in trust fo public use. The house was found to extend fiv feet easterly of what the trial court found to be t mean high water mark. It was then ordered to b abated. The appellate court held that the trial cou erred in ordering the entire structure to b removed and revised the order to include only th portion of the structure which extended beyon the mean high water mark. (Petruff-Florida)
W77-09572

PITMAN V WASHINGTON SUBURBAN SAN TARY COMMISSION (ENVIRONMENTAL E FECTS REPORTS ONLY REQUIRED FO STATE ACTIONS).
368 A2d 473-78 (Md Ct App 1977).

Descriptors: *Sludge disposal, *Judicial decisio *Administrative agencies, *Environmental fects, *Maryland, Legislation, Legal aspects, A propriation, Economics, Local governmen State governments, Cases, Water law, Le review, Government finance, Sludge treatme Sludge, Sewage, Sewage treatment.
Identifiers: Administrative regulations, Envir mental policy, State policy, Environmental effe report.

Plaintiffs, persons residing in the vicinity o proposed sludge disposal site, brought action enjoin the defendant Commission from purcha the site. The plaintiffs alleged that no environm tal effects report had been prepared as required the Maryland Environmental Policy Act. Un the Act a report must be prepared for e proposed state action that will significantly af the environment. The Act defines state actio requests for legislative appropriations or o legislative actions that will alter the quality of air, land, or water. The court held that the referred only to action taken by the state legi ture and that the fact that there existed a relat ship between the proposed site and a state fun sewage treatment plant was insufficient establish state action. Accordingly, the court h that the Commission was not required by the to prepare a report since it had made no reque the state legislature for the site purchase pric for other action. Furthermore the court found appropriation requests made to local gover bodies would not make the requirements of Act operative. (Petruff-Florida)
W77-09573

LANSCO, INC. V DEPARTMENT OF ENVIR MENTAL PROTECTION (INSUROR'S LIAB TY FOR COST OF CLEAN UP OF OIL SPILL
368 A2d 363-64 (NJ Super Ct App Div 1977).

Descriptors: *New Jersey, *Oil spills, *Clea *Insurance, Acts of God, Judicial decis Water law, State governments, Water qu Water pollution control, Oil industry, L aspects, Protection, Oil pollution, Regulation.
Identifiers: *Hazardous substances, Liability

Defendant insurance companies appealed the sion of the Superior Court of New Jersey, C cery Division, that it indemnify its insured costs incurred in cleaning up oil spillage. Th sured was legally liable for the cost of clea under the New Jersey Water Quality Improve Act of 1971. In the appeal, the insuror soug establish that if the discharge was due to ac third parties or vandals, that would be an e

n to liability under the statute. The Appellate vision held that this would not be an exception liability, the only two exceptions to liability for charge of petroleum products being those ich occur as a result of (a) an act of war, or (b) act of God. The court thus affirmed the finding he insuror's liability. (Jones-Florida)
7-09574

TERATION OF CHANNEL OF STREAMS RMIT SYSTEM).
ho Code Ann secs 42-3801 thru -3810 (Supp 6).

scriptors: *Idaho, *Streams, *Water quality trol, *Wildlife conservation, Fish conserva-, Environmental control, Aesthetics, Recrea-, Degradation(Stream), Surface-groundwater tionships, Law enforcement, Regulation, nnels, Water pollution control, Water pollu- effects, Water policy, Wildlife habitats.

stream channels of the state of Idaho and their ironments shall be protected against alteration the preservation of the fish and wildlife itat, aquatic life, recreation, aesthetic beauty water quality. Before engaging in any project ch may alter a stream channel, an application, mpanied by plans, must be submitted to the e's department of water resources. After con-ng with other state agencies, the department ctor must determine the likely effect of the posed alteration on the stream channel's en-nment. If the applicant is dissatisfied with the ctor's decision regarding the application, he appeal to the state water resources board for review. No permit is required to clean or ir stream channels, canals, ditches, or laterals. ervoirs and port districts are exempt from the When emergencies require immediate action, director may waive the provisions of the act. ators are guilty of a misdemeanor and may be shed by fine. Any unauthorized channel al-ion may be declared as public nuisance and ect to abatement. (Rieck-Florida)
-09575

SERVATION OF CERTAIN LAKES AS LTH RESORTS AND RECREATION CES.
o Code Ann secs 67-4301 thru -4312 (1948), as nded (Supp 1976).

riptors: *Idaho, *Recreation, *Lakes, ervoirs, *Appropriation, Recreation facili-Scenery, Social aspects, Social needs, Water Legal aspects, Aesthetics, Preferences(Water s), Priorities, Legislation, Public health, c benefits, Social values.
ifiers: Priest Lake, Pend d'Oreille Lake, r d'Alene Lake, Big Payette Lake, Thousand gs.

governor of Idaho may appropriate in trust all nappropriated water of Big Payette Lake, or ich as may be necessary to preserve the lake present condition. The lands between the high w water marks at the lake are to be used as a ation place, and not as a storage reservoir for tion or power purposes. The unappropriated of Priest, Pend d'Oreille and Coeur d'Alene may also be held in trust for the state's ns for health and recreational purposes. Cer-escribed portions of Malad Canyon, Niagra gs, Big Springs and Box Canyon are to be or the same purposes. Upon cessation of the f waters in Thousand Springs for electrical ation, the Springs shall be preserved for their beauty. The permits for all of the described s shall be issued by the director of the de-ent of water resources after the determina-f the historical waterflow. Any future ap-ation of the specifically described waters re granted above the designated flow limits not involve any diversion that shall detract he geological value, historical significance ic attraction of the lands. (Rieck-Florida)

W77-09576

STATE OF FLORIDA V FLORIDA NATIONAL PROPERTIES, INC. (RIPARIAN BOUNDARIES IN MEANDERED, FRESH-WATER LAKES).
338 So2d 13-21 (Fla 1976).

Descriptors: *Florida, *Boundaries(Property), *High water mark, Accretion(Legal aspects), Ownership of beds, Riparian rights, Riparian land, State governments, Land tenure, Legal aspects, Surveys, Patents, Adjacent land owners, Shores, Real property.
Identifiers: *Reliction, *Property interests.

Plaintiff, an owner of lands bordering a navigable lake, sought to quiet title to property alleged by the state to be sovereignty bottom lands under a statute setting boundaries of such lands as of the date of statehood. The boundary claimed by the state included approximately half of plaintiff's purchased property. The state alleged that the lake level had been artificially lowered by drainage conducted by surrounding property owners. Plaintiff contended that any lowering of the lake was legally reliction, and that the boundary was the present ordinary high water line. The Supreme Court of Florida found the application of the statute to establish the boundary as of the date of statehood unconstitutional, noting that access to water is often the most valuable feature of riparian property. The court also observed that operation of the statute would deny the plaintiff due process by taking the land without payment of just compensation. Furthermore, the property line separating sovereignty and riparian property rights is the ordinary high-water mark in meandered fresh-water lakes. (Molloy-Florida)
W77-09577

TANNERS' COUNCIL OF AMERICA V TRAIN (REVIEW OF EFFLUENT LIMITATIONS FOR TANNING INDUSTRY).
540 F2d 1188-95 (4th Cir 1976).

Descriptors: *Federal Water Pollution Control Act, *Tannery wastes, *Standards, *Administrative agencies, Industrial wastes, Waste water treatment, Federal government, Permits, Effluents, Administrative decisions, Technology, Decision making, Legal review, Water pollution sources, Regulation.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Plaintiff trade association of leather tanners brought action to set aside regulations establishing effluent limitations guidelines and standards of performance for industry point source categories, issued by the Administrator of the Environmental Protection Agency (EPA) under the Federal Water Pollution Control Act (FWPCA). Plaintiff alleged that the EPA was not authorized to set effluent limitations, and that the regulations were arbitrary and capricious due to technical errors made in the rulemaking process. The court noted that authorization to set the limitations had already been upheld, and that the EPA had to show all grounds relied on during the rulemaking process. In considering the limitations, which imposed a transfer of technology from the meat packing industry to the tanning industry, the court failed to find any evidence in the record showing reasonableness of the reduction levels. Failure to consider reduction of efficiency in low temperatures was also noted by the court. Because of the statutory requirement for continuing EPA review, the 1983 limitations were upheld, while the 1977 limitations standards were remanded to the EPA for reconsideration. (Molloy-Florida)
W77-09578

CPC INTERNATIONAL, INC V TRAIN (REVIEW OF EFFLUENT LIMITATIONS FOR THE CORN WET MILLING INDUSTRY).
540 F2d 1329-45 (8th Cir 1976).

Descriptors: *Water quality standards, *Industrial wastes, *Waste water treatment, *Federal government, *Administrative agencies, Federal Water Pollution Control Act, Permits, Standards, Decision making, Effluents, Food processing industry, Legal review, Administrative decisions, Cost analysis, Estimated costs, Technology.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Administrative regulations, Corn wet milling industry.

Petitioner representatives of the corn wet milling industry sought review of regulations promulgated by the Environmental Protection Agency (EPA) setting forth standards of effluent discharges for new plants under the Federal Water Pollution Control Act Amendments of 1972. The standards had been remanded to the EPA in a prior case with instructions either to furnish support for the standards or to establish new ones. Petitioners alleged that the EPA had failed to fairly reconsider the standards, that the 1977 standards could not be met by proposed new technology, and that the EPA had erred in determining projected cost figures of compliance. The court found that the EPA had made a serious effort to obtain available information on the standards, and upheld all new source standards except for BOD5 and TSS maximum averages of daily effluent values. Neither capital costs nor recovery and operating costs were shown to be arbitrary. The case was remanded to the EPA with instructions to revise the excepted standards within 60 days, with the court again to review if lower standards were adopted. (Molloy-Florida)
W77-09579

UNITED STATES V COMMODORE CLUB (CRIMINAL PENALTY FOR FILLING VIOLATION).
418 F Supp 311-23 (E D Mich 1976).

Descriptors: *Michigan, *Penalties(Legal), *Law enforcement, *Rivers and Harbors Act, *Navigation, Legislation, Permits, Federal government, Administrative agencies, Landfills, Federal jurisdiction, Regulation, Navigable waters, Lakes, Riparian rights, Judicial decisions.
Identifiers: *Fill permits, Navigational obstructions, Navigability tests.

Corporate and individual defendants were tried in criminal prosecution for violating the Rivers and Harbors Act of 1899, which prohibits the construction of any obstruction of navigable waters without prior authorization. The defense alleged that the prosecution failed to prove that navigable waters were involved, that authorization was not obtained, and that the requisite intent was present. Defendants had purchased swampy land for development, and applied for a permit from the Corps of Engineers. A final draft permit was sent by the Corps before compliance with prerequisites, and the defendants admittedly began filling. The court held that while the final draft permit might equitably prevent the Corps from enjoining further activity, the criminal statute requires a valid permit, which was not issued. The court considered the history of the property in question, past uses, and extent of recent flooding to determine that the government had not proved to the necessary degree of certainty that the waters were navigable. Considering the penalties imposed, uncertainty of the Corps' jurisdiction, and availability of injunctive remedies, the court held that general intent to violate the Act must be established for criminal conviction, and that the defendants were, therefore, not guilty. (Molloy-Florida)
W77-09580

HILL V TENNESSEE VALLEY AUTHORITY (APPLICATION OF ENDANGERED SPECIES ACT TO FEDERAL PROJECT).
419 F Supp 753-64 (E D Tenn 1976).

Descriptors: *Tennessee Valley Authority, *Dams, *Fish, *Environmental effects, *Aquatic habitats, Fish establishment, Habitats, Legislation, Budgeting, Administration, Federal government, Federal project policy, Tennessee River, Wildlife conservation.
Identifiers: *Snail darter.

Plaintiff environmental groups sought to enjoin completion of a dam by the Tennessee Valley Authority (TVA) by alleging violation of the Endangered Species Act (ESA). ESA provides in part that all federal departments and agencies shall insure that their actions do not jeopardize the existence of endangered species. The species so endangered by the dam was the snail darter, a small fish whose primary habitat was the river being dammed. The court agreed with plaintiffs' allegation that completion of the dam would result in modification or destruction of the snail darter's critical habitat. In determining whether ESA required that an injunction be issued to prevent completion of the project, the court considered the record of Congressional funding of the project, the fact that authorization for the project predated by ESA by seven years, and the absence of reasonable modifications that would insure compliance with ESA. The court concluded that ESA would not operate in such a manner as to halt the completion of this particular project. (Molloy-Florida)
W77-09581

STATE V OROVILLE-WYANDOTTE IRRIGATION DISTRICT (INHERENT DUALITY OF THE FEDERAL POWER ACT).
411 F Supp 361-68 (E. D. Cal 1975).

Descriptors: *California, *Federal Power Act, *Federal-state water rights conflicts, *Administrative agencies, Legal aspects, Jurisdiction, State jurisdiction, Water rights, Irrigation districts, Projects, Judicial decisions, Canals, Tunnels, Federal government, State governments, Relative rights, Reservoirs.
Identifiers: Injunctions(Prohibitory), Federal Power Commission, California Public Utilities Commission.

Plaintiff state brought action seeking declaratory and injunctive relief regarding alleged conflicting orders between state and federal agencies against defendant irrigation district, itself a state agency. Defendant was required by the Federal Power Commission to construct a tunnel that would be destroyed by plaintiff's project. The state utility commission therefore ordered the plaintiff to be responsible for a substitute facility. Defendant contended that the licensed operation of plaintiff's reservoir would destroy defendant's canal. The plaintiff then contended that damages would result from defendant's unauthorized canal modifications in violation of defendant's obligations under the Federal Power Act, therefore relieving plaintiff of responsibility. The California district court held that while the Federal Power Act confers broad federal control over power projects, states may continue to exercise powers compatible with the duality inherent in the act. States may not veto projects which have been approved by federal agencies. Since the state agency did not substantially interfere with either project, the Federal Power Commission's requirement that the defendant irrigation district build a canal and the state agency's requirement that the plaintiff be financially responsible for the replacement tunnel were not in conflict. (Rieck-Florida)
W77-09582

STATE V LANG (DEFINING TIDAL WETLAND PROPERTY).
383 NYS2d 400-01 (App Div 1976).

Descriptors: *New York, *Wetlands, *Tidal waters, *State jurisdiction, *Regulation, State governments, Marshes, Tidal marshes, Conservation, Land use, Legal aspects, Land management, Land resources, Protection, Land development, Environmental control, Environmental effects, Land classification.
Identifiers: *Injunctions(Prohibitory).

Plaintiff state brought this action to enjoin defendant land owner from altering the state of tidal wetlands. The defendant was the owner of a one-acre parcel of land which was completely surrounded by partially improved non-wetland property. The one-acre parcel was artificially connected to tidal waters by a ditch, culvert and pipe. The lower court denied plaintiff's motion for a partial summary judgment and granted defendant's cross motion for summary judgment. Affirming the order as appealed, the New York Supreme Court, Appellate Division, held that the one-acre plot, which was only artificially connected to tidal waters and surrounded by partially improved non-wetland property, was not a tidal wetland as defined in the Environmental Conservation Law. (Welch-Florida)
W77-09583

CONSERVATION DISTRICTS LAW.
Wash Rev Code Ann, secs 89.08.005 thru .020, .070 thru .100 and .220 (1975).

Descriptors: *Erosion control, *Long-term planning, *Administrative agencies, *Washington, *Conservation, Legal aspects, State governments, Natural resources, Planning, Water resources development, Water supply, Water utilization, Water distribution(Applied), Erosion.

The Washington legislature has determined that improper land-use practices have contributed to erosion, which in turn has caused the clogging of stream channels and depletion of underground water reserves. Therefore, the legislature has provided for the creation of conservation districts that will preserve the land resources of the state and will also work to control flooding and soil erosion. These districts shall have the following powers: (1) to conduct surveys and research relating to resource conservation; (2) to conduct educational projects; (3) to carry out preventative and control measures and works of improvement for the conservation of renewable natural resources; (4) to prepare and keep current a comprehensive long-range program recommending conservation of all renewable resources, including watershed stabilization, water for agriculture, and the prevention of pollution and sedimentation; (5) to sue and be sued; and (6) to enter into joint projects with other districts. (Frank-Florida)
W77-09584

FLOOD CONTROL.
Utah Code Ann sec 65-1-75 (1968).

Descriptors: *Utah, *Flood control, *Flood protection, *Administrative agencies, Legislation, Water control, Flood damage, Flood forecasting, Floods, Non-structural alternatives, Water distribution(Applied), Water management(Applied), Water policy, Flood data, Flood flow, Flooding, Engineering structures, Equipment, Control structures, Diversion structures, Administrative costs, Project planning, Social aspects, Personnel management.
Identifiers: *State land board(Utah).

The Utah state land board may survey any lands of the state, and all areas where there have been damaging floods, or where such floods are likely to occur, in order to prevent and control floods, and to conserve the natural resources of the state. Cooperation with the people of the affected communities, counties, cities or towns, state road commission, federal government and such other interested persons is suggested. The state land board may construct flood-control works, acquire additional lands for flood prevention and control, employ the services of qualified engineers, foresters and rangemen, and may study and recommend solutions to flood-control problem
In addition, the board may promote revegetatio
and range improvement of any state lands, contr
grazing on any state lands, acquire in cooperatio
with the federal government watershed land
which have become barren and capable of causi
floods, and expend funds to pay the costs of su
activities. (Hadoulias-Florida)
W77-09585

**DOBBS V MISSOURI PACIFIC RAILROA
COMPANY (LIABILITY OF RAILROADS FO
SURFACE WATER DIVERSION).**
416 F Supp 5-9 (E D Okla 1975).

Descriptors: *Railroads, *Surface wate
*Oklahoma, *Trespass, *Diversion losses, Div
sion, Legal aspects, Judicial decisions, Le
review, Water law, Common law, Legislatio
Negligence, Governments, State governmen
Risks.
Identifiers: *Missouri Pacific Railroad Compa
*Federal civil procedure, Common enemy rule.

Plaintiff owns property adjacent to the tracks
defendant, the Missouri Pacific Railroad Compa
Improvements made by the railroad caused s
face water to divert from its natural course. Pla
tiff seeks recovery for damages allegedly result
from the diversion. The District Court denied
fendant's motion to dismiss the complaint
failure to state a cause of action, stating two le
theories upon which plaintiff could rely. First,
to defendant's contention that the statute of lim
tions had run since the railroad made the impro
ments over twenty years ago, the court ruled th
cause of action arised when the trespass acu
occurs. The plaintiff need only prove that the
provement is permanent in nature, and that
trespass is not the natural result or obvious c
sequence of the permanent improvement,
gardless of when the improvements were actu
made. The court also ruled that plaintiff co
maintain an action based on the wrongful di
sion of surface water. In Oklahoma one has a r
to divert surface water, but only to the extent
it does not harm neighboring land. If damage c
result from such diversion of surface water,
party causing such damage is liable for
(Moorhouse-Florida)
W77-09586

**AN OPTIMAL STATE WATER LAW: FL
WATER RIGHTS AND FLEXIBLE MAR
PRICES,**
D. D. Johnson.
Virginia Law Review, Vol 57, p 345-74 (1971).

Descriptors: *Environmental effects, *Cost
cation, *Water allocation(Policy), *Appropria
*Economic efficiency, Recirculated w
Recycling, Economic impact, Economet
Recharge, Cost sharing, Cost analysis, Econ
justification, Costs, Cost repayment.

Under present water appropriation systems,
is not enough water to fill all needs. Recent le
tion has focused on water quality and poll
control to solve the problem resulting from
growing divergence between the demand fo
supply of water. But, this narrow approach
not consider the quantity of water demanded
supply available, or a system for distribution.
article proposes to: establish economic criter
measuring social benefits; consider character
of alternative processes; discuss inadequacie
herent in existing water allocation systems
present a general plan for water allocation
consders supply and demand, provide
mechanism for allocation, and solves the pro
of pollution control and abatement. The pro
system allocates water supplies for a price
price reflects costs involved in furnishing wa
the public and private users. Different qualit
water would demand different prices. A sch
of total demands by competing users wou

ermined. Thereafter, a set of prices would be ed at which demands for all users would be isfied. This comprehensive approach guaran- s that water will be allocated to uses getting the hest marginal benefit from water. (Josepher- rida)
7-09587

. Nonstructural Alternatives

TITUTIONAL CONSTRAINTS ON WATER SOURCE DEVELOPMENT IN ARID LANDS,
primary bibliographic entry see Field 6E.
7-09316

OD PLAIN INFORMATION: RIO SAN E, PUEBLO OF ACOMA, NEW MEXICO.
y Engineer District, Albuquerque, N.M.
primary bibliographic entry see Field 4A.
7-09363

OD PLAIN INFORMATION: BIG AND LIT- FOSSIL CREEKS, FORT WORTH, TEXAS.
y Engineer District, Fort Worth, Tex.
primary bibliographic entry see Field 4A.
7-09364

OD PLAIN INFORMATION: WARD CREEK TRIBUTARIES, BATON ROUGE, LOUI- NA, NO. 2.
y Engineer District, New Orleans, La.
primary bibliographic entry see Field 4A.
-09365

OD PLAIN INFORMATION: VERMILION ER AND TRIBUTARIES, LAFAYETTE, ISIANA.
y Engineer District, New Orleans, La.
primary bibliographic entry see Field 4A.
-09366

OD PLAIN INFORMATION, LITTLE R, HANOVER COUNTY, VA.
Engineer District, Norfolk, Va.
rimary bibliographic entry see Field 4A.
09367

OD PLAIN INFORMATION, STONY RUN EK, HANOVER COUNTY, VA.
Engineer District, Norfolk, Va.
rimary bibliographic entry see Field 4A.
09368

OD PLAIN INFORMATION: ALLEGHENY R AND LILLIBRIDGE CREEK, OUGH OF PORT ALLEGANY, PENNSYL- A.
Engineer District, Pittsburgh, Pa.
imary bibliographic entry see Field 4A.
09369

D PLAIN INFORMATION: ALLEGHENY R, FOREST COUNTY, PENNSYLVANIA.
Engineer District, Pittsburgh, Pa.
imary bibliographic entry see Field 4A.
9370

FORK DES MOINES RIVER AND PER- CREEK FLOOD PLAIN INFORMATION, OM, MINNESOTA.
Engineer District, Rock Island, Ill.
mary bibliographic entry see Field 4A.
9371

FLOOD PLAIN INFORMATION: LITTLE DRY FORK, LOVE BRANCH, BURGHER BRANCH, CITY OF ROLLA, MISSOURI.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W77-09372

FLOOD PLAIN INFORMATION: ST. CHARLES COUNTY, MISSOURI, PART 3, CUIVRE RIVER AND TRIBUTARIES.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W77-09373

FLOOD PLAIN INFORMATION: STE. GENEVIEVE, MISSOURI: MISSISSIPPI RIVER, NORTH AND SOUTH GABOURI CREEKS.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W77-09374

FLOOD PLAIN INFORMATION, ADAMS CREEK AND TRIBUTARIES, TULSA AND WAGONER COUNTIES, OK.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W77-09375

FLOOD PLAIN INFORMATION: HOLLIDAY AND MCGRATH CREEKS, WICHITA FALLS, TEXAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W77-09376

BINGHAMTON WASTEWATER MANAGEMENT STUDY: SPECIALTY APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09384

FLOODPLAIN ZONING--AN ALTERNATIVE APPROACH TO LAND REGULATION IN FLOOD HAZARD AREAS: A CASE STUDY, KALAMAZOO, MICHIGAN,
S. D. Mac Rae.
Shore and Beach, Vol 44, p 31-34 (April 1976). 2 fig, 1 tab.

Descriptors: *Flood plain zoning, *Michigan, *Floodways, *Flood control, *Land use, Legal aspects, Regulation, Water zoning, Zoning, Beneficial use, Flood plains, Flood protection, Non-structural alternatives, Water resources development, Flood discharge, Flood profiles, Regulation, Environmental effects, Land development, Land management, Land classification, Flood frequency.
Identifiers: *Kalamazoo(Mich).

The author examines the use of flood plain zoning in Kalamazoo, Michigan as a method of land use regulation for controlling hazardous flood conditions. A floodplain is that area of land adjoining a watercourse which has been or may be covered by floodwater. A floodway is a high flood area, and a flood fringe is that portion of the floodplain beyond the limits of the floodway. The historical evidence of flooding, the expected frequency of floods, and engineering studies of flood levels are among the factors considered when delineating the boundaries of the floodplain. Floodplain regulations via zoning, have so far proved to be legally permissible. Such authority and power to zone is grounded in the state police powers which permit land use regulations to protect the health, safety, morals or welfare of the public. Floodplain regulations create open spaces by prohibiting construction in the floodway area. Buildings are allowed however, in flood fringe areas provided they are elevated above a designated regulatory flood level. (Hadoulias-Florida)
W77-09532

LAND USE CONTROL IN THE COASTAL ZONE: THE DELAWARE EXAMPLE,
Natural Resources Law Inst. Portland, Oreg.
J. L. Pedrick, Jr.
Coastal Zone Management Journal, Vol 2, No 4, p 345-368 (1976).

Descriptors: *Land use, *Land management, *Constitutional law, *Delaware, Government interrelations, Inter-agency cooperation, Water resources development, Water policy, Coastal areas, Beaches, Wetlands, Land reclamation, Industries, Permits, Dredging, Drainage, Landfills, Preservation, Conservation, Compensation, Legislation, Programs, Planning, Administrative agencies, Projects, Environmental effects.
Identifiers: *Coastal Zone Management Program, Coastal waters, *Coastal zone management.

This article focuses on the administrative, legal and intergovernmental controversies arising under Delaware's Coastal Zone Management Act. The effects of the Act on Sussex County are specifically discussed. The three areas of land use regulation critically analyzed include industry regulation in the coastal zone, beach preservation, and wetland preservation. Delaware's Coastal Zone Act completely prohibits new heavy industry in the coastal zone, and requires permits for expansions or extensions of pre-existing industry. Permits must also be obtained prior to making substantial changes in the character of beach property. Permits are required for dredging, draining, filling, and other like activities in wetland areas. Courts have permitted land use regulations because the public interests favoring preservation of such areas outweigh the injured private rights. However, such regulatons are becoming subject to attack under the 5th and 14th Amendments of the U.S. Constitution on allegations of taking private property without just compensation in violation of due process. The author suggests that the administrative coordination of the Act be improved, and that the decision making chain of command allow for decision making on local levels. The author thinks Delaware's Act is constitutional. (Hadoulias-Florida)
W77-09533

NEW ROLES FOR THE OLD DAM BUILDERS,
National Wildlife Federation, Washington, D. C. General Counsel Office.
O. A. Houck.
National Wildlife, Vol 13, No 5, p 13-15 (1975).

Descriptors: *Environmental effects, *Wetlands, *Political aspects, *Environmental engineering, Environmental control, Regulation, Governmental interrelations, Federal government, Navigable waters, Non-structural alternatives, Dams, Environment, Water policy, Water management(Applied), Flood control, Legislation, Judicial decisions.
Identifiers: *National Environmental Policy Act, Private interest groups.

Environmentalists are greatly concerned with the issue of whether the Army Corps of Engineers has significantly changed its approach towards environmental regulation. Historically, the Corps has favored political and economic interests to the detriment of environmental interests in its sponsorship of projects. It has functioned as an engineering firm, shirking its duties as an environmental regulator. By 1975 objections to Corps' projects became widespread. Environmental groups, using the National Environmental Policy Act (NEPA) as their handle, began to use the courts to voice their objections. Recently, moreover, the winds of change have come into the Corps' system. There are indications that it has changed its approach to flood control and environmental protection. How much it has changed is not clear, however. For example, the Corps is not only a construction agency, but it is also a permitting agency for private construction. In the past the Corps has been slow to exercise this regulatory

responsibility. As a result of a series of court decisions, the Corps has been thrust squarely into the environmental protection business. The question remains whether the Corps will meet the challenge of regulating, especially with regard to wetlands development, or whether it will fight its responsibilities. (Josepher-Florida)
W77-09552

6G. Ecologic Impact Of Water Development

CHANGES IN THE HABITAT CONDITIONS OF ANIMALS IN THE VOLGA DELTA ASSOCIATED WITH THE IMPLEMENTATION OF THE VOLGOGRAD HYDROELECTRIC STATION, (IN RUSSIAN),
V. V. Vinogradov, and S. I. Chernyavskaya.
Byull Mosk O-Va Ispyt Prir Otd Biol 81(1), p 136-138, 1976.

Descriptors: *Wildlife habitats, *Deltas, *Dams, *Succession, *Environmental effects, Hydroelectric plants, Hydrologic budget, Alluvial channels, Willow trees, Flow.
Identifiers: Osiers, *USSR(Volga River), Volgograd, Vegetation changes.

Since implementation of the Volgograd dam (USSR) in 1958, significant changes have occurred in the hydrological regime and ecological conditions of the Volga delta. Vastly reduced alluvial deposits slowed the formation of new islands and spits, thereby hampering the renewal of osier beds. As the sprouting ability of the white willow declines after 20 yr, the highly productive water-retaining and soil-preserving willow association is replaced by a less productive reed-grass association. Animal species affected by these conditions and other changes in water flow are listed and the dynamics of particular ecological disruptions are discussed.--Copyright 1977, Biological Abstracts, Inc.
W77-09102

THE ENVIRONMENTAL IMPULSE AND ITS COMPETITORS: ATTITUDES, INTERESTS, AND INSTITUTIONS AT LAKE TAHOE,
California Univ., Davis. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W77-09145

ENVIRONMENTAL MODELING AND SIMULATION, PROCEEDINGS OF THE CONFERENCE ON.
Environmental Protection Agency, Washington, D. C. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W77-09154

MODELING THE EFFECT OF PESTICIDE LOADING ON RIVERINE ECOSYSTEMS,
Southeast Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5B.
W77-09174

AN ENVIRONMENTAL RESIDUAL ALLOCATION MODEL,
Energy Resources Co. Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W77-09179

COMPUTER SIMULATION OF LONG-TERM SECONDARY IMPACTS OF WATER AND WASTEWATER PROJECTS,
Boyle Engineering Corp., Newport Beach, Calif. Environmental Studies.
For primary bibliographic entry see Field 5B.
W77-09195

THE ENVIRONMENTAL QUALITY MONITORING REPORT.
National Oceanic and Atmospheric Administration, Washington, D.C. Outer Continental Shelf Task Force.
For primary bibliographic entry see Field 5G.
W77-09231

TRACE METALS IN MANGROVE SEEDLINGS FROM POLLUTED AND UNPOLLUTED BAYS IN PUERTO RICO,
Puerto Rico Nuclear Center, Mayaguez. Marine Ecology Div.
For primary bibliographic entry see Field 5A.
W77-09240

NOAA SHIP DELAWARE II CRUISE 74-2 REPORT OF MAY 13-21, 1974, SURVEY OF DEEPWATER DUMPSITE 106,
National Marine Fisheries Service, Highlands, N.J. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5B.
W77-09245

INVESTIGATION OF RADIOACTIVE WASTE DISPOSAL AT DEEPWATER DUMPSITE 106--SAMPLING PROGRAM MAY 1974,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5B.
W77-09246

LIFE AT THE DESERT'S EDGE.
For primary bibliographic entry see Field 4C.
W77-09305

URBAN PLANNING TO MINIMIZE ENVIRONMENTAL IMPACT,
Illinois Univ. at Chicago Circle. Dept. of Systems Engineering.
For primary bibliographic entry see Field 6B.
W77-09377

ANTI-POLLUTION BEHAVIOR: A FUNCTION OF PERCEIVED OUTCOME AND LOCUS OF CONTROL,
L. J. Trigg, D. Perlman, R. P. Perry, and M. P. Janisse.
Environment and Behavior, Vol 8, No 2, p 307-313, June 1976. 1 tab, 12 ref.

Descriptors: *Psychological aspects, Behavior, *Motivation, *Attitudes, Correlation analysis, Surveys.
Identifiers: Perceived outcome, Locus of control.

The study postulates two hypotheses. Hypothesis 1: Internally oriented individuals have more accurate information about environmental pollution. Internally oriented individuals are defined as those believing that that their rewards are contingent upon their own abilities, effort, and skill; external individuals believe their rewards are contingent upon luck, chance, or 'powerful others'. Hypothesis 2: Among people optimistic about future levels of pollution, internals would engage in more anti-pollution activities than externals. Data collected in a survey on environmental issues were used to test these hypotheses. Multistage probability and clustering sampling techniques were used to draw the sample of potential respondents. Two analyses of variance were used to assess the survey responses. Knowledge and anti-pollution behavior were the dependent variables. Locus of control, perceived outcome of pollution, and sex were the independent variables. The data supported the hypothesis that internals have more accurate information about environmental pollution. They also demonstrated that when people had favorable expectations about future levels of pollution, internal locus of control was associated with greater involvement in conventional forms of social action. (Nessa-NC)
W77-09378

BINGHAMTON WASTEWATER MANAGEMENT STUDY: IMPACT ASSESSMENT AN EVALUATION APPENDIX.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 5G.
W77-09386

RESTORING THE WILLAMETTE RIVE COSTS AND IMPACTS OF WATER QUALIT CONTROL,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5G.
W77-09455

ENVIRONMENTAL POLICY-MAKING IN TH USSR: THE ROLE OF INDUSTRIAL AND E VIRONMENTAL INTEREST GROUPS,
Mississippi State Univ., State College.
For primary bibliographic entry see Field 6E.
W77-09456

SITING OF MAJOR ENERGY FACILITIES.
Organization for Economic Co-Operation a Development, Paris (France).
Environmental Directorate 32098, 1977. 87 p, 6 f 7 tab, 106 ref, 3 append.

Descriptors: *Sites, *Powerplants, *Facilit *Environmental effects, Locating, Perm Nuclear powerplants, Electric power production Water demand, Decision making, Social aspe Political aspects, Cost-benefit analysis.

To provide member governments of the Organ tion for Economic Cooperation and Developm with policy options or guidelines to prevent minimize environmental conflicts, problems volved in selection of sites for energy-genera facilities are enumerated and reviewed. The re aims at forecasting demands for sites and amines criteria against which a choice can be m for any given site. After estimating the numbe sites required in the OECD countries, based predicted electrical demands and fuel supp methods of identifying suitable sites are descri Official procedures for licensing power genera plants are given for the United Kingdom, Fed German Republic, Sweden, France and the Un States; for the latter, licensing and pe procedures are enumerated for both the fed and state level. Environmental impact assessm procedures are also given for such plants for United States, Spain and Canada. Also provid a checklist of criteria used in siting decisions ing into account electrical energy needs and pacts on land use, water resources, air qua solid waste disposal, radiation, and noise. C materials deal with considerations of p response and participation and interac between the technical and environmental fa in plant siting. (Harris-Wisconsin)
W77-09459

ENVIRONMENTAL IMPACTS F OFFSHORE EXPLORATION AND PRO TION OF OIL AND GAS.
Organization for Economic Co-Operation Development, Paris (France).
Environment Directorate 32090, 1977. 95 p, 2 22 tab, 24 ref.

Descriptors: *Continental slope, *Oil poll *Oil industry, *International waters, *Natura *Environmental effects, Oil spills, Offshore forms, Engineering structures, Coastal struct Drilling, Exploration, Water pollution so Water pollution effects, International co sions, International law, Social aspects, Ha Oceans, Continental shelf.
Identifiers: *Offshore oil production

To provide member nations of the Organi for Economic Cooperation and Developmen policy options or guidelines to prevent or mi

vironmental conflicts, information is given on ues raised by the offshore oil and gas develop- nt and solutions are suggested. Environmental pacts of the industry are described, including nds for OECD countries in terms of likely troleum reserves and potential pollution effects ng shorelines and in the oceans. Five subject as are covered in greater detail: (1) large ac- ental spills from offshore platforms and elines; (2) chronic pollution from offshore ac- ities; (3) legislation concerning the structural in- rity of offshore structures; (4) probability of oc- rence of oil spills; and (5) onshore effects from shore activity. Additionally, guidelines are sented for siting large installations, including crete platform construction units, deepwater bors, pipelines terminals, harbor supply bases, ministrative headquarters and oil-related manu- turing. Also described are social effects leading dverse environmental effects, such as the in- x of large work forces with oil industry develop- nts. (Harris-Wisconsin)
7-09460

LORADO RIVER WATER QUALITY IM- OVEMENT PROGRAM (FINAL ENVIRON- NTAL STATEMENT).
eau of Reclamation, Washington, D.C.
primary bibliographic entry see Field 5G.
7-09527

PORT TO CONGRESS ON ABNORMAL OC- RRENCES: JULY-SEPTEMBER 1975.
clear Regulatory Commission, Washington, D.
primary bibliographic entry see Field 6E.
7-09549

E NEED FOR A NATIONAL OCEAN PRO- AM AND PLAN.
primary bibliographic entry see Field 6E.
7-09555

L V TENNESSEE VALLEY AUTHORITY PLICATION OF ENDANGERED SPECIES T TO FEDERAL PROJECT).
primary bibliographic entry see Field 6E.
7-09581

RESOURCES DATA

Network Design

ELOPMENT OF THE SPRING CREEK A ACQUISITION SYSTEM,
tana State Univ., Bozeman. Dept. of Electri- ngineering.
. Williams.
lable from the National Technical Informa- Service, Springfield, VA 22161 as PB-269 499, codes: A04 in paper copy, A01 in microfiche. arch Report No. 3174, Electronics Research ratory, Montana State University, Bozeman, st 1974. 51 p, 9 fig, 3 tab, 9 fig, append. T A-068-MONT(1).

riptors: *Data acquisition, *Instrumentation, a transmission, *Telemetry, Data processing, puters, Electronic equipment, Monitoring, mflow, *Montana.
ifiers: *Teletype, *Stream monitoring, stic couplers, *Spring Creek(Mont).

lopment of a computer-operated remote data sition system located on Spring Creek, nan, Montana is described. The experimen- ring Creek station is the location of various er and stream monitoring instruments all in- ed to the data acquisition system for remote ogation by an HP 2115-A computer. A user lso call the computer from his location and obtain reports by using an acoustic coupler and teletype. Presented are a physical description of the Spring Creek Station and data communication link; a hardware description including instruments, interfaces, and mofications; a description of the software development; and, a few remarks on the present and future use of the system. (Holje-Mont St)
W77-09258

COASTAL ENGINEERING DATA NETWORK. SECOND SEMI-ANNUAL REPORT JULY 1976 TO DECEMBER 1976,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 8B.
W77-09329

7B. Data Acquisition

HYDROGRAPHIC SURVEYING TURNS TO ELECTRONICS,
Tibbetts Abbett, McCarthy and Stratton, Seattle, Wash.
R. A. Heinz.
Civil Engineering-American Society of Civil Engineers, Vol. 47, No. 4, p 62-65, April 1977. 1 fig, 1 tab.

Descriptors: *Hydrography, *Remote sensing, *Surveys, Bathymetry, Water levels, Depth, Equipment, Boats, Electronic equipment, Underwater, Sounding, Sonar, Sound waves, Microwaves, Radar, Satellites(Artificial), Aerial photography, Surface waters, Coasts, Lakes, Measurement.

The traditional technique for measuring water depth is to use a lead-weighted line. The 'tag line,' stretched along the water surface so that soundings are made in orderly fashion, can be dangerous. Such techniques are being replaced. Now, electronic devices can be used to make both the horizontal measurements (in air) and the vertical (through water). To improve stability of the boat in which the surveying crew operates, multi-hull boats and air-cushion craft are being used or considered. Types of horizontal positioning hardware-including microwave and radar- were described, as were types of water depth measuring gear (among them acoustical, aerial photography, satellite imagery, side-scan sonar, and sub-bottom profiling). (Sims-ISWS)
W77-09105

RECORDING RIVER AND RESERVOIR WATER DEPTH,
Moore, Gardner and Associates, Inc., Asheboro, N. C.
M. Gilmore.
Civil Engineering-American Society of Civil Engineers, Vol. 47, No. 4, p 65-66, April 1977. 1 fig.

Descriptors: *Hydrography, *Remote sensing, *Surveys, Bathymetry, Depth, Equipment, Electronic equipment, Sonar, Sounding, Rivers, Reservoirs, Measurement, Data processing, Sediments, Reservoir silting, Sedimentation.
Identifiers: *Kerr Reservoir, *Roanoke River.

At the Kerr Reservoir on the Roanoke River in Virginia and North Carolina, reservoir bottom was surveyed before reservoir filling, and twice thereafter, to determine rate of siltation. The post-filling surveys, in 1959-60 and in 1976, offer an interesting illustration of the progress being made in hydrographic surveying. In both cases, sound-type (sonar) water depth sensors were used. But improvements were made in the latest resurvey: a narrower-beam signal gave accurate measurements at greater depth of water. Hardware for simultaneously printing location and water depth eliminated inaccuracies in the 1959 resurvey, when a cable was used for location. Computer programs enabled automatically calculating increase in siltation. (Sims-ISWS)
W77-09106

ICE AND OCEAN TILT MEASUREMENTS IN THE BEAUFORT SEA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch.
For primary bibliographic entry see Field 2C.
W77-09117

RIDGES ON ANTARCTIC ICE RISES,
British Antarctic Survey, Cambridge (England).
For primary bibliographic entry see Field 2C.
W77-09120

EXTRACTION OF TRACE COMPONETS FROM LARGE QUANTITIES OF ICE IN BORE HOLES,
Bern Univ. (Switzerland). Physikalisches Institut.
For primary bibliographic entry see Field 2C.
W77-09121

A METHOD OF CONCENTRATING THE MAJOR IMPURITIES CONTAINED IN ICE BY ION EXCHANGE,
Grenoble-1 Univ. (France). Institut de Geographie Alpine.
For primary bibliographic entry see Field 2C.
W77-09122

ON THE USE OF TENSIOMETERS IN SNOW HYDROLOGY,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 2C.
W77-09123

PORTABLE AUTOMATED MESONET IN OPERATION,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2B.
W77-09131

PHOTOGRAPHIC RECONNAISSANCE OF CONTINENTAL SLOPE AND UPPER CONTINENTAL RISE,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 5B.
W77-09247

PREDICTING SNOW DEPTHS ON A MOUNTAIN WATERSHED,
Colorado State Univ., Fort Collins. Dept. of Fishing and Wildlife Biology.
For primary bibliographic entry see Field 2C.
W77-09257

AN IMPROVED TECHNIQUE FOR MEASURING SOIL PH,
Montana Agricultural Experiment Station, Bozeman.
For primary bibliographic entry see Field 2G.
W77-09295

EVAPORATION AND EVAPOTRANSPIRATION IN NIGERIA,
For primary bibliographic entry see Field 2D.
W77-09299

MEASUREMENT OF WATER FLUXES AND POTENTIALS IN A SINGLE ROOT-SOIL SYSTEM I. THE TENSIOMETER-POTOMETER SYSTEM,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.

For primary bibliographic entry see Field 2I.
W77-09308

REMOTE SENSING METHODS AND PROBLEM OF NATURAL RESOURCE INVENTORY, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
N. G. Kharin.
Probl Osvoeniya Pustyn'. 3, p 3-7, 1974.

Descriptors: *Aerial photography, *Remote sensing, Data processing, *Natural resources, Radar, Spectroscopy, X-ray analysis, *Surveys, Electromagnetic wave,.

Modern inventory of natural resources is based in aerial photography. Remote sensing is a valuable aid, using wide band registration of electromagnetic waves and data processing. For this purpose multispectral, thermal and radar systems should be used. Special regional centers for inventoring natural resources should be organized, all the resources of the region being estimated at one time.–Copyright 1975, Biological Abstracts, Inc.
W77-09311

SATELLITE MICROWAVE OBSERVATIONS OF SOIL MOISTURE VARIATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2G.
W77-09335

ON THE FLUCTUATIONS IN LEVELS OF CLOSED LAKES,
Commonwealth Scientific and Indu
For primary bibliographic entry see Field 2H.
W77-09338

REMOTE SENSING OF EARTH RESOURCES: (1970-1973 SUPPLEMENT) A LITERATURE SURVEY WITH INDEXES, SECTION 1, ABSTRACTS.
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 10C.
W77-09344

REMOTE SENSING OF EARTH RESOURCES: (1970-1973 SUPPLEMENT) A LITERATURE SURVEY WITH INDEXES, SECTION 2, INDEXES.
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 10C.
W77-09345

EARTH RESOURCES--A CONTINUING BIBLIOGRAPHY WITH INDEXES.
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 10C.
W77-09346

SCALING FIELD-MEASURED SOIL HYDRAULIC PROPERTIES USING A SIMILAR MEDIA CONCEPT,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 2G.
W77-09350

SATELLITE AND CURRENT DROGUE STUDIES OF OCEAN-DISPOSED WASTE DRIFT,
Delaware Univ., Newark. Center for Remote Sensing.
For primary bibliographic entry see Field 5B.
W77-09358

A SIMPLE CONTINUOUS ICE CRYSTAL REPLICATOR FOR USE IN LABORATORY CLOUD CHAMBERS,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). Div. of Cloud Physics.
For primary bibliographic entry see Field 2B.
W77-09360

A SUGGESTED TECHNIQUE FOR THE ANALYSIS OF AIRBORNE CONTINUOUS ICE NUCLEUS DATA,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
For primary bibliographic entry see Field 3B.
W77-09361

A METHOD FOR SECTIONING SATURATED SOIL CORES,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-09436

A PORTABLE RAINFALL SIMULATOR FOR ERODIBILITY AND INFILTRATION MEASUREMENTS ON RUGGED TERRAIN,
Klamath N· .ional Forest, Yreka, Calif.
For primary bibliographic entry see Field 2J.
W77-09441

IN SITU MEASUREMENT OF GAS DIFFUSION COEFFICIENT IN SOILS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 2G.
W77-09442

REMOTE SENSING OF SUBMERGED AQUATIC VEGETATION IN THE LOWER CHEASAPEAKE BAY,
Virginia Inst., of Marine Science, Gloucester Point. Div. of Biological Oceanography.
For primary bibliographic entry see Field 2L.
W77-09468

7C. Evaluation, Processing and Publication

GROUNDWATER RESOURCES OF AUSTRALIA.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 4B.
W77-09103

CRITERION TO CHOOSE STEP LENGTH FOR SOME NUMERICAL METHODS USED IN HYDROLOGY,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W77-09110

PLEISTOCENE GLACIATION IN ETHIOPIA: NEW EVIDENCE,
Oregon State Univ., Corvallis. Dept. of Geology.
For primary bibliographic entry see Field 2C.
W77-09124

A MULTI-PARAMETER ESTUARY MODEL,
Tetra Tech., Inc., Lafayette, Calif.
For primary bibliographic entry see Field 5B.
W77-09165

EFFICIENT STORAGE OF URBAN STORM WATER RUNOFF,
Environmental Protection Agency, Denver, Colo.
For primary bibliographic entry see Field 5D.
W77-09171

FEDBAK03 - A COMPUTER PROGRAM FOR THE MODELLING OF FIRST ORDER CONSECUTIVE REACTIONS WITH FEEDBACK UNDER A STEADY STATE MULTIDIMENSIONAL NATURAL AQUATIC SYSTEM,
Environmental Protection Agency, New York. Data Systems Branch.
For primary bibliographic entry see Field 5B.
W77-09176

A DYNAMIC WATER QUALITY SIMULATION MODEL FOR THE THAMES RIVER,
Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5B.
W77-09182

SELECTING THE PROPER REAERATION COEFFICIENT FOR USE IN WATER QUALITY MODELS,
Texas Water Quality Board, Austin. Administrative Operations.
For primary bibliographic entry see Field 5G.
W77-09184

RECEIV-II, A GENERALIZED DYNAMIC PLANNING MODEL FOR WATER QUALITY MANAGEMENT,
Raytheon Co., Portsmouth, R.I. Oceanographic and Environmental Services.
For primary bibliographic entry see Field 5B.
W77-09185

MODIFICATIONS TO QUAL - II TO EVALUATE WASTEWATER STORAGE,
Environmental Protection Agency, Atlanta, G Technical Support Branch.
For primary bibliographic entry see Field 5D.
W77-09186

WATER POLLUTION MODELING IN TH DETROIT METROPOLITAN AREA,
Detroit Water and Sewerage Dept.Mich.; a Wayne State Univ. Detroit, Mich. Coll. of E gineering.
For primary bibliographic entry see Field 5B.
W77-09187

A RIVER BASIN PLANNING METHODOLOG FOR STREAMS WITH DISSOLVED OXYG AND EUTROPHICATION CONSTRAINTS,
Army Engineer Waterways Experiment Stati Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5B.
W77-09198

SWAN, A SEWER ANALYSIS AND MODELI SYSTEM,
Erdman Anthony, Associates. Rochester, N.Y.
For primary bibliographic entry see Field 5D.
W77-09206

ON-LINE MODELS FOR COMPUTERIZ CONTROL OF COMBINED SEWERS.
Colorado State Univ., Fort Collins. Dept. of C Engineering.
For primary bibliographic entry see Field 5D.
W77-09207

MATHEMATICAL MODELS FOR CALCUL ING PERFORMANCE AND COST OF WAS WATER TREATMENT SYSTEMS,
Municipal Environmental Research Lab., Cin nati, Ohio. Systems and Economic Analysis tion.
For primary bibliographic entry see Field 5D.
W77-09208

ATA COLLECTION FOR WATER QUALITY ODELING IN THE OCCOQUAN ATERSHED OF VIRGINIA,
rginia Polytechnic Inst. and State Univ., acksburg. Dept. of Civil Engineering.
or primary bibliographic entry see Field 5A.
77-09211

ESEARCH PROJECTS IN GLACIOLOGY - 76.
epartment of the Environment, Ottawa ntario). Water Resources Branch.
r primary bibliographic entry see Field 2C.
77-09220

ANADIAN GLACIERS IN THE INTERNA-ONAL HYDROLOGICAL DECADE PRO-RAM, 1965 - 1974, NO. 1. SENTINEL GLACI-, BRITISH COLUMBIA - SUMMARY OF EASUREMENTS,
partment of the Environment, Ottawa ntario). Water Planning and Management anch.
r primary bibliographic entry see Field 2C.
77-09222

ERS MANUAL - OIL AND HAZARDOUS ATERIALS SPILL INFORMATION TRIEVAL SYSTEM.
vironmental Protection Agency, Washington, C. Div. of Oil and Hazardous Materials.
primary bibliographic entry see Field 5G.
7-09229

YSICAL OCEANOGRAPHY HISTORICAL TA FOR DEEPWATER DUMPSITE 106,
tional Marine Fisheries Service, Narragansett, Atlantic Environmental Group.
primary bibliographic entry see Field 5B.
7-09248

YSICAL OCEANOGRAPHIC OBSERVA-ONS AT DEEPWATER DUMPSITE 106 -- Y 1974,
tional Marine Fisheries Service, Narragansett, Atlantic Environmental Group.
primary bibliographic entry see Field 5B.
7-09249

VELOPMENT OF THE SPRING CREEK TA ACQUISITION SYSTEM,
ntana State Univ., Bozeman. Dept. of Electri-Engineering.
primary bibliographic entry see Field 7A.
7-09258

E ROLE OF SYSTEMS ANALYSIS IN THE OF AGRICULTURAL WASTES,
itoba Univ., Winnipeg Dept. of Agricultural ineering.
primary bibliographic entry see Field 5G.
7-09282

IOTE SENSING METHODS AND PROBLEM NATURAL RESOURCE INVENTORY, (IN SIAN),
ert Inst., Ashkhabad (USSR).
primary bibliographic entry see Field 7B.
-09311

CITIZEN'S GUIDE TO NORTH OLINA'S SHIFTING INLETS,
h Carolina State Univ. at Raleigh. Center for n Affairs and Community Services.
primary bibliographic entry see Field 2L.
-09327

COASTAL ENGINEERING DATA NETWORK. SECOND SEMI-ANNUAL REPORT JULY 1976 TO DECEMBER 1976,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 8B.
W77-09329

REMOTE SENSING OF EARTH RESOURCES: (1970-1973 SUPPLEMENT) A LITERATURE SURVEY WITH INDEXES, SECTION 1, ABSTRACTS.
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 10C.
W77-09344

REMOTE SENSING OF EARTH RESOURCES: (1970-1973 SUPPLEMENT) A LITERATURE SURVEY WITH INDEXES, SECTION 2, INDEXES.
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 10C.
W77-09345

EARTH RESOURCES--A CONTINUING BIBLIOGRAPHY WITH INDEXES.
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 10C.
W77-09346

BAYESIAN GENERATION OF SYNTHETIC STREAMFLOWS, 2. THE MULTIVARIATE CASE,
Simon Bolivar Univ., Caracas (Venezuela).
For primary bibliographic entry see Field 2E.
W77-09349

FLOOD PLAIN INFORMATION: RIO SAN JOSE, PUEBLO OF ACOMA, NEW MEXICO.
Army Engineer District, Albuquerque, N.M.
For primary bibliographic entry see Field 4A.
W77-09363

FLOOD PLAIN INFORMATION: BIG AND LITTLE FOSSIL CREEKS, FORT WORTH, TEXAS.
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W77-09364

FLOOD PLAIN INFORMATION: WARD CREEK AND TRIBUTARIES, BATON ROUGE, LOUISIANA, NO. 2.
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 4A.
W77-09365

FLOOD PLAIN INFORMATION: VERMILION RIVER AND TRIBUTARIES, LAFAYETTE, LOUISIANA.
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 4A.
W77-09366

FLOOD PLAIN INFORMATION, LITTLE RIVER, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W77-09367

FLOOD PLAIN INFORMATION, STONY RUN CREEK, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W77-09368

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER AND LILLIBRIDGE CREEK, BOROUGH OF PORT ALLEGANY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W77-09369

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, FOREST COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W77-09370

WEST FORK DES MOINES RIVER AND PERKINS CREEK FLOOD PLAIN INFORMATION, WINDOM, MINNESOTA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-09371

FLOOD PLAIN INFORMATION: LITTLE DRY FORK, LOVE BRANCH, BURGHER BRANCH, CITY OF ROLLA, MISSOURI.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W77-09372

FLOOD PLAIN INFORMATION: ST. CHARLES COUNTY, MISSOURI, PART 3, CUIVRE RIVER AND TRIBUTARIES.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W77-09373

FLOOD PLAIN INFORMATION: STE. GENEVIEVE, MISSOURI: MISSISSIPPI RIVER, NORTH AND SOUTH GABOURI CREEKS.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W77-09374

FLOOD PLAIN INFORMATION, ADAMS CREEK AND TRIBUTARIES, TULSA AND WAGONER COUNTIES, OK.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W77-09375

FLOOD PLAIN INFORMATION: HOLLIDAY AND MCGRATH CREEKS, WICHITA FALLS, TEXAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W77-09376

URBAN PLANNING TO MINIMIZE ENVIRONMENTAL IMPACT,
Illinois Univ. at Chicago Circle. Dept. of Systems Engineering.
For primary bibliographic entry see Field 6B.
W77-09377

SIMULTANEOUS INVESTMENT-ALLOCATION: AN APPLICATION OF GENERALIZED BENDERS DECOMPOSITION TO WATER PLANNING,
Texas Univ., at Austin. Center for Cybernetic Studies.
For primary bibliographic entry see Field 6A.
W77-09466

REMOTE SENSING OF SUBMERGED AQUATIC VEGETATION IN THE LOWER CHEASAPEAKE BAY,
Virginia Inst., of Marine Science, Gloucester Point. Div. of Biological Oceanography.
For primary bibliographic entry see Field 2L.
W77-09468

AQUATIC BASELINE SURVEY OF SELECTED TEST AREAS ON EGLIN AIR FORCE BASE RESERVATION, FLORIDA,
Air Force Armament Lab., Eglin AFB, Fla.
R. C. Crews.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 912, Price codes: A02 in paper copy, A01 in microfiche. Report No. AFATL-TR-76-4, January 1976. 23 p, 5 fig, 2 tab, 3 ref, 1 append.

Descriptors: *Baseline studies, *Fish, *Military reservations, *Florida, Streams, Creeks, Varieties, Darters, Madtoms, Lampreys, Shiners.
Identifiers: Eglin AFB(Fla), Armament testing ground, Endangered species, Okaloosa datter.

Seventeen fish and one lamprey species were collected from 23 streams draining areas used for testing and evaluation of conventional munitions developed by the Eglin Air Force Armament Laboratory, Florida. The sailfin shiner (Notropis hypselopterus Gunther) was the most abundant species encountered. Also abundant were the mosquitofish (Gambusia affinis Baird and Girard), blackbanded darter (Percina nigrofasciata Agassiz), speckled madtom (Noturus leptacanthus Jordon), and the southern brook lamprey (Ichthyomyzon gagei Hubbs and Frautman). The endangered Okaloosa darter (Etheostoma okaloosae Fowler) was found at every station except at one turbid sampling point. The Okaloosa darter habitats are described and its competition and hybridization with the brown darter (Etheostoma edwini) is discounted on the basis of its ecological preferences in this area. A list of species collected from each station is provided in an appendix. (Auen-Wisconsin)
W77-09499

USER'S MANUAL FOR THE M.I.T. TRANSIENT WATER QUALITY NETWORK MODEL--INCLUDING NITROGEN-CYCLE DYNAMICS FOR RIVERS AND ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-09519

8. ENGINEERING WORKS

8A. Structures

WAVE FORCES ON MODELS OF SUBMERGED OFFSHORE STRUCTURES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-09232

8B. Hydraulics

A SEDIMENT TRANSPORT MODEL FOR STRAIGHT ALLUVIAL CHANNELS,
Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 2J.
W77-09104

WAVE FORCES ON MODELS OF SUBMERGED OFFSHORE STRUCTURES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
P. E. Versowsky, and J. B. Herbich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 059, Price codes: A07 in paper copy, A01 in microfiche. Sea Grant Publication No. TAMU-SG-75-215, August 1975. 134 p, 50 fig, 38 ref, 5 append. Also as C.O.E. Report No. 175. Sea Grant 04-3-158-18.

Descriptors: *Waves(Water), *Water pollution control, *Offshore platforms, Ocean waves, Structural analysis, Engineering structures, *Model studies, Hydraulic models, Gravity waves.
Identifiers: *Outer Continental Shelf, *Submerged offshore structures.

The results of a model study of the forces caused by oscillatory waves on large rectangular tank-like submerged objects are presented. Three phases of the problem were examined: (1) description of the forces in terms of dimensionless parameters, (2) description of the effect of large wave heights which are of importance to the designer, and (3) the presentation of a format to be used in model studies on submerged structures. Theoretical studies of the problem have assumed wave heights to be small and the forces to be entirely inertial. However, of interest to the engineer are the forces caused by the larger waves generated by severe storms. In the model study the forces caused by the larger waves were determined and the effect of the water particle velocity in producing a drag force was examined. The relationships between the fluid particle displacement and the coefficient of mass and drag were evaluated. Previous studies indicated that particle displacement is related to the values of empirical coefficients assumed by previous investigation. The experimental results are given in a dimensionless form. Provided the laws of modeling are followed, and there are no scale effects, these results may be used to determine the forces on prototype structures in the ocean. (Sinha-OEIS)
W77-09232

PERFORMANCE ANALYSIS OF A TETHERED FLOAT BREAKWATER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. J. Seymour, and D. M. Hanes.
Sea Grant Publication No. 55; IMR Reference No. 77-102, January 1977. 158 p, 13 fig, 8 ref SG-04-158-20.

Descriptors: *Breakwaters, *Shore protection, Ocean waves, Fetch, Coastal structures, Performance, Model studies.
Identifiers: Wave attenuation, *Tethered floats.

The reports describes laboratory experiments at one-half scale using simulated random seas and field tests at full scale of an installation of a dynamic floating breakwater system in a limited fetch situation. An analytical model is described which successfully predicts the performance of any tethered float breakwater configuration, given the incident wave spectrum. The methodology for selecting the arbitrary resistance coefficients in the predictive model is disscussed. Predicted and measured performance data for a total of 60 laboratory and field experiments are displayed, covering a very broad range of wave climates. (NOAA)
W77-09328

COASTAL ENGINEERING DATA NETWORK. SECOND SEMI-ANNUAL REPORT JULY 1976 TO DECEMBER 1976,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. J. Seymour, M. H. Sessions, S. L. Wald, and A. E. Woods.
Sea Grant Publication No. 56; IMR Reference No. 77-103, January 1977. 150 p, 5 fig, 2 ref, append. SG-04-6-153-44110.

Descriptors: *California, *Waves(Water), *Ocean waves, Statistics, Computer programs, Data processing, Coasts, Water resources, *Coastal engineering.
Identifiers: *Physical oceanography, *Wave climate.

The Coastal Engineering Data Network is a cooperative program sponsored by the University of California Sea Grant College Program and th California Department of Navigation and Ocea Development. The network is devoted primarily t the collection of long-term wave statistics from large number of nearshore locations, although th capability to collect other nearshore data exists. fifth station installed by the Coastal Engineerin Research Center at Port Hueneme measures sed ment transport at the Channel Islands Breakwat north of Port Hueneme. A special interface w constructed so that the output of the wave ga would be compatible with the rest of the syste The system has now been in operation for slight more than a year. During this period approximat ly 3,000 data runs or 3 million points were co lected with an overall success rate of 95%. T availability of a year's data from a site now allo for some meaningful analysis of the wave clima The appendix contains the monthly reports f July 1976 through Dec 1976. (NOAA)
W77-09329

A SCREENING MODEL FOR FLOOD CO TROL PLANNING,
California Univ., Los Angeles.
For primary bibliographic entry see Field 4A.
W77-09595

8C. Hydraulic Machinery

THE CALIBRATION OF SHARP CREST WEIRS BY THE PONDAGE DRAWDO METHOD,
Sheffield Univ. (England). Dept. of Civil Structural Engineering.
F. A. Johnson, and C. S. Green.
Journal of Hydrology, Vol 33, No 3/4, p 363-3 1977. 5 fig, 1 tab, 10 ref.

Descriptors: *Weirs, *Calibrations, *Flow surement, *Drawdown, Ponds, Streamfl Structures, Hydraulic structures, Flowmet Gates, Laboratory tests, Hydrology, Hydraulic
Identifiers: *Sharp crested weirs, *Pondage dr down method.

The problems of calibrating flow measuring st tures by conventional techniques are outlined. principle of the pondage drawdown metho calibration was described, and the accuracy of method was determined by application to a 90 V notch sharp crested weir. (Sims-ISWS)
W77-09113

8G. Materials

INVESTIGATION OF THE APAC WA SEEPAGE BARRIER,
Arizona Univ., Tucson. Dept. of Civil Engine and Engineering Mechanics.
For primary bibliographic entry see Field 3B.
W77-09140

8I. Fisheries Engineering

DETERMINATION OF PHYSICAL HYDRAULIC PREFERENCES OF BROWN BROOK TROUT IN THE SELECTION SPAWNING LOCATIONS,
Wyoming Univ., Laramie. Water Reso Research Inst.
For primary bibliographic entry see Field 2I.
W77-09153

0. SCIENTIFIC AND TECHNICAL INFORMATION

0B. Reference and Retrieval

ERS MANUAL - OIL AND HAZARDOUS ATERIALS SPILL INFORMATION TRIEVAL SYSTEM.
vironmental Protection Agency, Washington, C. Div. of Oil and Hazardous Materials.
r primary bibliographic entry see Field 5G.
7-09229

0C. Secondary Publication And Distribution

OASTAL ZONE MANAGEMENT FOCUS ON W ENGLAND; AN ANNOTATED SELECTED BLIOGRAPHY,
ssachusetts Inst. of Tech., Cambridge.
r primary bibliographic entry see Field 6B.
7-09241

AMIS ABSTRACTS, NO 2,
zona Univ., Tucson. School of Renewable tural Resources.
M. White, D. B. Thorud, and P. F. Ffolliott.
ailable from the National Technical Informa- Service, Springfield, VA 22161 as PB-269 315, ce codes: A08 in paper copy, A01 in microfiche. hool of Renewable Natural Resources, June 5. 144 p. OWRT A-042-ARIZ(8). 14-31-0001-3.

scriptors: *Information retrieval, bliographies, Wildlife habitats, Burning, getation, *Arizona, *New Mexico, Water quali- Surface waters, Soil erosion, *Rocky Mountain gion.

s bibliography shows a sampling of the erences which are retrievable in the Watershed nagement Information System (WAMIS), a mputerized bibliographic reference retrieval em operated by the School of Renewable ural Resources, University of Arizona. The e topics used for the computer searches were: ildlife habitats in wooded or shrub areas; burning cts on vegetation in Arizona or New Mexico; quality of surface water in the Rocky Moun- region (mostly soil erosion material). The total iography has some 270 references. (See also 5-05767)
7-09256

AVY METALS IN WATER (EXCLUDING RCURY), A BIBLIOGRAPHY, VOLUME 1.
ce of Water Research and Technology, hington, D.C.
primary bibliographic entry see Field 5A.
-09259

Y METALS IN WATER (EXCLUDING RCURY), A BIBLIOGRAPHY, VOLUME 2,
ce of Water Research and Technology, hington, D. C.
primary bibliographic entry see Field 5A.
-09260

VY METALS IN WATER (EXCLUDING RCURY), A BIBLIOGRAPHY, VOLUME 3.
ce of Water Research and Technology, hington, D. C.
primary bibliographic entry see Field 5A.
-09261

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 4.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-09262

HEAVY METALS IN WATER (EXCLUDING MERCURY), A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-09263

URBAN WATER PLANNING, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 6B.
W77-09264

LAND APPLICATION OF WASTE WATER, A BIBLIOGRAPHY.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5D.
W77-09265

REMOTE SENSING OF EARTH RESOURCES: (1970-1973 SUPPLEMENT) A LITERATURE SURVEY WITH INDEXES, SECTION 1, ABSTRACTS.
National Aeronautics and Space Administration, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as N-75-25235, Price codes: A99 in paper copy, A01 in microfiche. NASA SP-7036(01) February 1975. 654 p.

Descriptors: *Great Lakes, *Information retrieval, *Indexing, *Bibliographies, *Remote sensing, *Abstracts, Agriculture, Forestry, Geology, Mapping, Instrumentation, Aircraft, Geophysics, Water management(Applied), Data processing, Information exchange, Aerial photography, Satellites(Artificial), Natural resources, Hydrology, Minerals, Environment, Oceanography, Ice, Glaciers, River basins, Estuaries, Estuarine environment, Cities.
Identifiers: Earth resources program, Spacecraft, Mineral resources.

The bibliography listed 4930 reports, articles, and other documents introduced into the NASA scientific and technical information system between March 1970 and December 1973. Subject matter was grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, oceanography and marine resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. The publication was issued in two sections: Section 1, Abstracts; and Section 2, Indexes. Each entry in the Abstract section contains a citation and an abstract. The Index section contains five indexes--subject, author, source, contract, and report number. (See also W77-09345) (Froehlich-ISWS)
W77-09344

REMOTE SENSING OF EARTH RESOURCES: (1970-1973 SUPPLEMENT) A LITERATURE SURVEY WITH INDEXES, SECTION 2, INDEXES.
National Aeronautics and Space Administration, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as N-75-25236, Price codes: A18 in paper copy, A01 in microfiche. NASA SP-7036(01), February 1975. 402 p.

Descriptors: *Bibliographies, *Remote sensing, *Information retrieval, *Documentation, *Indexing, *Great Lakes, Agriculture, Forestry, Geology, Mapping, Instrumentation, Aircraft, Geophysics, Water management(Applied), Data processing, Information exchange, Aerial photography, Satellites(Artificial), Natural resources, Hydrology, Minerals, Environment, Oceanography, Ice, Glaciers, River basins, Estuaries, Estuarine environment, Cities.
Identifiers: Earth resources program, Spacecraft, Mineral resources.

The bibliography listed 4930 reports, articles, and other documents introduced into the NASA scientific and technical information system between March and December 1973. Subject matter was grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and mineral resources, oceanography and marine resouces, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. The publication was issued in two sections: Section 1, Abstracts; and Section 2, Indexes. Each entry in the Abstract section contains a citation and an abstract. The Index section contains five indexes--subject, author, source, contract and report number. (See also W77-09344) (Froehlich-ISWS)
W77-09345

EARTH RESOURCES--A CONTINUING BIBLIOGRAPHY WITH INDEXES.
National Aeronautics and Space Administration, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-17445, Price codes: A07 in paper copy, A01 in microfiche. NASA SP-7041(05), October 1975. 150 p.

Descriptors: *Bibliographies, *Great Lakes, *Documentation, *Information retrieval, *Indexing, *Remote sensing, *Abstracts, Agriculture, Forestry, Geology, Mapping, Instrumentation, Aircraft, Geophysics, Water management(Applied), Data processing, Information exchange, Aerial photography, Satellites(Artificial), Natural resources, Hydrology, Minerals, Environment, Oceanography, Ice, Glaciers, River basins, Estuaries, Estuarine environment, Cities.
Identifiers: Earth resources program, Spacecraft, Mineral resources.

This bibliography listed 601 reports, articles, and other documents introduced into the NASA scientific and technical information system between January 1975 and March 1975. Emphasis was placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter was grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. (Froehlich-ISWS)
W77-09346

LIVESTOCK AND THE ENVIRONMENT, A BIBLIOGRAPHY WITH ABSTRACTS--VOLUME III,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
For primary bibliographic entry see Field 05D.
W77-09398

MULTIPHASE FLUID FLOW THROUGH POROUS MEDIA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W77-09408

10D. Specialized Information Center Services

USERS MANUAL - OIL AND HAZARDOUS MATERIALS SPILL INFORMATION RETRIEVAL SYSTEM.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
For primary bibliographic entry see Field 05G.
W77-09229

WAMIS ABSTRACTS, NO 2,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 10C.
W77-09256

10F. Preparation Of Reviews

MULTIPHASE FLUID FLOW THROUGH POROUS MEDIA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W77-09408

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SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 10, NUMBER 21
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 21
NOVEMBER 1, 1977

W77-10101 -- W77-10800

Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication mats. The contents of these documents cover the water-ated aspects of the life, physical, and social sciences as ll as related engineering and legal aspects of the charac-stics, conservation, control, use, or management of water. ch abstract includes a full bibliographical citation and a set descriptors or identifiers which are listed in the **Water sources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-arch categories established by the Committee on Water sources Research of the Federal Council for Science and chnology.

RSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE PIES OF DOCUMENTS ABSTRACTED IN THIS JOUR-L. Sufficient bibliographic information is given to enable ders to order the desired documents from local libraries other sources.

ected Water Resources Abstracts is designed to serve scientific and technical information needs of scientists, ineers, and managers as one of several planned services he Water Resources Scientific Information Center RSIC). The Center was established by the Secretary of the rior and has been designated by the Federal Council for ence and Technology to serve the water resources com-nity by improving the communication of water-related earch results. The Center is pursuing this objective by co-nating and supplementing the existing scientific and tech-l information activities associated with active research investigation program in water resources.

provide WRSIC with input, selected organizations with ve water resources research programs are supported as nters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion, Water Yield Improvement; Use of Water of Impaired Quality, Conservation in Domestic and Municipal Use, Conservation in Industry, Conservation in Agriculture.

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SELECTED WATER RESOURCES ABSTRACTS

. NATURE OF WATER

A. Properties

EOCHEMISTRY OF GEOPRESSURED EOTHERMAL WATERS FROM THE FRIO LAY IN THE GULF COAST REGION OF EXAS,
eological Survey, Menlo Park, Calif. Water esources Div.
or primary bibliographic entry see Field 2K.
77-10568

ROWTH RATE OF AN ICE CRYSTAL IN SUB-OOLED PURE WATER,
racuse Univ., New York. Dept. of Chemical En-neering and Materials Science.
P. Kallungal, and A. J. Barduhn.
ChE Journal, Vol 23, No 3, p 294-303, May 77. 11 fig, 2 tab, 36 ref. OWRT 14-30-3124.

escriptors: *Crystal growth, *Ice, *Laboratory sts, *Model studies, Mathematical models, Tem-rature, *Water properties, Convection, Flow, elocity, Instrumentation, Equipment, Freezing, tes, Crystals, Ice-water interfaces, Physical operties.
entifiers: *Ice crystal growth.

ew and extensive experimental data on the rate growth of ice crystals in the a axis direction in iescent and slow flowing subcooled pure water ow conclusively that thermal natural convection an important heat transfer mechanism con-lling the growth rate. At zero and low forced ocities, steady growth is observed only when crystals grow horizontally or upward. Steady wnward growth does not occur in quiescent ter. This is consistent with the physical proper-s of water and the phenomenon of thermal natu-convection. Growth rates at high water flow es vary as the square root of the forced velocity l the 3/2 power of the subcooling and follow the ory of Fernandez and Barduhn with the ice-ter interfacial energy set at 52 mJ/sq m (52 /sq cm). (Sims-ISWS)
7-10796

WATER CYCLE

A. General

OCHASTIC MODELS FOR PRECIPITATION,
ntucky Water Resources Research Inst., Lex-ton.
primary bibliographic entry see Field 2B.
7-10180

W OF PROBABILITY FOR TWO LOW TER VARIABLES,
ection des Eaux, Baja (Hungary).
primary bibliographic entry see Field 2E.
7-10297

E USE OF MATHEMATICAL MODELS FOR RECASTING IN HYDROLOGY AND TEOROLOGY,
ctricite de France, Grenoble. General Techni-Div.
Guillot.
Mathematical Models in Hydrology, Volume 1; ceedings of the Warsaw Symposium, July 1: International Association of Hydrological ences Publication No. 100, p 266-276, 1974. 3 22 ref.

criptors: *Forecasting, *Hydrology, eteorology, *Probability, ecipitation(Atmospheric), *Evaluation, Low flow, Rainfall, Runoff, Daily, Seasonal, Floods, Temperature, Mathematical models, Equations, Systems analysis.
Identifiers: Multiple regression, Hourly, 'Gradex' method, Western Europe, North Atlantic, Graphical correlation methods.

Described are practical forecasting models applied by Electricite de France. The multiple regression computation is applied to the following types of forecast: (1) long-term forecasting of runoff volumes and the subsequent evaluation of low-water flows, based on monthly rainfall and temperature; (2) short-term flood forecasting, based on antecedent daily or hourly rainfall, antecedent runoff and eventually a seasonal parameter; (3) extreme floods' probability, evaluated by the 'Gradex' method, in which extreme daily (or hourly) flow and extreme daily (or hourly) rainfall distributions are extrapolated together, both being assumed to decrease exponentially according to e-xa (a is called 'Gradex'); and (4) forecast of local daily rainfall, one and two days ahead, by multiple correlation of rainfall versus pressure at ground level, and 1000-700mb thickness, inside a sample of analog days, selected by pattern recognition of the 700mb level over Western Europe-North Atlantic. Graphical correlation methods--including 'co-axial relations'--are considered to be subjective and ineffective. The main point in computing multiple regression is that it allows rapid selection of the most useful variables for the forecast and the principal part of the natural model to be isolated, even if it is nonlinear. A satisfactory linear approximation can be achieved by means of simple transformations. Deterministic models are merely considered to be inventories of links pointing to possible correlations, rather than as representing actual forecasting models. Nothing is gained in relying exclusively on over-detailed physical schemes of debatable usefulness; a reliable choice of variables is much more critical than the exact analytical form of the relations. (Bell-Cornell)
W77-10298

ANALYSIS OF THE STOCHASTIC COINCIDENCE OF CERTAIN HYDROLOGICAL PROCESSES,
For primary bibliographic entry see Field 2E.
W77-10299

A STOCHASTIC MODEL FOR THE SIMULATION OF THE TEMPERATURE OF A WATER-COURSE,
Electricite de France, Chatou. Div. Exchanges Atmospheriques.
R. Gras, and J. P. Henry.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 326-332, 1974. 3 fig, 3 ref.

Descriptors: *Rivers, *Water temperature, *Simulation analysis, *Stochastic processes, *Monte Carlo method, Thermal water, Thermal powerplants, Seasonal, Meteorology, Behavior, Downstream, Atmosphere, Data collections, Equations, Mathematical models, Systems analysis, Thermal pollution.
Identifiers: Heat exchange, White noise.

The structural study of chronological series of river temperatures and of meteorological variables governing the phenomena leading to those temperatures allows the generation of temperatures and meteorological variables (such as wind velocities) series by a Monte-Carlo method in order to simulate river thermal behavior downstream from a river-cooled thermal power plant when observed data sequences are too short. The water temperature is considered as the sum of a deterministic component with structure given by a stationary Markovian process of the first order. The heat exchange coefficient between water and atmosphere, computed from the meteorological variables, although by nature not purely random, is represented by a white noise which distribution is a Pearson law III. The procedure, applied to a physical example, allowed limits to be set to the duration of the period of field data collection. (Bell-Cornell)
W77-10300

PROBABILISTIC MODELS FOR MULTIPLE AND SYNTHETIC HYDROLOGIC VARIABLES,
Electricite de France, Chatou, France. Service Technologie Generale Applications de l'Electricite et Hydraulique.
J. Bernier.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 333-342, 1974. 2 fig, 1 tab, 5 ref, append.

Descriptors: *Synthetic hydrology, *Probability, *Simulation analysis, *Mathematical models, River basins, Tributaries, Regional analysis, Equations, Systems analysis.
Identifiers: *Hydrologic variables, Autoregressive model, Multi-dimensional model.

Presented is a multi-dimensional first-order autoregressive model for the description of regional hydrological processes, assuming a temporal and regional structure of dependence. The model is useful for the simulation of the tributaries of a basin. (Bell-Cornell)
W77-10301

SOIL AERATION,
Edinburgh Univ. (Scotland). School of Agriculture.
For primary bibliographic entry see Field 2G.
W77-10325

HIERARCHICAL ANALYSES OF WATER RESOURCES SYSTEMS, MODELING AND OPTIMIZATION OF LARGE-SCALE SYSTEMS,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 6A.
W77-10418

APPLICATION OF MATHEMATICAL MODELS IN HYDROLOGY AND WATER RESOURCES SYSTEMS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
Proceedings of the Bratislava Symposium, September 1975. IAHS-AISH Publication No. 115, International Association of Hydrological Sciences, 1975. 283 p, 96 fig, 37 tab, 210 ref. $31.25.

Descriptors: *Water resources, *Hydrology, *Mathematical models, *Simulation analysis, Statistical methods, Dynamic programming, Stochastic processes, Optimization, Flow, Rivers, Reservoir operation, Planning, Design, Forecasting, Rainfall-runoff relationships, Water balance, Water temperature, Control, Monte Carlo Method, Discharge(Water), Groundwater, Systems analysis.
Identifiers: Chance-constrained programming.

Presented are 36 papers concerned with the application of mathematical models to hydrology and water resources systems. A wide variety of modeling areas is covered. Included are: statistical methods for estimating minimum flow; a water balance model; models for optimal multipurpose reservoir operation and simulation models for reservoir design; rainfall-runoff modeling; a model of flood waves; river flow modeling; principles of hydrological forecasting; and many more. Listed are 12 additional papers, received too late for publication, which can be found in Hydrological

Sciences Bulletin, March 1976. The symposium and workshops were organized by the Czechoslovak National Committee for the International Hydrological Programme in cooperation with the International Commission on Water Resources Relations and Systems of the International Association of Hydrological Sciences (IAHS). (See W77-10420 thru W77-10438) (Bell-Cornell)
W77-10419

APPLICATION OF SOME STATISTICAL METHODS FOR THE ESTIMATION OF MINIMUM FLOW,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2E.
W77-10420

A YEAR ROUND WATER BALANCE MODEL, ITS APPLICATION AND ITS FUTURE,
Ceskoslovenska Akademie Ved, Prague. Inst. of Hydrodynamics.
J. Balek.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 6-12, 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Model studies, *Water balance, *Hydrologic cycle, *Canada, Watersheds(Basins), Hydrologic aspects, Foreign countries, Foreign research, Hydrology, Programs, Computer models, Hydrologic budget.
Identifiers: *Czechoslavakia, *Netherlands, *Zambia.

A year-round water balance model, originally developed at the University of Guelph, was tested on several catchments in three continents under different climatical conditions. In principle, the model was accomplished as a system of interconnected natural reservoirs or zones: (1) surface-biological zone, (2) surface runoff zone, (3) snow pack zone, (4) upper/lower soil moisture zone, (5) groundwater zone, and (6) perched water zone. The model was designed to meet the following criteria: (1) the ability to incorporate data from a great number of catchments; (2) to have a wide application; and (3) compatibility. The following results are expected from the model: (1) a general picture of the hydrological cycle and its components; (2) a continuous water balance of a general catchment for selected time intervals; and (3) the testing of various methods and formulae proposed as characterizing various parts of the hydrological cycle. The results of the application and the future of such water balance modelling were discussed. It was concluded that, as a subject for basic research, modelling has reached a final stage. However, it is not true that further model development should stagnate, because present results show that model theory is ahead of the data and parameters available. Therefore, more attention should be given to work on data and parameter improvement and inputs, both in quality and quantity. (See also W77-10419) (Humphreys-ISWS)
W77-10421

CONSEQUENCES OF GROUNDWATER EXTRACTION ON EVAPOTRANSPIRATION AND SATURATED-UNSATURATED FLOW,
International Courses in Hydraulic and Sanitary Engineering, Delft (Netherlands).
For primary bibliographic entry see Field 4B.
W77-10422

MATHEMATICAL MODELLING OF THE RETURN WATERS RUNOFF,
Laboratory of Mathematical Modelling of Hydrological Processes, Sarnigmi, Tashkent (USSR).
For primary bibliographic entry see Field 4B.
W77-10423

THE APPLICATION OF A DETERMINISTIC MODEL TO A SEMIARID BASIN (APPLICATION DU MODELE A DISCRETISATION SPATIALE A UN BASSIN VERSANT SEMI-DESERTIQUE),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
G. Girard.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 104-114, 1975, 4 fig, 2 tab, 4 ref.

Descriptors: *Runoff, *Model studies, *Hydrologic aspects, *Africa, Discharge(Water), Arid lands, Hydrology, Watersheds(Basins), Precipitation(Atmospheric), Rainfall, Simulated rainfall, Foreign countries, Foreign research.
Identifiers: *African Sahel(Mauritania).

Reported herein was the conception of the deterministic model (rainfall-runoff transformation) based upon a gridded map of the basin. Each square of the grid is defined by its physiographic features, its size, and the drainage direction in it. Presented were the applications of this model on the Ghorfa basin located in a semiarid zone of the African Sahel (Mauritania). The model was fitted on two years of observation data. The applications were: (1) production of time series of daily runoff discharges from observed or simulated daily rainfall data, and (2) estimation of flood discharges from data due to exceptional meteorological events (operating time interval of an hour). In the model, the separation between the production function and the transfer function makes its utilization in different climatic zones and its transposition from one basin to another in the same hydrological region easier. (See also W77-10419) (Humphreys-ISWS)
W77-10424

A NEW METHOD FOR MODELLING MONTHLY DISCHARGE SERIES,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W77-10425

PERFORMANCE OF TWO DETERMINISTIC HYDROLOGICAL MODELS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 4A.
W77-10426

SIMULATION OF THE HYDROLOGICAL CYCLE OVER THE TISZA VALLEY USING ATMOSPHERIC WATER VAPOUR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
P. Magyar.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 149-153, 1975. 1 fig, 3 ref.

Descriptors: *Hydrologic cycle, *Mathematical studies, *Model studies, *Watersheds(Basins), Mathematical models, Hydrology, Evapotranspiration, Water vapor, Precipitable water, Meteorology, Analytical techniques, Analysis, Water storage, Foreign research, Foreign countries, Underground storage, Time series analysis.
Identifiers: *Hungary, *Tisza Valley(Hungary), Surface storage.

Simulation of the combined atmospheric and ter restrial hydrological cycle, the so-calle hydrometeorological approach, consists of mathe matical processes used to extract the maximur amount of information from meteorological obser vations describing the movement of water vapou in the air, in order to solve hydrological problem on the ground. Input for the model consists of (precipitable water content, (2) moisture flux of th air, (3) precipitation, and (4) runoff of the specif area. The result is the output of time series evaportranpiration and surface plus subsurfac storage values. The same type of simulation w performed in 1973-1974 to determine the abov mentioned missing hydrological components f the valley of the Tisza River. The following con clusions were reached: (1) No systematic err was detected in the time series of the precipitab water content of the air. (2) The time series water vapour flux was found to be quite unstab Systematic errors were eliminated by a three-st adjustment procedure consisting of the adjustme of means, variances, and insignificant noises. The calculated change in land storage a evapotranspiration time series were checked data obtained by the Thornthwaite method for t calculation of actual evapotranspiration and t stored amount of water for discrete points of t area. Differences were considerable. In gener compared with the values obtained by t Thornthwaite method, summer maximums w lower and winter maximums higher evapotranspiration and the reverse for stora (See also W77-10419) (Humphreys-ISWS)
W77-10427

A HYDROLOGICAL MODEL WITH PHY CALLY REALISTIC PARAMETERS,
Severn-Trent Water Authority, Birmingh (England)
R. E. Manley.
In: Application of Mathematical Models Hydrology and Water Resources Syste Proceedings of the Bratislava Symposium, S tember 1975: International Association Hydrological Sciences Publication No. 115, p 161, 1975. 3 fig, 1 tab, 7 ref.

Descriptors: *Model studies, *Run *Watersheds(Basins), *Mathematical mod Hydrology, Soil water, Hydrologic cy Precipitation(Atmospheric), Groundwater, W storage, Discharge(Water), Computer progra Evapotranspiration, Analytical techniques, An sis, Surface waters, Hydrographs.
Identifiers: *United Kingdom.

The reasons were examined for the use of ph cally realistic parameters in mathema hydrological models. The parameters include ability to use data on catchment shape, soil t and channel dimensions in addition to meteoro ical and flow data. A model was described whi based on such parameters. The soil componen the model has reservoirs representing upper lower soil horizons. In these horizons, capi suction, effective permeability, and moisture tent are simulated and are used to calculate transfer of moisture in the soil and percolatio groundwater. The model employs a kinem routing method for flow in channels. Model ou consists of a printout of daily mean and maxi simulated flows and, optionally, daily gro water level and hourly flows. The presented m results verified that the model has been ap satisfactorily to a number of catchments in gland. (See also W77-10419) (Humphreys-ISW W77-10428

APPLICATION OF DYNAMIC PROGRAMM TO MODEL TRI-DIMENSIONAL FLOW POROUS MEDIA (APPLICATION DE LA P GRAMATION DYNAMIQUE AUX MODE TRIDEMENSIONNELS DE CALCUL ECOULEMENTS DANS LES MIL POREUX),
Tehran Univ. (Iran). Dept. of Irrigation.

or primary bibliographic entry see Field 2F.
V77-10429

IATHEMATICAL SIMULATION MODELS OF YDROLOGICAL PROCESSES IN TURKEY,
egean Univ., Bornova (Turkey). Faculty of Engineering Sciences.
. Ozis.
: Application of Mathematical Models in ydrology and Water Resources Systems; roceedings of the Bratislava Symposium, September 1975: International Association of ydrological Sciences Publication No. 115, p 185-91, 1975. 1 fig, 38 ref.

escriptors: *Model studies, *Hydrologic aspects, Watersheds(Basins), *Hydrology, Foreign countries, Foreign research, Reviews, Groundwater, ater levels, Karst hydrology, Streamflow, atistical methods, Annual, Monthly.
entifiers: *Turkey.

ne application of mathematical simulation odels and experimental statistical methods are of eat importance, especially for countries where cords of hydrological processes are of relatively ort duration and only a minor part of the available water resources have actually been developed. rkey is a country where the longest streamflow cord covers a period of less than 40 years, the lk of hydrometric and meteorological stations ve been set up after 1960, and only 10-20% of e water resources have been developed. Mathetical Simulation models increasingly have been plied to hydrological processes in Turkey during cent years. The analysis of the work achieved s revealed that two subjects in particular have racted much interest in Turkey. The first is the rat (Euphrates) basin, which represents almost 5 of the water supply and 1/3 of the water power tential; the second is the karstic basins, which ver almost all the southern half of Turkey. This per reviewed and briefly summarized studies of nual streamflow series, annual hydroelectric ergy series, monthly streamflow series, monthly ring discharges, monthly groundwater levels, d daily hydrologic processes. (See also W77-419) (Humphreys-ISWS)
77-10430

OCHASTIC IDENTIFICATION OF NON-NEAR HYDROLOGICAL SYSTEMS,
tsburg Univ., Pa. Dept. of Civil and Environtal Engineering.
G. Quimpo.
Application of Mathematical Models in drology and Water Resources Systems; ceedings of the Bratislava Symposium, September 1975: International Association of drological Sciences Publication No. 115, p 192-, 1975. 2 fig, 9 ref. NSF GK 20388 A 2.

scriptors: *Hydrologic systems, *Model stus, *Stochastic processes, *Hydrograph analy- Statistical methods, Correlation analysis, thematical analysis, Daily hydrographs, drology, Analytical techniques, Analysis, ut-output analysis.
ntifiers: Kernels.

use of higher order cross-correlation nniques in the identification of a nonlinear rological system was developed. The nonlinear del adopted is the functional series representa- whose deterministic identification has been viously developed by others using either the ogonal expansion method or a least-square opzation procedure. The stochastic method ented complements the mentioned two deteristic techniques. An inflow-outflow example worked out to illustrate the determination of first and second order kernels of the nonlinear em model. It was concluded that the stochastic tification of the nonlinear kernel using the eloped approach is feasible. Once the edures are generalized to remove some of the restrictions imposed, the technique promises to be a powerful tool in nonlinear modelling to complement existing deterministic methods. (See also W77-10419) (Humphreys-ISWS)
W77-10431

A MODEL OF THE MELTING PROCESS OF THE SNOW COVER AS A PART OF CATCHMENT MODELS,
Meteorologischer Dienst der Deutschen Demokratischen Republik, Berlin. Forschungsinstitut fuer Hydrometeorologie.
For primary bibliographic entry see Field 2C.
W77-10432

STATISTICAL MODELLING OF RIVER FLOW BY THE MONTE CARLO METHOD AND EVALUATION OF DISTRIBUTION PARAMETERS AND QUANTITIES,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2E.
W77-10433

A MATHEMATICAL MODEL FOR URBAN RUNOFF,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
E. J. Sarginson, and B. B. Nussey.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 209-213, 1975. 3 fig, 1 tab, 6 ref.

Descriptors: *Urban runoff, *Mathematical models, *Rainfall-runoff relationships, Runoff, Discharge(Water), Storm runoff, Hydrographs, Model studies, Surface runoff, Runoff forecasting, Runoff coefficient, Rational formula, Analytical techniques, Foreign research, Foreign countries.
Identifiers: *United Kingdom.

In developing a mathematical 'model' relating rainfall and runoff in urban areas, the following principles were important: it should attempt to reproduce the mechanics of urban runoff, it should consistently predict discharges accurately, and it should be relatively simple to apply in practice to design problems. The model reported herein assumes that after deducting lossses for surface depression and infiltration, the excess rainfall from the whole catchment is routed successively overland and through the pipe system. The process is equivalent to flow through two equal linear reservoirs in series and leads to a linear second-order differential equation. The total rainfall loss during a storm is a linear function of the total rainfall and the slope and impermeability of the catchment. In combination with a standard design storm such as the one suggested by the Meteorological Office of the United Kingdom, the 'model' results in a simple formula for the discharbe, incorporating 'reduction factors' which depend on the rainfall loss coefficient and the linear pipe routing parameter, which can be computed from the dimensions of the pipe system. A statistical analysis of existing data showed a linear correlation between the percentage runoff and the catchment slope and leads to a modification of the 'rational' formula, which incorporates this correlation. (See also W77-10419) (Humphreys-ISWS)
W77-10434

CHARACTERISTICS OF RAINFALL CELL PATTERNS IN THE SOUTHEAST COASTAL PLAIN AREAS OF THE USA, AND A COMPUTER SIMULATION MODEL OF THUNDERSTORM RAINFALL,
Middle East Technical Univ. Ankara (Turkey).
For primary bibliographic entry see Field 2B.
W77-10435

STOCHASTIC PROPERTIES OF THE PROCESSES TRANSFORMED IN LINEAR HYDROLOGICAL SYSTEMS,
Polish Academy of Sciences, Warsaw. Inst. of Geophysics.
W. G. Strupczewski, R. J. Kiczko, Z. W. Kundzewicz, J. J. Napiorkowski, and H. T. Mitosek.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 231-237, 1975. 1 tab, 6 ref.

Descriptors: *Hydrologic systems, *Model studies, *River systems, *Synthetic hydrology, Watersheds(Basins), Stochastic processes, Mathematical models, Hydrology, Hydrologic aspects, Statistical methods, Input-output analysis, Markov processes, Analytical techniques, Correlation analysis.
Identifiers: Muskingum model, Nash model, Linear analysis.

The transformation of white noise and the Markov process through the linear, time invariant river system was examined. The systems presented correspond to the linear reservoir model, the Nash model, the Muskingum model, and two linear river system models with common input. Normalized functions of auto- and cross-correlation were presented. The time series obtained by integration of the output process were also considered. The results obtained would be difficult to obtain experimentally because of the fact that the models approximate actual nonlinear hydrological systems and also that hydrometeorological measurement devices add some error to the actual signal in the form of additional noise. Since the conceptual linear hydrological models are widely used, the analysis of some stochastic properties may seem useful for practical applications. (See also W77-10419) (Humphreys-ISWS
W77-10436

APPLICATION OF CONCEPTUAL RAINFALL-RUNOFF MODELS IN A COMPLEX PROGRAM,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
J. Urban, J. Novak, and J. Stransky.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 247-256, 1975. 4 fig, 4 ref.

Descriptors: *Model studies, *Rainfall-runoff relationships, *Watersheds(Basins), *Computer models, Computer programs, Unit hydrographs, Runoff, Rainfall, Rainfall disposition, Hydrographs, Hydrologic aspects, Hydrology, Input-output analysis, Discharge(Water), Streamflow forecasting, Foreign research, Depth-area curves.

The program of the complex solution consists of two parts. The first part includes the evaluation of rainfall data from individual stations, determination of the direct runoff and effective rainfall, computation of parameters and instantaneous unit hydrograph for the selected model and criteria of coincidence between the observed and regenerated hydrographs. The second part of the program enables the runoff hydrograph to be predicted from the given rainfall data. The program has a structure in which the main program MASTER SEGMENT controls individual blocks solving corresponding basic problems. Each of these problems may be solved separately, either with the data obtained from the previous blocks or with any other data given as the input. The program is written in 1900 FORTRAN for ICL 1900 and ODRA 1300 computers. (See also W77-10419) (Humphreys-ISWS)
W77-10437

Field 2—WATER CYCLE

Group 2A—General

A MATHEMATICAL MODEL OF FLOOD WAVES MOVING ALONG A CASCADE OF RESERVOIRS ON A LARGE RIVER,
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 2E.
W77-10438

STRUCTURE OF NATURAL HYDROLOGIC TIME PROCESSES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Stochastic Approaches to Water Resources, Volume I, Chapter 2; Colorado State University, Fort Collins, p 2-1 -- 2-59, 1976. 29 fig, 10 ref.

Descriptors: *Water resources, *Stochastic processes, *Mathematical studies, *Hydrologic systems, Theoretical analysis, Mathematical models, Statistical methods, Equations, Time series analysis, Analytical techniques, Hydrology, Runoff, Streamflow, Precipitation(Atmospheric), Frequency, Correlation analysis, Variability, Solar radiation, Probability, Water temperature.
Identifiers: Correlograms, Stationarity.

Natural hydrologic time processes are defined as time series of various hydrologic variables of all three types of variables of a natural water resources system, namely of inputs, states-of-the-system, and outputs. The term 'natural' implies that in observing those time processes in the form of samples of given sizes, they have no significant systematic errors (inconsistency in data), no large random measurement errors (small random measurment errors are unavoidable), and no significant man-made or natural accidental changes (nonhomogeneity in data). When inconsistency and nonhomogeneity do exist ad are proven, their proper removal would reduce the observed samples to samples of natural time processes. The inputs to man-made water resources systems, or to combined natural and man-made systems, are most often in the form of natural hydrologic time processes. This chapter dealt only with the structure of consistent, homogeneous natural time processes, or with samples reduced to such processes. (See also W77-10439) (Humphreys-ISWS)
W77-10440

GENERATION OF HYDROLOGIC AND WATER RESOURCES SAMPLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Stochastic Approaches to Water Resources, Volume I, Chapter 4; Colorado State University, Fort Collins, p 4-1 -- 4-41, 1976. 21 fig, 7 tab, 11 ref.

Descriptors: *Water resources, *Stochastic processes, *Synthetic hydrology, *Statistical methods, *Great Lakes, Statistics, Hydrologic data, Sampling, Hydrologic systems, Hydrologic aspects, Hydrology, Mathematical studies, Time series analysis, Variability, Parametric hydrology, Frequency, Correlation analysis, Mathematical models, Model studies, Analytical techniques, Data processing.
Identifiers: Sample generation, Correlograms, Random numbers, Hydrologic processes.

The generation of new samples of stochastic processes in hydrology and water resources was analyzed by a study of individual series (univariate time processes) or a study of a set of point series (multivariate time processes), or a set of interrelated variables (also multivariate time processes). It is easy to reduce a multivariate time process to a univariate process, so the discussion started with the general discussion of generating samples of a set of station series. The monthly and quarter-monthly net basin supplies for the system for Great Lakes in the United States and Canada were used to demonstrate the techniques of generating the new samples of hydrologic data Basically, all information available, statistical of the historic data and physical (or otherwise), should be used to obtained the best inference about the population process. it is understood that the ture population of hydrologic processes are never known. When the new samples are generated, the tests should be designed to show that both the historic and the generated samples are from the same, unknown population approximated by the inferred population model. (See also W77-10439) (Humphrey-ISWS)
W77-10441

DATA COLLECTION, ANALYSIS AND INSTRUMENTATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
W. Z. Sadeh.
In: Stochastic Approaches to Water Resources, Volume I, Chapter 5; Colorado State Univ., Fort Collins, p 5-1 – 5-27, 1976. 4 fig, 52 ref.

Descriptors: *Water resources, *Hydrologic data, *Sampling, *Data processing, *Stochastic processes, Statistics, Statistical methods, Probability, Analytical techniques, Mathematical studies, Variability, Correlation analysis, Frequency, Estimating, Instrumentation.
Identifiers: *Random data, Hydrologic processes.

Acquisition and processing of random data to a large extent depends on the physical process being investigated and on the specific aims of the study. The procedure involves five main phases: (1) data collection; (2) data recording; (3) data preparation; (4) data qualification; and (5) data analysis. The five primary steps, including the sequential stages of each category, were illustrated. (See also W77-10439) (Humphreys-ISWS)
W77-10442

LONG-RANGE CHANGES,
Department of the Environment, Ottawa (Ontario). Inland Water Directorate; Department of the Environment, Ottawa (Ontario). Water Resources Branch.
W. Q. Chin, and V. Yevjevich.
In: Stochastic Approaches to Water Resources, Volume I, Chapter 6; Colorado State University, Fort Collins, p 6-1 - 6-45, 1976. 18 fig, 40 ref.

Descriptors: *Paleoclimatology, *Reviews, *Dendrochronology, *Stochastic processes, Dating, Climatology, Climates, Geologic time, Paleohydrology, History, Analytical techniques, Model studies, Borehole geophysics, Core logging, Sediments, Ice, Sampling, Pleistocene epoch, Solar radiation.
Identifiers: Long term changes, Historical climate.

Hydrologic processes are intimately related to climate. Climatic fluctuations are manifested as droughts, floods, advance or retreat of glaciers, and other changes in various geophysical phenomena. The main concern of this chapter, however, is with long-range changes of the climate as a result of natural causes. There is ample evidence that remarkable fluctuations of the climate have occurred during the earth's history. The changes have different characteristics, depending on whether our interest is with time spans of decades, centuries, millennia, or hundreds of millions of years. The climate of the earth has varied from warm or hot tropical regimes to ice ages with various degrees of changes between these extremes. A brief overview of long-range climate changes was presented. Concepts and techniques used in developing deterministic-stochastic models for evaluating climatic change based on the proxy records from deep-sea sediment cores and the ice core of the Greenland ice sheet were discussed. (See also W77-10439) (Humphreys-ISWS)
W77-10443

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 1. ARKANSAS RIVER BASIN, RED RIVER BASIN, SABINE RIVER BASIN, NECHES RIVER BASIN, TRINITY RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10552

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 2. SAN JACINTO RIVER BASIN, BRAZOS RIVER BASIN, SAN BERNARD RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10553

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 3. COLORADO RIVER BASIN, LAVACA RIVER BASIN, GUADALUPE RIVER BASIN, NUECES RIVER BASIN, RIO GRANDE BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10554

GEOLOGICAL SURVEY RESEARCH 1976.
Geological Survey, Reston, Va.
Available from the Supt. of Documents, GPO Washington, DC 20402, Price $5.50. Profession Paper 1000, 1976. 414 p, 10 fig, 4 tab, 581 ref.

Descriptors: *Natural resources, *Program *Projects, *Water resources, *Geologic investig tions, Mineralogy, Water analysis, Analytic techniques, Land use, Mapping, Data collection Geothermal studies, Oil, Coals, Remote sensin Satellites(Artificial), Evaluation, Geological Su vey.

This U.S. Geological Survey activities report cludes a summary of recent (1976 fiscal yea scientific and economic results accompanied by list of geologic and hydrologic investigations progress and a report on the status of topograph mapping. The summary of results includes: (Mineral resources, Water resources, (2) Enginee ing geology and hydrology, (3) Regional geolog (4) Principles and processes, (5) Laboratory a field methods, (6) Topographic surveys a mapping, (7) Management of resources on pub lands, (8) Land information and analysis, and Investigations in other countries. Also includ are lists of cooperating agencies and Geologic Survey offices. (Woodard-USGS)
W77-10560

HYDROLOGIC EVALUATION OF ASHLE VALLEY, NORTHERN UINTA BASIN ARE UTAH,
Geological Survey, Salt Lake City, Utah. Wa Resources Div.
J. W. Hood.
Utah Department of Natural Resources Techn Publication No 54, 1977. 25 p, 3 fig, 1 plate, 6 ref

Descriptors: *Water resources, *Surface wate *Groundwater resources, *Water quali *Irrigation effects, Surface-groundwater relati ships, Water yield, Streamflow, Reservoi Aquifers, Hydrogeology, Water level fluctuatio Pumping, Groundwater recharge, Available wat *Ashley Valley(Utah), Northern Uinta Basin.

The water resources of the northern Uinta Bas Utah and Colorado, were studied during 1971- Ashley Valley was evaluated in slightly grea detail than the general area, in order to assess

eneral relation of ground- and surface-water supies. In Ashley Valley, the principal source of oth irrigation supply and ground-water recharge the flow from Ashley Creek canyon. Groundater recharge to the valley fill, however, is ainly from canal and field losses along the west de of the valley. The permeability of the fill in ost places is high, and water-level records inicate rapid changes in storage in response to the nnual applications of irrigation water. The mount of ground water available from storage in shley Valley is estimated to be 50,000-75,000 cre-feet, or enough water to supply irrigation in e vally for a maximum of 2 years. The water om Ashley Creek canyon is fresh. Mixing of owmelt and base flow in Steinaker Reservoir elds a water of more uniform quality; but despite me concentration by evaporation from the reserir, the outflow from the reservoir is fresh. round water in most of the valley is fresh, but the ater increases in dissolved-solids concentration ward the south and east. (Woodard-USGS)
77-10564

NDEX OF PUBLISHED SURFACE-WATER-UALITY DATA FOR OKLAHOMA 1946-1975,
eological Survey, Oklahoma City, Okla. Water esources Div.
or primary bibliographic entry see Field 7C.
77-10567

/ATER-RESOURCES INVESTIGATIONS IN ONTANA, 1976.
eological Survey, Helena, Mont. Water esources Div.
or primary bibliographic entry see Field 7A.
77-10573

/ATER-RESOURCES INVESTIGATIONS IN KLAHOMA, 1976.
eological Survey, Oklahoma City, Okla. Water esources Div.
or primary bibliographic entry see Field 7A.
77-10574

ATER-RESOURCES INVESTIGATIONS IN YOMING, 1976.
eological Survey, Cheyenne, Wyo. Water esources Div.
or primary bibliographic entry see Field 7A.
77-10575

PROCEDURE FOR THE SELECTION OF OBCTIVE FUNCTIONS FOR HYDROLOGIC MULATION MODELS,
chnion - Israel Inst. of Tech., Haifa. Dept. of vil Engineering.
r primary bibliographic entry see Field 2E.
77-10767

ME REMARKS ON THE STATISTICAL IEORY OF EXTREME VALUES,
ole Polytechnique, Montreal (Quebec). Dept. of thematics.
Todorovic, and H. W. Shen.
Stochastic Approaches to Water Resources, lume II, Chapter 14, Colorado State University, rt Collins, p 14-1 - 14-31, 1976. 8 fig, 10 ref.

scriptors: Water resources, *Stochastic ocesses, *Model studies, *Reviews, Theoretical alysis, Statistical methods, Mathematical stus, Mathematics, Mathematical models, Probaty, Analytical techniques, Equations, Hydrolo- Floods, Droughts, Precipitation(Atmospheric). ntifiers: *Extreme values, Stationarity.

e statistical theory of extreme values had its ginning shortly after the turn of the eighteenth tury. The oldest problems that eventually ght lead to a theory of extreme values are some drological phenomena, such as floods, droughts, precipitation, etc., whose importance have been recognized since ancient times. Frequently, however, the structure of the phenomena is so complex that an application of the existing stochastic models is not feasible. This is one of the reasons why engineers are inclined to use some other methods in analysis of extreme values of various hydrologic and geophysical phenomena, rather than those available in probability theory. In this paper, the authors attempted to review and summarize in an integrated form some theoretical results in the statistical theory of extreme values which have potential applicability to various water resources problems. Subjects presented included stochastic structures, extreme values, location of extremes, some joint distributions, extreme terms in a sequence of a random number of random variables, and the time when extremes are achieved. (See also W77-10439) (Humphreys-ISWS)
W77-10786

STOCHASTIC STRUCTURES OF THE LOCAL PATTERN OF PRECIPITATION,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 2B.
W77-10787

FLOODS AND DROUGHTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-10788

STATISTICAL APPLICATIONS IN GROUNDWATER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-10789

WATERSHED SEDIMENT YIELD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
For primary bibliographic entry see Field 4D.
W77-10790

MODELING OF STREAM GEOMETRY AND ITS APPLICATIONS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-10791

STOCHASTIC ASPECTS OF INCIPIENT GRAIN MOTION ON RIVERBEDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-10792

SEDIMENT TRANSPORT MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
For primary bibliographic entry see Field 2J.
W77-10793

DETERMINISTIC AND STOCHASTIC APPROACHES FOR MODELLING OF LONGITUDINAL DISPERSION IN A TURBULENT OPEN CHANNEL FLOW,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 5B.
W77-10794

DISPERSION OF SEDIMENT PARTICLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-10795

2B. Precipitation

SEASONAL OCEANIC PRECIPITATION FREQUENCIES FROM NIMBUS 5 MICROWAVE DATA,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
S. Q. Kidder, and T. H. Vonder Haar.
Journal of Geophysical Research, Vol. 82, No. 15, p 2083-2086, May 20, 1977. 7 fig, 1 tab, 22 ref. NASA NGR-06-002-102.

Descriptors: *Remote sensing, *Precipitation(Atmospheric), *Rainfall, *Tropical regions, Seasonal, Satellites(Artificial), Oceans, Clouds, Microwaves, Frequency, Frequency analysis, Temperature, Measurement, Data processing, Meteorology.
Identifiers: *Nimbus 5, Microwave precipitation measurement, ESMR data, Radiometers.

Microwave brightness temperature data from the Nimbus 5 satellite were analyzed by using threshold brightness temperatures to yield tropical oceanic precipitation frequencies for several classes of rainfall rates during the season December 1972 through February 1973. Data taken near local noon and near local midnight were analyzed. The overall results were consistent with both climatological precipitation frequency and with concurrent satellite-derived frequency of highly reflective clouds. The difference between the local noon and the local midnight frequency is small, but the heavier rainfall rates tend to occur more frequently near local noon. The ratios of the frequencies of light, moderate, and heavy rain were observed to be relatively constant over the tropical oceans. Passive microwave measurements from space seem to be an important step toward accurate measurement of oceanic precipitation. (Sims-ISWS)
W77-10105

DETERMINATION OF RAINFALL DISTRIBUTIONS FROM MICROWAVE RADIATION MEASURED BY THE NIMBUS 6 ESMR,
Wisconsin Univ.-Madison. Dept. of Meteorology.
J. A. Weinman, and P. J. Guetter.
Journal of Applied Meteorology, Vol. 16, No. 4, p 437-442, April 1977. 3 fig, 5 tab, 7 ref, 1 append. NSF ATM75-21117.

Descriptors: *Remote sensing, *Rainfall, *Microwaves, Satellites(Artificial), Radiation, Clouds, Analytical techniques, Data processing, Mathematical models, Measurement, Meteorology.
Identifiers: *Polarized radiation, Nimbus, ESMR measurements.

The polarization of 37 GHz microwave radiances emerging from rain clouds above land and rough and calm water surfaces was computed from the equation of radiative transfer. Scattering was assumed to be characterized by a Rayleigh phase matrix. The radiative transfer equation was solved by means of a Neumann solution. It was found that the brightness temperatures of the upward directed radiances emerging from rain clouds were relatively independent of polarization. The weak polarization of radiation emitted by rain clouds can be used to discriminate between cool brightness temperatures emerging from rain clouds and from open water. The brightness temperatures of radiances emerging from rain clouds over water can be transformed into a single-valued function of the rainfall rate if polarization effects are considered. A sample of Nimbus 6 data was analyzed in accord with the results of the theoretical analysis. (Sims-ISWS)
W77-10106

PERSISTENCE, RUNS AND RECURRENCE OF PRECIPITATION,
Air Force Geophysics Lab., Hanscom AFB, Mass.
I. A. Lund, and D. D. Grantham.
Journal of Applied Meteorology, Vol. 16, No. 4, p 346-358, April 1977. 10 fig, 16 tab, 6 ref.

Descriptors: *Precipitation(Atmospheric), *Probability, *Frequency, *Northeast U.S., *Southeast U.S., Data processing, Analytical techniques, Model studies, Mathematical models, Persistence, Variability, Rainfall, Snowfall, Seasonal, Climatology, Meteorology.
Identifiers: Duration, Recurrence.

A total of 511,056 hourly observations of precipitation, taken over a 13-year period at nine stations, was studied to obtain a better understanding of the characteristics of persistence, runs, and recurrence. Each hourly precipitation observation was categorized as either none, light, moderate, or heavy. Probabilities of each category, except heavy, were estimated from relative frequencies determined from the large data sample and were compared with some theoretical models. The heavy category occurred too infrequently at all of the nine stations to obtain statistically stable relative frequencies from a 13-year period of record. The sample provided sufficient information about the other categories to confidently fit models to the data. The models can be applied to estimate probabilities that precipitation will be observed for sequences of x hours, or more; for exactly x hours; or at time t and also at time t + x hours. (Sims-ISWS)
W77-10110

A FIELD EXPERIMENT ON THE CALIBRATION OF RADARS WITH RAINDROP DISDROMETERS,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
B. E. Martner.
Journal of Applied Meteorology, Vol. 16, No. 4, p 451-454, April 1977. 3 fig, 5 ref. NOAA 03-5-022-6.

Descriptors: *Radars, *Rainfall, *Oklahoma, *Raindrops, Measurement, Precipitation(Atmospheric), Thunderstorms, Hail, Remote sensing, Rain gages, Meteorology.
Identifiers: *Disdrometers, *Drop spectra, Radar reflectivity.

Radar reflectivity factors determined from disdrometer measurements of drop spectra were compared with simultaneous WSR-57 radar measurements in two Oklahoma thunderstorms. The possibility of using a disdrometer for an in-field calibration check of a radar was examined and found to have limited usefulness for convective precipitation sampled at long ranges. (Sims-ISWS)
W77-10112

A SATELLITE TECHNIQUE FOR QUANTITATIVELY MAPPING RAINFALL RATES OVER THE OCEANS,
National Aeronautics and Space Adminstration, Greenbelt, Md. Goddard Space Flight Center.
T. T. Wilheit, A. T. C. Chang, M. S. V. Rao, E. B. Rodgers, and J. S. Theon.
Journal of Applied Meteorology, Vol. 16, No. 5, p 551-560, May 1977. 9 fig, 2 tab, 31 ref.

Descriptors: *Remote sensing, *Rainfall, *Oceans, *Mapping, Microwaves, Satellites(Artificial), Clouds, Radar, Measurement, Meteorology.
Identifiers: *ESMR data, Radiometers, Nimbus, Brightness temperature.

A theoretical model for calculating microwave radiative transfer in raining atmospheres was developed. The calculations were compared with microwave brightness temperatures at a wavelength of 1.55 cm measured by the Electrically Scanning Microwave Radiometer (ESMR) on the Nimbus 5 satellite and with rain rates derived from WSR-57 meteorological radar measurements. A specially designed ground-based verificaton experiment also was performed, wherein upward viewing microwave brightness temperature measurements at wavelengths of 1.55 and 0.81 cm were compared with directly measured rain rates. It was shown that over ocean areas, brightness temperature measurements from ESMR may be interpretated in terms of rain rate with about an accuracy of a factor of 2 over the range 1-25 mm/h rain rate. (Sims-ISWS)
W77-10113

SETTLING VELOCITIES OF SMALL ICE CRYSTALS,
Ben Gurion Univ. of the Negev, Beer Sheva (Israel). Research and Development Authority.
G. Michaeli.
Tellus, Vol 29, No 3, p 282-285, June 1977. 1 fig, 1 tab, 11 ref.

Descriptors: *Crystals, *Ice, *Settling velocity, Laboratory tests, Cloud physics, Velocity, Data processing, Theoretical analysis, Meteorology.
Identifiers: *Ice crystals.

Settling velocities, masses and external dimensions were determined experimentally for small freely falling ice crystals grown for about 100 s at 12 different temperatures within the range -3.4 to -20 C. The corresponding terminal velocities were calculated using the above measurements, together with the empirical Be-Re relationships, deduced from previous model experiments. Reasonably good agreement was found between theory and experiment. (Sims-ISWS)
W77-10121

CLOUD CONDENSATION NUCLEUS SIZE DISTRIBUTIONS AND THEIR EFFECTS ON CLOUD DROPLET SIZE DISTRIBUTIONS,
Naval Weapons Center, China Lake, Calif. Research Dept.
E. E. Hindman, II, P. V. Hobbs, and L. F. Radke.
Journal of the Atmospheric Sciences, Vol 34, No 6, p 951-956, June 1977. 3 fig, 1 tab, 20 ref, 1 append.

Descriptors: *Nucleation, *Drops(Fluids), *Raindrops, *Washington, Cloud physics, Chemistry of precipitation, Condensation, Crystal growth, Crystallization, Precipitation(Atmospheric), Rain, Clouds, Particle size, Meteorology.
Identifiers: *Condensation nuclei, Size distributions, Cloud droplets.

Cloud droplet size distributions, calculated from cloud condensation nucleus (CCN) measurements made beneath non-raining, warm clouds in western and eastern Washington State, show reasonable agreement with droplet size distributions measured in the clouds. The results of both the measurements and the calculations showed that high concentrations of large (D between 0.2 and 2 micrometers) and giant (D greater than 2 micrometers) CCN lead to droplet size distributions, which contain large droplets (D greater than 30 micrometers) only if low concentrations of small (D between 0.06 and 0.2 micrometers) CCN are present. If high concentrations of small CCN are present, the droplet size distributions contain few, if any, large droplets, regardless of the concentrations of giant CCN. (Sims-ISWS)
W77-10125

ISOTOPIC, CRYSTAL AND AIR BUBBLE STRUCTURES OF HAILSTONES,
National Center for Atmospheric Research, Boulder, Colo.
W. C. Macklin, C. A. Knight, H. E. Moore, N. C. Knight, and W. H. Pollock.
Journal of the Atmospheric Sciences, Vol 34, No 6, p 961-967, June 1977. 2 fig, 1 tab, 20 ref.

Descriptors: *Hail, *Thunderstorms, *Crystals, Temperature, Crystallization, Ice, Deuterium, Bubbles, Laboratory tests, Precipitation(Atmospheric), Cloud physics, Heat balance, Meteorology.
Identifiers: *Hailstones, Hailstone growth, Air bubbles, Crystal structure.

The deuterium, crystal, and air bubble structures of 11 large hailstones from three severe storms were examined. It was emphasized that there are a number of assumptions underlying the interpretation of such data, and the assumptions were discussed. In seven of the hailstones, the ambient temperatures at which they grew were inferred from the crystal size. The deuterium concentrations and ambient temperatures generally showed similar variations, and the crystal data thereby provided a useful way of placing an absolute temperature scale against the deuterium values. Throughout most of their growth, the hailstones grew in the updraft between about the ambient temperature levels of -17 to -30C. The air bubble analyses showed that the transparent layers in the hailstones were formed in the wet growth regime, while the opaque layers were formed near the wet growth limit. On this basis, calculations of the effective liquid water concentrations EW give values of 2-3 g/cu m. On the assumption that the median volume radius of the cloud droplets is 1 micrometers, the actual liquid water concentrations are then about 4 to 5.5 g/cu m. (Sims-ISWS)
W77-10126

EFFECTS OF ACID PRECIPITATION ON SMALL ACID LAKE IN SOUTHERN NORWAY
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5B.
W77-10127

THE EFFECT OF MODEL GRID LENGTH AN OROGRAPHIC RAINFALL 'EFFICIENCY' O COMPUTED SURFACE RAINFALL,
Radar Establishment, Malvern (England) Meteorological Office Research Unit.
C. G. Collier.
Quarterly Journal of the Royal Meteorologic Society, Vol 103, No 436, p 247-253, April 1977. fig, 8 ref.

Descriptors: *Model studies, *Orograph *Rainfall, Numerical analysis, Cloud physic Mountains, Clouds, Efficiencies, Foreign cou tries, Foreign research.
Identifiers: *Grid length, *Orographic rainfa *Wales, Numerical parameterization model, Are rainfall, Orographic enhancement.

Surface rainfall distributions over North a South Wales were derived using a numeric parameterization model. Several different g lengths were used, which allowed the dependen on grid length of areal rainfall produced by t model to be examined. It was found that as the g length increased from one to ten km, areal rainf totals predicted by the model decreased, in so cases quite rapidly. The areal rainfall totals a depended upon the amount of orographic enhanc ment operating in particular cases owing to clo physics processes which were not parameteriz in the model. A suggestion was offered as to h the processes can be taken into account in t model. (Roberts-ISWS)
W77-10133

AN INVESTIGATION OF THE PARTICULA PHASE OF ACID PRECIPITATION.
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry
J. E. Ganjei, and G. H. Morrison.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-270 6 Price codes: A02 in paper copy, A01 in microfic Completion Report, June 1977. 10 p, 5 fig, 2 tab ref. OWRT A-066-NY(1). 14-34-0001-6033.

escriptors: *Environmental control, Effects, easibility, Microscopy, Precipitaon(Atmospheric), Ions, Pollutant identification. entifiers: *Acid rain, Particulates, *Light icroscopy, *Ion microprobe, Sensitivity, ualitative analysis.

cid rain has been recognized as an important enronmental problem. Many researchers are curntly working on the different aspects of the oblem such as sources, geographical and asonal monitoring and ecological effects. This oject studied the feasibility of using the light croscope and ion microprobes for rain particue analysis (> 0.5 micrometers). The light croscope was very good for qualitative analysis pes of particles) but generally unrealiable for antitative determinations. The ion microprobe d the sensitivity to detect minor elements within all particles but the lack of appropriate stanrds prevented quantitative analyses.
77-10178

OCHASTIC MODELS FOR PRECIPITATION,
ntucky Water Resources Research Inst., Lexton.
Purdue, and Z. Govindarajulu.
ailable from the National Technical Informan Service, Springfield, VA 22161 as PB-270 647, ce codes: A04 in paper copy, A01 in microfiche. search Report No. 105, June 1977. 49 p, 32 tab, ref. OWRT A-055-KY(2), 14-31-0001-5017, 14-0001-6018.

scriptors: Precipitation(Atmospheric), *Model dies, *Markov processes, *Kentucky, mulation analysis, *Rainfall disposition, ochastic processes, *Simulated rainfall. ntifiers: *Semi-Markov processes.

stochastic model, using Semi-Markov cesses, was developed to simulate daily rainfall terns in Kentucky. This model contains many the currently used models as special cases and pplicable at any station in Kentucky as well as ewhere. For use in Kentucky an 8 state Semirkov process is developed and the parameters the model are determined from historical rain- data. The model is tested at 4 different stations Kentucky and the simulated and actual rainfall cesses are found to be in good agreement. ally some long run probabilities are calculated well as mean return times. An appendix outlin- some basic properties of the Semi-Markov cess is also included. (Huffsey-Kentucky)
7-10180

NTER AND SUMMER INSOLATION PATRNS FOR SOUTHERN AFRICA,
al Univ., Pietermaritzburg (South S Africa). t. of Agricultural Engineering.
E. Schulze, and O. S. McGee.
th African Journal of Science, Vol. 72, p 182- June 1976. 9 ref, diagrams.

criptors: *Energy, *Solar radiation, Sunlight, tial distribution, Cloud cover, Fog, Coasts, nter, Wet seasons, Weather forecasting, Geohical regions, Climatology, Meteorology, ca, *Summer.
ntifiers: South Africa, Rhodesia, Zambia, An-, Botswana, Zaire, Malawi, South West ca, *Africa(Southern).

lated seasonal solar radiation maps have been vn for Southern Africa, using the latest readily lable radiation data from 46 existing and ly-established stations on the subcontinent. or radiation patterns as described by Drumd and Vowinckel (1957) persist in the present y, although the latitudinal evidence is more ngly evident in the revised maps. (So African er Info Center)
-10195

EXPECTED FUTURE RAINFALL OVER SELECTED PARTS OF SOUTH AFRICA,
University of the Witwatersrand Univ., Johannesburg (South Africa). Dept. of Geography and Environmental Science.
T. G. Dyer.
South African Journal of Science, Vol. 72, No. 8 p 237-239, August 1976. 9 fig, map, 5 ref.

Descriptors: *Weather patterns, *Weather forecasting, Droughts, Climatic zones, Climatic data, *Rainfall, Temporal distribution, Seasonal, Stochastic hydrology, Precipitation(Atmospheric), Wet seasons, Weather data, Climatology.
Identifiers: South Africa, Transvaal, Karoo.

It appears that estimation of future spells of wet and dry years is possible, based on the assmption that the general circulation over South Africa and the surrounding oceans will be similar to the pattern of the past sixty years. A subjective forecasting technique, and one based on trigonometric regression tend to indicate that the present wet period has probably reached its peak in the summer rainfall area. Years to serious drought in the 1980's are predicted. A method based on sunspots predicts later-occurring fluctuations of the same order. (So African Water Info Center)
W77-10198

ANNUAL RAINFALL FREQUENCY DISTRIBUTIONS FOR 80 RAINFALL DISTRICTS IN SOUTH AFRICA,
South Africa Univ., Pretoria (South Africa).
P. A. Onesta, and P. Verhoef.
South African Journal of Science, Vol. 72, No. 4, p 120-122, April 1976. 2 fig, 3 tab, 6 ref.

Descriptors: *Rainfall, Dispersion, Skewness, Distribution, *Distribution patterns, Geographical regions, Precipitation(Atmospheric), *Rainfall disposition.
Identifiers: *South Africa.

South Africa has been classified into various rainfall districts at different times. The classifications of Schumann and Hofmeyr (1960) and van Van Rooy (1972) are discussed on the basis of precipitation frequency distribution. The coefficient of variation of rainfall varies from between 15 and 20% in the east of the country to over 30% in the Karoo and Northern Cape. (So African Water Info Center)
W77-10206

THE USE OF MATHEMATICAL MODELS FOR FORECASTING IN HYDROLOGY AND METEOROLOGY,
Electricite de France, Grenoble. General Technical Div.
For primary bibliographic entry see Field 2A.
W77-10298

CLOUD SEEDING EXPERIMENTAL PROGRAM IN RHODESIA: 1974-75,
Meteorological Service, Salisbury (Rhodesia).
For primary bibliographic entry see Field 3B.
W77-10306

MELTING RATES OF VARIOUS SIZE HAILSTONES IN A LARGE VERTICAL WIND TUNNEL,
State Univ. of New York at Albany. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W77-10307

COLLECTION KERNELS FOR THE CAPTURE OF SILVER IODIDE NUCLEI BY CLOUD WATER DROPS,
Naval Weapons Center, China Lake, Calif. Earth and Planetary Sciences Div.
For primary bibliographic entry see Field 3B.
W77-10308

CHARACTERISTICS OF SILVER IODIDE ICE NUCLEI GENERATORS CURRENTLY USED BY SO.R.E.M.,
Societa' Richerche Esperienze Meteorologiche (Italy).
For primary bibliographic entry see Field 3B.
W77-10309

EXPERIMENTAL DETERMINATION OF THE RADIO EMISSION OF THE UNDERLYING SURFACE ON LAMBDA = 2.1 CM,
For primary bibliographic entry see Field 7B.
W77-10322

GLOBAL MASS AND ENERGY REQUIREMENTS FOR GLACIAL OSCILLATIONS AND THEIR IMPLICATIONS FOR MEAN OCEAN TEMPERATURE OSCILLATIONS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
B. Saltzman.
Tellus, Vol. 29, No. 3, p 205-212, June 1977. 3 fig, 12 ref. NSF ATM75-00351, ATM75-21814.

Descriptors: *Paleoclimatology, *Water temperature, *Glaciers, *Oceans, Water balance, Energy, Energy budget, Atmosphere, Ice, Water, Thermodynamics, Model studies, Mathematical models, Climatology, Meteorology, Glaciology.
Identifiers: *Ocean temperature.

Conservation equations for water in all forms and thermodynamic energy were developed for the complete atmosphere-hydrosphere-lithosphere-cryosphere system, allowing the possibility for temporal variations of all significant components of the system that may be involved in long term climate changes. Using the equations, an integral constraint on the fluctuations of the mean, mass-averaged, ocean temperature that accompany glacial fluctuations was found. Some possible inferences were discussed, based on speculations concerning the variations of the net radiative flux at the top of the atmosphere. For one plausible qualitative estimate of the processes involved, it was determined that the mean global ocean temperature should be increasing during the period of growth of ice coverage, reaching a maximum sometime after the time of maximum ice extent and a minimum sometime after the interglacial, a result that is in substantial accord with the ice-age mechanism discussed by Newell. (Sims-ISWS)
W77-10327

OROGRAPHIC RAINFALL IN WARM SECTORS OF DEPRESSIONS,
Meteorological Office, Bracknell, Berkshire (England).
M. J. Bader, and W. T. Roach.
Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 436, p 269-280, April 1977. 8 fig, 1 tab, 13 ref.

Descriptors: *Rainfall, *Orography, *Mathematical models, *Meteorology, Precipitation(Atmospheric), Theoretical analysis, Model studies, Cloud physics, Raindrops, Condensation, On-site investigations, Foreign countries, Foreign research, Topography, Washouts.
Identifiers: *Wales, *Treorchy(Wales).

Results of some calculators were presented which showed that the washout of droplets in a low-level, orographically produced cloud by raindrops falling from a higher-level cloud (formed by large-scale ascent) can augment the rainfall rate by several mm/h over a hill a few hundred meters high. The dependence of the enhancement upon different meteorological parameters was discussed, and calculated values were compared with some observed rainfall rates over south Wales. In the model, the lower orographic and upper rain-producing clouds were treated as separate entities, and the rainfall rate from the upper cloud, P, was assumed to be unaffected by the hill. It is probable, though, that

the hill also may perturb the airflow at the level of the upper precipitating cloud, perhaps even upwind of the hill, thus augmenting P and the surface rainfall rate. However, even with the crudest representation of the dynamics, the degree of agreement with the observed rainfall rates over the south Wales hills confirmed that the washout of a low-level orographically produced cloud is a major mechanism whereby precipitation over hills is enhanced. (Humphreys-ISWS)
W77-10330

THE APPLICATION OF A DETERMINISTIC MODEL TO A SEMIARID BASIN (APPLICATION DU MODELE A DISCRETISATION SPATIALE A UN BASSIN VERSANT SEMI-DESERTIQUE),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
For primary bibliographic entry see Field 2A.
W77-10424

SIMULATION OF THE HYDROLOGICAL CYCLE OVER THE TISZA VALLEY USING ATMOSPHERIC WATER VAPOUR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W77-10427

CHARACTERISTICS OF RAINFALL CELL PATTERNS IN THE SOUTHEAST COASTAL PLAIN AREAS OF THE USA, AND A COMPUTER SIMULATION MODEL OF THUNDERSTORM RAINFALL,
Middle East Technical Univ. Ankara (Turkey).
A. U. Sorman.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 214-221, 1975. 3 fig, 4 ref.

Descriptors: *Model studies, *Simulated rainfall, *Thunderstorms, *Georgia, Rainfall, Computer models, Rainfall disposition, Demonstration watersheds, Hydrology, Stochastic processes, Rainfall density, Computer programs, Precipitation(Atmospheric), Distribution patterns.
Identifiers: *Tifton(Ga).

Characteristics of rainfall cell patterns were studied from data collected from a dense rain gauge network located over the Little River Experimental Watershed near Tifton, Georgia. Characteristics of thunderstorm rainfall cell parameters, such as cell shape, size, cell duration, temporal and spatial variation of rainfall intensity, and direction and orientation, of cells were analyzed. Distribution functions and their parameters for generating a storm rainfall model stochastically were discussed. A method was suggested for generating synthetic rainfall cells and for combining cells to form rainfall patterns for statistical comparison with actual surface storm patterns. A conceptual model of thunderstorm rainfall was formulated from the observed storm cell characteristics. The model was coded for a digital computer, and a number of rainfall events were generated by the dynamic model, which is based on the stochastic generation of rainfall cell patterns. The model was validated with events observed on the Little River during the summers of 1968, 1969, and 1970. It was suggested that the simulation model can be used in conjunction with basin models for the generation of synthetic streamflow, and this study will aid in the efficient use of water resources throughout the coastal plain areas. (See also W77-10419) (Humphreys-ISWS)
W77-10435

A HYDROMETEOROLOGICAL RESEARCH PROGRAM,
Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
F. A. Huff, and S. A. Changnon, Jr.
Water Resources Bulletin, Vol 13, No 3, p 573-581, June 1977. 3 fig, 4 ref.

Descriptors: *Precipitation(Atmospheric), *Illinois, *Meteorology, *Radar, Rainfall, Urban hydrology, Storm water, Research and development, Rainfall-runoff relationships, Water control.
Identifiers: *Urban precipitation, *Chicago(Ill), Hydrometeorological operational techniques, Radar rainfall measurements, Storm rainfall.

An extensive research program in hydrometeorology has been initiated in the Chicago, Illinois, region. Major objectives are to develop a real-time, prediction-monitoring system for storm rainfall using a combination of weather radar and telemetered rain gauge data. Other objectives include precipitation measurements for hydrologic design, operation, and modeling purposes; definition of space-time characteristics of heavy rainstorms in the Chicago urban area; and establishment of methods for applying the Chicago findings in other cities. Basic components of the field measurement program are a network of over 300 recording rain gauges in 4,000 sq mi in and around Chicago, plus two sophisticated weather radar systems for obtaining real-time information on storm parameters pertinent to optimizing operation of urban water resource systems. The rain gauge networks are used to compile information relevant to design and to operational aspects of urban hydrology. Radars are used primarily in developing the real-time operational techniques. Testing and evaluation of the real-time operational system was done in cooperation with the Metropolitan Sanitary District of Chicago, operator of one of the most complex urban water control systems among major metropolitan areas. (Roberts-ISWS)
W77-10658

VARIABILITY AND ERROR IN RAINFALL OVER A SMALL TROPICAL WATERSHED,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
E. U. Nwa.
Journal of Hydrology, Vol 34, No 1/2, p 161-169, July 1977. 6 fig, 3 tab, 6 ref.

Descriptors: *Rainfall, *Variability, *Networks, Watersheds(Basins), Rain gages, Network design, Rain, Foreign countries, Foreign research, Analytical techniques, Data processing, Hydrology, Meteorology, Tropical regions.
Identifiers: *Nigeria, Error analysis, *Tropical watersheds.

An analysis is presented of the variability of rainfall over a small tropical watershed and also examined the errors involved in measuring rainfall over such small areas. Using a gauge density of 8.86 ha/gauge (5-rain-gauge network) as standard, it was shown that a 3-rain-gauge network would be sufficient for the watershed and would keep the average coefficient of variation below 10% and the average error in mean rainfall below 0.8 mm. The average error in mean rainfall and the average coefficient of variation are exponential functions of the mean rainfall and the number of rain gauges or gauge density. (Sims-ISWS)
W77-10769

PRELIMINARY EVALUATION OF THE 1976 RAIN MODIFICATION PROJECT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W77-10774

AN EXAMINATION OF THE RAINFALL DIS TRIBUTION OVER THE TARGET AREA O THE COLORADO RIVER MUNICIPAL WATE DISTRICT'S WEATHER MODIFICATION PRO GRAM,
Colorado River Municipal Water District, Tex.
For primary bibliographic entry see Field 3B.
W77-10775

STOCHASTIC STRUCTURES OF THE LOCA PATTERN OF PRECIPITATION,
Ecole Polytechnique, Montreal (Quebec). Dept. o Mathematics.
P. Todorovic, and D. Woolhiser.
In: Stochastic Approaches to Water Resource Volume II, Chapter 15, Colorado State Universit Fort Collins, p 15-1 - 15-37, 1976. 7 fig, 30 ref.

Descriptors: *Water resources, *Stochast processes, *Model studies, *Local precipitatio Rainfall, Precipitation intensity, Probability, Di tribution, Temporal distribution, Mathematic models, Statistical methods, Mathematical st dies, Mathematics, Analytical technique Theoretical analysis, Equations, Mark processes, Precipitation(Atmospheric).

The objective of this chapter was to present general stochastic description of the poi precipitation process and then to develop si plified mathematical models. A stochastic descri tion of the local precipitation process has ma practical applications in engineering and agric ture. Design of surface water drainage structur or flood control works requires some knowled of the statistical distribution of flood peaks. Wh runoff records are too short or unavailable, hydrologic model frequently is used to develop t linkage between the precipitation and run processes. All the mathematical models co sidered were various functionals of a non-negati intermittent stochastic process positive on rand time intervals. (See also W77-10439) (Humphre ISWS)
W77-10787

FLOODS AND DROUGHTS,
Colorado State Univ., Fort Collins. Dept. of C Engineering.
For primary bibliographic entry see Field 2E.
W77-10788

AN EVALUATION OF PRECIPITATION GA DENSITY IN A MOUNTAINOUS TERRAIN,
Stephen F. Austin State Univ., Nacogdoches, T School of Forestry.
M. Chang.
Water Resources Bulletin, Vol 13, No 1, p 39- February 1977. 2 fig, 1 tab, 10 ref. OWRT A-0 WVA(1).

Descriptors: *Precipitation gages, *West Virgi *Network design, Correlation analysis, Spa distribution, Topography, Rainfall, Mounta Hydrology, Instrumentation.
Identifiers: *Precipitation gage density, Inter tion analysis, Reflecting distance, Elevation ference, Land slope.

Inter-station analysis was employed to eval the adequacy of the precipitation network in t graphically complex West Virginia. A 25-y period was determined as the minimum lengt record needed for relatively stable and fairly ac rate estimates of long-term (50-year) precipita and in frequency analysis. Data from the 83 tional Weather Service stations with 25-y records were adjusted for consistency and w evaluated separately by zones east (31 stati and west (52 stations) of the Appalachian div Correlation coefficients (r) and average stan errors of estimate were computed for all sta pairs within 50 miles distance eliminated u elevation and land slope as the criteria in netw design in this mountainous terrain. A network

r) = 0.9 estimates annual precipitation with accu-
racy as great as 5%, but requires about 250 addi-
ional gages (i.e., about 200% of the present densi-
y). (Lee-ISWS)
W77-10800

2C. Snow, Ice, and Frost

STABILITY ANALYSIS OF FLOATING AND SUBMERGED ICE FLOES,
ARCTEC, Inc., Columbia, Md.
M. S. Uzuner.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY7, Proceedings Paper 13041, p 713-722, July 1977. 2 fig, 1 tab, 21 ref, 2 append. NSF GK3918X1.

Descriptors: *Ice jams, *Ice breakup, *Model studies, Mathematical models, Ice loads, Rivers, Ice cover, Stability, Froude number, Flow, Drag, Hydraulics.
Identifiers: Ice formation.

The mathematical model was based on the moment equilibrium of an ice floe resting beneath a uniformly thick ice cover. It was argued that the expression derived for incipient motion of ice block is similar to the relation developed for the stability of prisms resting on the riverbed. The critical thickness, densimetric Froude number for ice transport was compared with the number for the submergence of a floe at the upstream end of an ice cover and with Ashton's streamwise force balance analysis for ice floe stability beneath an ice cover. A nondimensional graph (Froude number versus block thickness-flow depth ratio) was presented to summarize the results. The analysis presented herein indicated that fragmented ice covers thicken generally by internal collapse rather than by transport of floes beneath the floating cover. (Sims-ISWS)
W77-10119

SETTLING VELOCITIES OF SMALL ICE CRYSTALS,
Ben Gurion Univ. of the Negev, Beer Sheva (Israel). Research and Development Authority.
For primary bibliographic entry see Field 2B.
W77-10121

EFFECT OF ANTECEDENT CONDITIONS ON FROZEN GROUND FLOODS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
P. Pedersen, M. Molnau, and E. S. Yen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 632, price codes: A03 in paper copy, A01 in microfiche.
Idaho Water Resources Research Institute, Moscow, Completion Report, January 1977. 23 p, fig, 10 tab, 10 ref. OWRT A-045-IDA(3).

Descriptors: *Frozen ground, *Frozen soils, Permafrost, Soil types, Floods, Rain, Runoff, Temperature, *Flood damage, Flood control, *Pacific Northwest US, Watersheds(Basins), Idaho, Oregon, Washington, Methodology.
Identifiers: Probability analysis, Antecedent moistures, *Discriminant analysis.

Predicting frozen ground occurrences can be helpful in preventing flood damage in areas that are subject to winter floods. Discriminant analysis was used to study frozen and unfrozen ground runoff events for four watersheds in the Pacific Northwest. Part of the discriminant procedure was used to choose a set of meteorological factors for each area that can distinguish between frozen and unfrozen ground runoff events. These variables were then used to define a system to classify other past or future runoff events. The occurrence of a frozen ground runoff event is dependent on the combination of several meteorological factors interacting together rather than on the influence of one single variable such as the average minimum air temperature. This methodology proved successful for two of the watersheds studied. It was found that a unique set of variables could be used for classification, depending on which watershed is being analyzed.
W77-10175

DELAWARE BAY ICE CONDITIONS, 1977,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W77-10188

A MODEL OF THE MELTING PROCESS OF THE SNOW COVER AS A PART OF CATCHMENT MODELS,
Meteorologischer Dienst der Deutschen Demokratischen Republik, Berlin. Forschungsinstitut fuer Hydrometeorologie.
M. Rachner.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 198-202, 1975. 8 ref, 2 append.

Descriptors: *Model studies, *Water yield, *Snow cover, *Melting, Watersheds(Basins), Snow, Computer models, Foreign research, Foreign countries, *Melt water.
Identifiers: *German Democratic Republic.

The inclusion of a sub-model describing the melting process of the snow cover as part of complex catchment models, requires, in addition to the availability of meteorological data, the consideration of the nature of the catchment area (especially altitude, vegetation, slop aspect) and the investigation of the charactristics of the melting process and the water yield from the snow cover as related to the atmospheric conditions. A model was represented which can be used for operational purposes. The inputs are basic meteorological data (air temperature, air humidity, wind velocity, (etc.). Model output is the water yield obtained from the melting snow cover. (See also W77-10419) (Humphreys-ISWS)
W77-10432

TECHNIQUES FOR MEASURING STRESS IN SEA ICE,
Alaska Univ., College. Inst. of Arctic Environmental Engineering.
R. D. Nelson, M. Tauriainen, and J. Borghorst.
Alaska Sea Grant Report No. 77-1, January 1977. 71 p, 30 fig, 3 tab, 20 ref. SG-04-5-159-35.

Descriptors: *Sea ice, *Stress analysis, *Resources development, Alaska, Measurement, Design, Hazards, Continental Shelf.
Identifiers: *Outer Continental Shelf, Stress measurement.

This report describes two techniques for measuring stress in situ in sea ice sheets. A technique using embedded load cells has been found successful in measuring compressive creep or failure stresses as well as moderate tensile stresses. A stress relief technique has been investigated and found unsuccessful. Design details are presented on transducers for each technique and cold-hardy instrumentation is discussed. A technique using inflated air bags to produce known stress fields is presented. (NOAA)
W77-10507

HEAT TRANSFER CHARACTERISTICS OF MELTING AND REFREEZING A DRILL HOLE THROUGH AN ICE SHELF IN ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H. Physical Sciences Branch.
Y-C. Yen, and C. Tien.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 368, Price codes: A02 in paper copy, A01 in microfiche. Report 76-12, April 1976. 21 p, 4 fig, 3 ref, append.

Descriptors: *Drill holes, *Ice, *Antarctic, *Model studies, Mathematical models, Melting, Graphical analysis, Freezing, Heat transfer, Heat flow, Heating, Cold regions, Analytical techniques.
Identifiers: Melting rates, Refreezing rates.

The heat transfer processes associated with melting and refreezing a drill hole 500 m in depth and 0.150 m in initial radius through an ice shelf were analyzed approximately. The results were expressed in graphical form showing the time available for experimentation under the hole as a function of heating duration and heating strength. It was found that the refreezing of the drill hole had a much slower rate than the melting of the hole. (Sims-ISWS)
W77-10655

OBSERVATION OF OSCILLATORY ICE STATES IN A SIMPLE CONVECTION EXPERIMENT,
Washington Univ., Seattle. Dept. of Oceanography.
P. Welander.
Journal of Geophysical Research, Vol 82, No 18, p 2591-2592, June 20, 1977. 2 fig, 2 ref. NSF OCE74-13339 A02.

Descriptors: *Freezing, *Melting, *Ice, Laboratory tests, Convection, Heating, Cooling, Temperature, Water temperature, Heat transfer, Ice cover, Water bodies, Oceanography.
Identifiers: *Oscillation ice states.

In an experiment where a body of water is heated internally while it is cooled to freezing from above, self-sustained oscillations may appear with ice forming and disappearing periodically. Application to natural systems was considered. (Sims-ISWS)
W77-10656

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS.
National Aeronautics and Space Administration, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-16561, Price codes: A18 in paper copy, A01 in microfiche. Report NASA SP-391, Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California. National Aeronautics and Space Administration, Washington, D.C., 1975. 438 p. A. Rango, editor.

Descriptors: *Remote sensing, *Snow cover, *Conferences, Satellites(Artificial), Aircraft, Snow, Snowmelt, Runoff, Vegetation, Mountains, Surveys, Data processing, Analytical techniques, Flood forecasting, Water management(Applied), Irrigation, Hydroelectric power, Reservoirs, Projects, Water resources, Water supply.
Identifiers: *LANDSAT, *NOAA satellites.

Recent progress in extracting meaningful snow information from satellite data led to the institution of a NASA Applications Systems Verification Test (ASVT) on Operational Applications of Satellite Snowcover Observations. Nine operational water management agencies in the Western United States are participating in the ASVT in cooperation with NASA. The Workshop on Operational Applications of Satellite Snowcover Observations was held primarily to bring the various cooperating agencies together for an information exchange of analysis techniques, results, and problem solving. Twenty-eight scientific papers were presented which covered the photo-interpretation and digital techniques used in analyzing LANDSAT and

NOAA satellite data, the use of snowcover observations in streamflow forecasting, and new advances in extraction of snowpack parameters, other than snow extent, employing a variety of remote sensors. An additional day-long working session provided the participants with a chance to examine and to try the various techniques used for obtaining snowcovered area and with an opportunity to discuss the snow mapping ASVT activities with the various investigators. (See W77-10663 thru W77-10689) (Sims-ISWS)
W77-10662

AN OVERVIEW OF THE APPLICATIONS SYSTEM VERIFICATION TEST ON SNOWCOVER MAPPING,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 1-12, 1975. 5 fig, 5 tab, 2 ref.

Descriptors: *Remote sensing, *Snow cover, *Mapping, Satellites(Artificial), Watersheds(Basins), Snowmelt, Runoff, Water resources, Projects, Flood control, Irrigation, Hydroelectric power, Reservoirs, Water management(Applied).
Identifiers: *LANDSAT.

The capability of the LANDSAT and NOAA satellites to measure accurately snowcovered area on various sized watersheds has been demonstrated by a number of investigators. Additionally, recent research has shown a highly significant statistical relationship between satellite-derived snowcovered area at the beginning of the snowmelt period and seasonal runoff. The decision was made, therefore, to test the results of several satellite snowcovered area studies in an Applications Systems Verification Test (ASVT) Program where quasioperational evaluations of total technical capability are performed. The objective of the ASVT's was to provide all the information necessary for a potential user to make effective decisions concerning the implementation of the new remote sensing technology in an operational applications system. The ongoing Operational Applications of Satellite Snowcover Observations (OASSO) Project became part of the ASVT Program in July 1975, and the project described in this paper. In cooperation with various operational water management agencies in Arizona, California, Colorado, and Oregon, the OASSO Project is scheduled for completion in September 1978. (See also W77-10662) (Sims-ISWS)
W77-10663

THE APPLICATION OF HYDROMETEOROLOGICAL DATA OBTAINED BY REMOTE SENSING TECHNIQUES FOR MULTIPURPOSE RESERVOIR OPERATIONS,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 4A.
W77-10664

INTERPRETATION OF SNOWCOVER FROM SATELLITE IMAGERY FOR USE IN WATER SUPPLY FORECASTS IN THE SIERRA NEVADA,
California State Dept. of Water Resources, Sacramento. Snow Surveys Branch.
For primary bibliographic entry see Field 4A.
W77-10665

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS IN RIO GRANDE DRAINAGE OF COLORADO,
Soil Conservation Service, Denver, Colo.
For primary bibliographic entry see Field 4A.
W77-10666

OPERATIONAL APPLICATION OF SATELLITE SNOWCOVER OBSERVATIONS-NORTHWEST UNITED STATES,
Bonneville Power Administration, Beaverton, Oreg. Hydrology Section.
For primary bibliographic entry see Field 7B.
W77-10667

THE OPERATIONAL PROGRAM OF SATELLITE SNOWCOVER OBSERVATION AT NOAA/NESS.
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 4A.
W77-10668

USE OF AREAL SNOW COVER MEASUREMENTS FROM ERTS-1 IMAGERY IN SNOWMELT-RUNOFF RELATIONSHIPS IN ARIZONA,
Arizona Univ., Tucson.
J. S. Aul, and P. F. Ffolliott.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 103-112, 1975. 1 tab, 7 ref.

Descriptors: *Remote sensing, *Snow cover, *Runoff, *Arizona, Satellites(Artificial), Snowpacks, Snow, Snowmelt, Runoff, Data processing, Analytical techniques, Streamflow, Rivers, Watersheds(Basins), Mapping, Water resources.
Identifiers: *Black River Watershed(Ariz), *ERTS data.

Analyses of methods of interpreting ERTS-1 imagery to measure areal snow cover and of the relationship of areal snow cover and runoff were among the objectives in this study of use of ERTS-1 imagery for forecasting snowmelt-runoff relationships. Nearly one-half of the scans of ERTS-1 imagery analyzed over the study period were obscured by cloud cover, which may preclude dependence on satellite imagery alone for monitoring snow cover depletion in Arizona. Differences among observers in estimating areal snow cover suggest difficulty in using ERTS imagery for this purpose unless an observer is familiar with the area. None of the methods of interpretation employed to measure areal snow cover could be ruled unusable, with the method to be used dependent on the investment to be made, the level of precision desired, and whether a map of snow cover extent is wanted. Estimates of areal snow cover from ERTS-1 imagery were similar to comparable estimates obtained by low-altitude aerial reconnaissance. A significant relationship between snow cover and subsequent runoff during the snowpack depletion period for the year of study suggests that measures of areal snow cover obtained from ERTS imagery may become a valuable tool in forecasting snowmelt runoff in Arizona. (See also W77-10662) (Sims-ISWS)
W77-10669

UTILIZATION OF LANDSAT MONITORING CAPABILITIES FOR SNOWCOVER DEPLETION ANALYSIS,
Wyoming Univ., Laramie. Water Resources Research Inst.
A. G. Thompson.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 113-127, 1975. 3 fig, 2 tab, 8 ref.

Descriptors: *Remote sensing, *Snow cover, *Runoff, *Wyoming, Satellites(Artificial), Snowpacks, Snow, Snowmelt, Melting, Streamflow, Rivers, Forecasting, Data processing, Watersheds(Basins), Hydrology.
Identifiers: *LANDSAT data, Snowcover depletion.

LANDSAT images for three snowmelt seasons have been utilized to map and to analyze snowcover depletion on a small river basin in southeastern Wyoming. Results indicated that snowcover-runoff curves established from repetitive LANDSAT coverage may be used in conjunction with streamflow data to provide low-cost seasonal runoff forecasts having a high degree of accuracy. Additionally, detectable variations within a snowpack might provide temporal estimates of peak flows. (See also W77-10662) (Sims-ISWS)
W77-10670

OPERATIONAL USE OF LANDSAT IMAGERY FOR THE ESTIMATION OF SNOW AREAL EXTENT,
California Univ., Berkeley. Remote Sensing Research Program.
For primary bibliographic entry see Field 7B.
W77-10671

OPERATIONAL APPLICATIONS OF NOAA-VHRR IMAGERY IN ALASKA,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 4A.
W77-10672

EMPLOYMENT OF SATELLITE SNOWCOVER OBSERVATIONS FOR IMPROVING SEASONAL RUNOFF ESTIMATES,
National Aeronautics and Space Administration New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 4A.
W77-10673

APPLICATIONS OF SATELLITE SNOW COVER IN COMPUTERIZED SHORT-TERM STREAMFLOW FORECASTING,
For primary bibliographic entry see Field 4A.
W77-10674

SIERRA NEVADA SNOW MELT FROM SMS-2,
National Environmental Satellite Service Redwood City, Calif. Satellite Field Services Station.
L. C. Breaker, and M. C. McMillan.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391 Proceedings of workshop held August 18-20, 1975 South Lake Tahoe, California, p 187-197, 1975. fig, 1 tab, 8 ref.

Descriptors: *Remote sensing, *Snow cover *Satellites(Artificial), Snowmelt, Runoff, Data processing, Analytical techniques, Melting, Snowpacks, Streamflow, Rivers, Watersheds(Basins) Hydrology.
Identifiers: *Sierra Nevada(Calif), Film loop SMS satellite data.

A film loop from SMS-2 imagery shows snowmelt over the Sierra Nevadas from May 10 to July 1975. The sequence indicated a successful application of geostationary satellite data for monitoring dynamic hydrologic conditions. (See also W77-10662) (Sims-ISWS)
W77-10675

SYNOPSIS OF CURRENT SATELLITE SNOW MAPPING TECHNIQUES, WITH EMPHASIS ON THE APPLICATION OF NEAR-INFRARED DATA,
Environmental Research and Technology, Inc. Concord, Mass.
J. C. Barnes, and M. D. Smallwood.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391 Proceedings of workshop held August 18-20, 1975 South Lake Tahoe, California, p 199-213, 1975. fig, 1 tab, 8 ref. NASA NAS9-13305.

Descriptors: *Remote sensing, *Snow cover, *Mapping, *Reflectance, Satellites(Artificial), Snowpacks, Snow, Data processing, Analytical techniques, Snowmelt, Runoff, Hydrology.
Identifiers: *Skylab data, S192 imagery, S192 bands.

The Skylab EREP S192 Multispectral Scanner data have provided, for the first time, an opportunity to examine the reflectance characteristics of snowcover in several spectral bands extending from the visible into the near-infrared spectral region. The analysis of the S192 imagery and digital tape data indicated a sharp drop in reflectance of snow in the near-infrared, with snow becoming essentially non-reflective in Bands 11 (1.55-1.75) micrometers and 12 (2.10-2.35 micrometers). Two potential applications to snow mapping of measurements in the near-infrared spectral region are possible: (1) the use of a near-infrared band in conjunction with a visible band to distinguish automatically between snow and water droplet clouds; and (2) the use of one or more near-infrared bands to detect areas of melting snow. (See also W77-10662) (Sims-ISWS)
W77-10676

APPROACHES TO DIGITAL SNOW MAPPING WITH LANDSAT-1 DATA,
Zurich Univ. (Switzerland). Dept. of Geography.
K. I. Itten.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 235-247, 1975. 5 fig, 1 tab, 15 ref.

Descriptors: *Remote sensing, *Snow cover, *Analytical techniques, Satellites(Artificial), Forests, Mountains, Mapping, Computers, Data processing, Snowpacks, Vegetation, Classification, Snow.
Identifiers: *LANDSAT data.

By applying the same LANDSAT-1 data to 3 substantially different image processing systems, a snow mapping task was performed. LARSYS Ver. 3, STANSORT-2, and General Electric Image-100 did all the jobs of detecting the snowline in forested mountainous terrain and determining the snowcovered area. While the control and accuracy achieved with LARSYS is remarkable, time and effort to perform the processing favor the systems STANSORT and Image-100. The experiences and results demonstrate the need for a fast interactive system for operational snowmapping with multispectral satellite data. (See also W77-10662) (Sims-ISWS)
W77-10677

AN ALL DIGITAL APPROACH TO SNOW AREAL MAPPING AND SNOW MODELING,
California Univ., Davis.
V. R. Algazi, and M. Suk.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 249-257, 1975. 2 fig, 12 ref. NASA NGL 05-003-404.

Descriptors: *Remote sensing, *Snow cover, *Model studies, Mathematical models, Ablation, Albedo, Snowpacks, Snowmelt, Melt water, Runoff, Temperature, Water resources, Satellites(Artificial), Mapping, Data processing, Hydrology.

A study was undertaken to incorporate remote sensing data into a spatially distributed model of snowpack evolution. Preliminary results were presented on the estimation of primary parameters needed in such a model. (See also W77-10662) (Sims-ISWS)
W77-10678

DIGITAL SNOW MAPPING TECHNIQUE USING LANDSAT DATA AND GENERAL ELECTRIC IMAGE 100 SYSTEM,
General Electric Co., Beltsville, Md.
W. C. Dallam, and J. Foster.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 259-278, 1975. 11 fig, 1 tab, 4 ref.

Descriptors: *Remote sensing, *Snow cover, *Analytical techniques, *Wyoming, Satellites(Artificial), Equipment, Data processing, Watersheds(Basins), Snowpacks, Mapping, Runoff, Snowmelt, Vegetation, Forests, Rocks, Mountains, Water resources.
Identifiers: *LANDSAT data, *Dinwoody Watershed(Wyo).

The need for rapid and reliable snow mapping using LANDSAT and future satellite data has been identified. In this study, a technique and procedures using General Electric IMAGE 100 system were derived for performing a snow cover analysis of small watersheds for quasi-operational application. The study area was the Wind River Mountains of west central Wyoming. A small watershed, Dinwoody Creek, was selected as a test site. LANDSAT data and U-2 imagery were used in the analysis. From a minimal snowcover LANDSAT scene, multispectral analysis was performed, yielding the distribution of forest, bare rock, grassland, water, and snow within the watershed. The forest and bare rock themes were saved and registered with other scenes containing greater snow cover. Likewise, elevation contours from a digitized map were stored and superimposed over the snowpack areas. Analysis of the distribution of the snowcover was facilitated by superimposing the themes and map. For any one watershed, the themes (forest, bare rock, and grassland) and map are constant. From the receipt of the digital LANDSAT tapes, approximately three quarters of an hour have been required for a snowcover analysis. As a result of the described work, it is feasible for small watersheds to have snowcover analysis performed by digital processing in a rapid and reliable manner. The receipt of such timely snowcover analysis by the operational agencies will aid in their management function in the control of reservoirs and in water supply forecasting. (See also W77-10662) (Sims-ISWS)
W77-10679

SNOW COVER MONITORING BY MACHINE PROCESSING OF MULTITEMPORAL LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
S. G. Luther, L. A. Bartolucci, and R. M. Hoffer.
In: Operational Applications of Satellite Snowcover Observations: Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 279-294, 1975. 10 fig, 3 tab. NASA NAS5-21880.

Descriptors: *Remote sensing, *Snow cover, *Analytical techniques, *Colorado, Satellites(Artificial), Data processing, Mapping, Snowpacks, Mountains, Ablation, Snowmelt, Runoff, Water resources.
Identifiers: *LANDSAT data, *Animas River Watershed(Colo).

LANDSAT frames were corrected geometrically and data sets from six different dates were overlaid to produce a 24 channel (six dates and four wavelength bands) data tape. Changes in the extent of the snowpack could be determined accurately and easily using a change detection technique on data which had previously been classified by the LARSYS software system. A second phase of the analysis involved determination of the relationship between spatial resolution or data sampling frequency and accuracy of measuring the area of the snowpack. (See also W77-10662) (Sims-ISWS)
W77-10680

SNOWCOVER MAPPING BY MACHINE PROCESSING OF SKYLAB AND LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
L. A. Bartolucci, R. M. Hoffer, and S. G. Luther.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 295-311, 1975. 7 fig, 3 tab, 11 ref. NASA NAS9-13380.

Descriptors: *Remote sensing, *Snow cover, *Analytical techniques, Satellites(Artificial), Data processing, Mapping, Snowpacks, Mountains, Classification, Topography, Computers, Snowmelt, Runoff, Water resources.
Identifiers: *LANDSAT data, *SKYLAB data, Computer aided analysis.

SKYLAB and LANDSAT MSS data were analyzed using computer-aided analysis techniques (CAAT) developed at LARS. Results indicated that the middle infrared wavelength bands of the SKYLAB S-192 scanner would allow effective discrimination between snowcover and water-droplet clouds, whereas the limited spectral response of the LANDSAT-1 or 2 scanners do not allow such spectral discrimination. In the next phase of the current investigation, five spectral classes of snowcover were defined and mapped. The five classes were found to be related to differences in the proportion of snow and forest cover in the individual resolution elements. In addition, topographic data (elevation, slope, and aspect) were digitally registered onto the SKYLAB and LANDSAT data to determine their influence on snowpack characteristics. Combining the results with the digital topographic data allowed acreage estimates of the various classes of snowcover to the tabulated according to elevational zones for either the entire data set or on an individual watershed basis. (See also W77-10662) (Sims-ISWS)
W77-10681

A PROGRESS REPORT ON ESTIMATING SNOW DEPTH USING VHRR DATA NOAA ENVIRONMENTAL SATELLITES,
National Environmental Satellite Service, Washington, D.C.
D. F. McGinnis, Jr.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 313-324, 1975. 5 fig, 6 ref.

Descriptors: *Remote sensing, *Snow cover, *Southeast US, Satellites(Artificial), Snow, Depth, Regression analysis, Data processing, Albedo, Reflectance, Analytical techniques, Computer programs.
Identifiers: *NOAA satellite data.

The NOAA environmental satellites provide daily coverage of the Earth in the visible (0.6-0.7 micrometer) and thermal (10.5-12.5 micrometers) spectral bands. The ground resolution of the Very High Resolution Radiometer (VHRR) is 1 km at nadir. The improved resolution in the visible permits more detailed observations of snow features than was possible with previous operational satellites. A densitometer examination of a visible-band image from Feb. 11, 1973, which shows heavy snow cover in considerable detail over areas extending from Alabama to North Carolina, indicates that, in general, there is direct correlation between increasing brightness and increasing snow depths. A power regression analysis of greatest satellite brightness versus greatest snow depth for 201 data pairs produced a correlation

coefficient of 0.86. Similar analysis of five late winter and early spring cases resulted in much lower correlations. (See also W77-10662) (Sims-ISWS)
W77-10682

A COMPARISON OF OPERATIONAL AND LANDSAT-AIDED SNOW WATER CONTENT ESTIMATION SYSTEMS,
California Univ., Berkeley. Social Sciences Group.
J. M. Sharp, and R. W. Thomas.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 325-344, 1975. 4 fig, 20 ref. NASA NGL05-003-404.

Descriptors: *Remote sensing, *Snow cover, *Moisture content, *California, Satellites(Artificial), Costs, Economics, Runoff, Snowmelt, Water resources, Water supply, Analytical techniques, Mathematical models, Surveys, Snow, Hydrology.
Identifiers: *LANDSAT data.

This study described how LANDSAT imagery can be cost-effectively employed to augment an operational hydrologic model. Attention was directed toward the estimation of snow water content, a major predictor variable in the volumetric runoff forecasting model presently used by the California Department of Water Resources. A stratified double sampling scheme was supplemented with qualitative and quantitative analyses of existing operations to develop a comparison between the existing and satellite-aided approaches to snow water content estimation. Results showed a decided advantage for the LANDSAT-aided approach. (See also W77-10662) (Sims-ISWS)
W77-10683

RED AND NEAR-INFRARED SPECTRAL REFLECTANCE OF SNOW,
Cold Regions Research and Engineering Laboratory, Hanover, N.H.
H. W. O'Brien, and R. H. Munis.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 345-360, 1975. 10 fig, 3 ref.

Descriptors: *Reflectance, *Snow, *Remote sensing, Laboratory tests, Infrared radiation, Snow cover, Melting, Aging(Physical), Albedo, Density, Physical properties, Data processing.

The spectral reflectance of snow in the range of 0.60 to 2.50 micrometers wavelengths was studied in a cold laboratory using natural snow and simulated preparations of snow. A white barium sulfate powder was used as the standard for comparison. The high reflectance (usually nearly 100%) of fresh natural snow in visible wavelengths declines rapidly at wavelengths longer than the visible, as the spectral absorption coefficients of ice increase. Aging snow becomes only somewhat less reflective than fresh snow in the visible region and usually retains a reflectance greater than 80%. In the near infrared, aging snow tends to become considerably less reflective than fresh snow. The rate of decline of near-infrared reflectance due to aging is strongly influenced by the history of the snow during aging. Some of the significant parameters which determine the reflectance of snow were discussed and, where possible, results were presented which illustrate the predominant influences. (See also W77-10662) (Sims-ISWS)
W77-10684

REMOTE SENSING OF SNOWPACK DENSITY USING SHORTWAVE RADIATION,
National Environmental Satellite Service, Washington, D.C.
M. C. McMillan, and J. L. Smith.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 361-373, 1975. 6 tab, 26 ref.

Descriptors: *Remote sensing, *Snow cover, *Radio waves, Satellites(Artificial), Aircraft, On-site investigations, Snow, Density, Albedo, Reflectance, Snowpacks, Water resources, Snowmelt, Melt water, Precipitation(Atmospheric).
Identifiers: *LANDSAT data.

Albedo or satellite radiance measurements can be used to estimate average snowpack density by means of a multiple linear equation. The in situ data equation predicted density with a correlation (r squared) of 0.79 and a standard error of 0.027 gm/cu cm. The data from LANDSAT-1 were not as significant in a similar equation, possibly because of the large field of view. (See also W77-10662) (Sims-ISWS)
W77-10685

MICROWAVE EMISSIONS FROM DRY AND WET SNOW,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
T. C. Chang, and P. Gloersen.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 399-407, 1975. 5 fig, 12 ref.

Descriptors: *Remote sensing, *Snow cover, *Microwaves, *Model studies, Mathematical models, Snow, Measurement, Satellites(Artificial), Temperature, Melting, Snowmelt, Melt water, Ice, Water resources.
Identifiers: *Microwave emission.

A microscopic model was developed to study the microwave emission from snow. In the developed model, the individual snow particles are considered to be the scattering centers. Mie scattering theory for spherical particles then was used to compute the volume scattering and the extinction coefficients of the closely packed scattering spheres, which were assumed not to interact coherently. The results of the computations showed significant volume scattering effects in the microwave region which result in low observed emissivities from cold, dry snow. In the case of wet snow, the microwave emissivities are increased considerably, in agreement with earlier experimental observations in which the brightness temperatures have increased significantly at the onset of melting. (See also W77-10662) (Sims-ISWS)
W77-10687

APPLICATION OF BAYESIAN DECISION THEORY TO AIRBORNE GAMMA SNOW MEASUREMENT,
National Weather Service, Portland, Oreg. River Forecast Center.
V. C. Bissell.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 409-420, 1975. 3 fig, 9 ref.

Descriptors: *Remote sensing, *Snow cover, *Gamma rays, Aircraft, Model studies, Mathematical models, Snow, Measurement, Snowmelt, Runoff, Radiation, Surveys.
Identifiers: Bayesian decision theory.

Measured values of several variables are incorporated into the calculation of snow water equivalent as 'measured' from an aircraft by snow attenuation of terrestrial gamma radiation. Bayesian decision theory provides a 'best' snow water equivalent measurement by taking into account the uncertainties in the individual measurement variables and 'filtering' information about the measurement variables through prior notions of what the calculated variable (water equivalent) should be. Generalizations of principles involved in the application were presented in subsequent discussion. (See also W77-10662) (Sims-ISWS)
W77-10688

SUMMARY OF THE OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS WORKING SESSION - AUGUST 20, 1975,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
V. V. Salomonson, and A. Rango.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 421-426, 1975.

Descriptors: *Remote sensing, *Snow cover, *Conferences, *Satellites(Artificial), Snowmelt, Snow, Runoff, Mapping, Data processing, Analytical techniques, Computers, Management, Water management(Applied), Water resources, Water supply.
Identifiers: *LANDSAT data, *NOAA satellites data.

Following two days of excellent formal paper presentations and constructive discussions, a working session dealing primarily with problems, techniques for analysis, possible solutions, and recommendations for future work pertaining directly to the Snow Applications Systems Verification Test (ASVT) study areas was held. This session treated in greater detail some of the points brought out in the discussions during the previous two days. Various techniques for reducing the satellite data to a form useable by the operational agencies were covered in mini-presentations and discussions by the operational satellite-snow interpretive personnel. The mini-presentations were followed by open discussion and actual manipulation of data by those present in the audience. Similar mini-presentations were made by operational agency streamflow forecasters on how satellite-derived snow data could be incorporated into runoff forecasting methods, potential influence on management decisions, and eventual transfer to completely operational use. A general discussion dealing with the directions that the snow ASVT should take as a result of the previous presentations and discussions concluded the working session. (See also W77-10662) (Sims-ISWS)
W77-10689

2D. Evaporation and Transpiration

PARAMETERIZATION OF SURFACE EVAPORATION RATE FOR USE IN NUMERICAL MODELING,
National Weather Service, Silver Spring, Md. Techniques Development Lab.
T-W Yu.
Journal of Applied Meteorology, Vol. 16, No. 4, 393-400, April 1977. 7 fig, 26 ref, 1 append.

Descriptors: *Evaporation, *Model studies, *Mathematical models, Moisture, Energy budget, Solar radiation, Humidity, Soil moisture, Heat transfer, Temperature, Winds, Meteorology
Identifiers: Parameterization, *Surface evaporation rates.

Numerical models require parameterization of surface evaporation rates when a surface energy budget equation is included in the calculation of the surface temperature. Techniques for parameterizing surface moisture and evaporation were reviewed. Two methods in particular were investigated with observational data taken from the Wangara, the O'Neill, the Kerang, and the Davis experiments. Method I was based on param

rization of the surface moisture with the surface vaporation computed through the flux-profile milarity relationships. Method II was based on a odified form of the Penman equation which quires a knowledge of solar radiation and soil eat flux to calculate surface evaporation. Comarisons of the results of these methods were ade with observations. Method I failed to acount for condensation, which is often observed ring the night. Method II was shown to be suerior to Method I in the calculation of surface vaporation for both day and night. (Sims-ISWS)
77-10111

FLUENCE OF ROW SPACING AND STRAW ULCH ON FIRST STAGE DRYING,
gricultural Research Service, Temple, Tex. outhern Region.
E. Adams, G. F. Arkin, and J. T. Ritchie.
il Science Society of America Journal, Vol. 40, o. 3, p 436-442, May-June 1976. 10 fig, 2 tab, 14 f.

escriptors: *Evaporation, Grain sorghum, Drying, Plant populations, Mulching, Crop oduction, Crop response, *Cultivation.
entifiers: Leaf area index, Crop canopy, Row acing.

vaporation during first stage drying was mearred with evaporation plates on the soil surface in ain sorghum plots with 25-, 50-, and 100-cm row acings, during several stages of grain sorghum velopment in 1972 and 1973. Evaporation during st stage drying was affected by row spacing, leaf ea index (LAI), and soil shading. Both LAI and il shading were related to row spacing and plant pulation. The more complete plant canopy of an sorghum with narrow-row spacing decreased netration of radiant energy to the soil surface d reduced the evaporation rate of soil water dur- first stage drying. Evaporation was greatest ring the early part of the season when shading s least and lowest during boot stage and pollina-n, when all leaves were fully expanded and proled maximum plant canopy and soil shading. arrow-row spacing established an earlier, and ore complete plant canopy than conventional 0-cm row spacing and shaded more of the soil rface from early vegetative growth to maturity. il surface shaded near solar noon was a better dicator of first stage evaporation beneath a opy than LAI. The combined effect of a ulched surface and a plant canopy on reducing aporation was the produce of the fractional duction in potential evaporation resulting from plant canopy and the evaporation resulting om the mulched surface with no canopy cover. empirical equation was developed from the aporation data for use in calculating first stage aporation as related to potential evaporation, ction of the soil surface shaded, and mulch rate. ogerboe-Colorado State)
77-10286

ELD STUDY OF EVAPORATION - ANALYSIS DATA FROM EUCUMBENE, CATARACT, ANTON AND MUNDARING,
reau of Meteorology, Melbourne (Australia).
D. Hoy, and S. K. Stephens.
stralian Water Resources Council Technical per No. 21, 1977. 64 tab, 47 fig, 74 ref, 5 append.

scriptors: *Evaporation, *Estimating, *Lakes, eservoir evaporation, Heat balance, Water ance, Evaporation pans, Water loss, Instrutation, Measurement, Variability, *Australia.
ntifiers: Lake Eucumbene(N.S.W.), Cataract servoir(N.S.W.), Manton Reservoir(N.T.), ndaring Reservoir(W.A.).

aporation from four large Australian lakes in ferent climatic regions was determined over iods of two years or more, using the Heat dget method, the Water budget method, the k Aerodynamic method, the Pan Conversion method and pan observations. Of these, the Heat Budget method is known to give the most reliable estimate of lake evaporation, and the other methods are compared with this. Instrumentation, calculations, and results, with standard errors, are described and compared for each lake, and criteria are offered for the selection of a method for operational evaporation determinations. (CSIRO)
W77-10376

CONSEQUENCES OF GROUNDWATER EXTRACTION ON EVAPOTRANSPIRATION AND SATURATED-UNSATURATED FLOW,
International Courses in Hydraulic and Sanitary Engineering, Delft (Netherlands).
For primary bibliographic entry see Field 4B.
W77-10422

WATER REQUIREMENTS FOR MESQUITE (PROSOPIS JULIFLORA),
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
J. M. Tromble.
Journal of Hydrology, Vol. 34, No. 1/2, p 171-179, July 1977. 4 fig, 2 tab, 11 ref.

Descriptors: *Water requirements, *Mesquite, *Evapotranspiration, Runoff, Indexing, Water users, Water table, Vegetation, Water resources, Water utilization.
Identifiers: Prosopis juliflora, *Water table fluctuations, Streambanks, Uplands, Vegetation density, Abstracted water, Index values, Stream channel.

Evapotranspiration (ET) determined by different investigators, compared with values determined by the White and Troxell methods, showed that their values provided reasonable estimates and that utilizing diurnal water table fluctuations furnished a a method of computing ET with less than 100% vegetation density. Average daily maximum ET rates for June were calculated, and ratios were compared with values from other independent studies. Since ET rates, determined by White and Troxell methods, indicated plausible values of water use when compared to other independent studies, the ET rates could be considered index values useful as guidelines for water abstracted by mesquite. Water table elevation measurements on a shallow perched aquifer under a mesquite thicket were used to calculate ET for time periods when the water table elevation varied diurnally. Average daily maximum ET values for June, when annual ET rates were highest, for the three years as predicted by the daily rate, White and Troxell methods were 1, 61, 10.10 and 12.17 mm, respectively. (Roberts-ISWS)
W77-10770

SURFACE ROUGHNESS OF CROPS AND POTENTIAL EVAPOTRANSPIRATION,
International Inst. for Land Reclamation and Improvement, Wageningen (Netherlands).
P. J. Slabbers.
Journal of Hydrology, Vol. 34, No. 1/2, p 181-191, July 1977. 5 fig, 4 tab, 25 ref.

Descriptors: *Evapotranspiration, *Roughness coefficient, *Crops, Winds, Grasses, Climatology, Arid climates, Wind velocity, Foreign countries, Foreign research.
Identifiers: *The Netherlands, *Potential evapotranspiration, *Roughness function, Surface roughness, Crop water requirements, Aerodynamic resistance.

A roughness function for grass was derived by Rijtema for climatological conditions in The Netherlands. The function depends on wind speed and crop length and was used to determine the aerodynamics resistance of grass when calculating potential evapotranspiration. An analysis was made of data collected in southern Iran and of data that had been published for northern Iran, Lebanon, and Tunisia to determine whether the function also could be used in calculating crop water requirements under semi-arid and arid conditions. Except for some deviating data for which explanations were presented, agreement was obtained for all crops tested against the original relationship for grass. The importance of taking crop roughness into account in the combination equation, especially for relatively tall crops, was stressed. (Roberts-ISWS)
W77-10771

2E. Streamflow and Runoff

SPATIALLY AVERAGED FLOW OVER A WAVY SURFACE,
Washington Univ., Seattle. Dept. of Oceanography.
J. D. Smith, and S. R. McLean.
Journal of Geophysical Research, Vol. 82, No. 12, p 1735-1746, April 20, 1977. 5 fig, 4 tab, 23 ref. NSF GA-14178, DES-75-15154.

Descriptors: *Flow, *Sand waves, *Columbia River, Rivers, Reservoirs, Streamflow, Velocity, Beds, River beds, Sediments, Suspended solids, Bed load, Current meters, On-site investigations, Model studies, Data processing, River flow, Nonuniform flow.
Identifiers: *Bonneville Reservoir.

An understanding of the mechanics of nonuniform flow is important in a variety of ecological and geophysical fluid mechanical problems. Moreover, the ability to predict local boundary shear stress on the uneven bed is essential in erosion and sediment transport problems. In order to elucidate the important fluid mechanical phenomena active over natural quasi-two-dimensional bed forms, a series of detailed flow measurements were made above 60- to 100-m-long 1- to 3-m-high dunes in the Columbia River. Velocity profiles obtained by averaging the flow data along lines of constant distance above the riverbed were examined, and it was shown that they can be constructed from well-known uniform flow results used in conjunction with a hypothesis about the structure of internal boundary layers. The approach permits skin friction as well as total boundary shear stress, averaged over one wavelength of the bed form to be determined from spatially averaged velocity profiles and, conversely, provides a mechanism whereby zero-order velocity profiles can be constructed for two-dimensional nonuniform channel flows. Corrections for changes in the bottom roughness parameter caused by bed load transport and for flow stratification induced by suspended load transport were derived and applied in order to make the results consistent with the measured spatially averaged shear stress field. (Sims-ISWS)
W77-10103

THE PLAN SHAPE OF CURRENT RIPPLES IN RELATION TO FLOW CONDITIONS,
Reading Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-10132

ASPECTS OF THE GROWTH AND REPRODUCTION OF LABEO CAPENSIS IN THE CALEDON RIVER,
Fort Hare Univ. (South Africa). Dept. of Zoology.
D. P. Baird.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1, p 25-28, 1976. 3 fig, 4 tab, 8 ref.

Descriptors: Freshwater fish, *Fish growth, Fish scales, Sampling, *Reproduction.
Identifiers: *Labeo capensis, Vaal River, *Caledon River(South Africa), Barberspan.

The scale studies indicate that the annulus is a reliable year mark. A linear relationship exists

between anterior scale radius and body length so that backocalculations of length were possible. Males and females had a similar growth rate. The growth rate is similar to that for L. capensis in the Vaal River. Fish under 35 centimetres in length had a sex ratio of 1:1 but in larger fish, only 16% were males. Males reach sexual maturity at a length of 15 to 20 centimetres and females at a length of 20 to 25 centimetres. The spawning season extends from September to March with a peak in November. Fecundity increased with an increase in length from 12 664 for a fish of 22,8 centimetres to 106 286 for a fish of 34,8 centimetres. (So. African Water Info. Center)
W77-10194

A MATHEMATICAL MODEL FOR TRANSIENT OPEN CHANNEL FLOW: A WATER RESOURCE PLANNING AND MANAGEMENT TOOL,
Tennessee Valley Authority, Knoxville.
W. O. Wunderlich.
In: The Tennessee Valley Authority Experience, Proceedings of the First Conference on Case Studies of Large Scale Planning Projects, October 28-Nov. 1, 1974. Hans Knop (Ed.), CP-76-2, Volume 1, International Institute for Applied Systems Analysis, Laxenburg, Austria, 1976, p 627-665. 23 fig, 17 ref.

Descriptors: *Tennessee Valley Authority, *Water resources development, *Open channel flow, *Mathematical models, Unsteady flow, Multiple purpose, Reservoirs, River systems, Computer models, Equations, Systems analysis.

The Tennessee Valley Authority has always been primarily concerned with the effective management and efficient use of its abundant water resources. The three basic multiple uses of flood control, navigation, and power gneration have expanded to include other uses, including recreation and environmental control. This paper describes a mathematical model, its verification, and its appliation to a variety of complex transient flow problem associated with the planning and management operations of the TVA water control system. The mathematical model for unsteady flows in open channels is assumed to be one-dimensional in the sense that the flow charcteristics such as depth and velocity are considered to vary only in the longitudinal direction with time. The channel geometry is three-dimensional. in conclusion, the unsteady flow mathematical model described herein can be efficiently applied to a wide variety of engineering problems. (Bell-Cornell)
W77-10290

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
P. A. Castruccio, H. L. Loats, Jr., T. R. Fowler, and S. L. Frech.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-14576, Price codes: A03 in paper copy, A01 in microfiche. ECO.-75: C-2-1. Executive Summary NAS8-30539. January 1975. 25 p, 10 fig.

Descriptors: *Hydrology, *Planning, *Mathematical models, *Simulation analysis, *Remote sensing, Projects, Watersheds(Basins), Regional development, Computers, Agriculture, Rainfall, Analytical techniques, Flooding, Hydrologic data, Behavior, Runoff, Equations, Systems analysis, *Forecasting.
Identifiers: *Peak flow, Sensitivity analysis, Hydrologic processes.

An improved model for the prediction of peak flow events has been structured, which is specifically designed to take maximum advantage of the data and information stream available from remote sensing. Reported are the results of a project instituted to determine the effectiveness of the new hydrologic planning model and to determine which parameters impact most the minimization of errors associated with the prediction of peak flow events. In the progression of model development, the overall framework has been constructed and five modules simulating the behavior of significant hydrologic processes have been developed, which include: rain occurrence; rainfall spatial correction; subsurface abstractions; overland flow; and point-of-flooding. Four hypotheses have been postualted and then four investigations made to test their validity. The improved model is considerably more sophisticated than conventional hydrologic planning models. In particular, it modules are not simply interconnected, but require feedback. In spite of this complexity, the model is readily adaptable to analog computation with modest amounts of hardware. Within the range of its simplified version, the new model appears to be considerably more accurate than conventional hydrologic planning models. (Bell-Cornell)
W77-10296

LAW OF PROBABILITY FOR TWO LOW WATER VARIABLES,
Direction des Eaux, Baja (Hungary).
I. Zsuffa.
In: Mathematical Models in Hydrology, Vol. 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 233-240, 1974. 4 fig, 7 ref.

Descriptors: *Hydrology, *Probability, *Low flow, Irrigation systems, Runoff, Estimating, Equations, Mathematical models, Systems analysis, *Distribution patterns.
Identifiers: *Distribution function.

To deduce the types of functions suitable for the estimation of the distribution function of two variables $F(x,t) = p(Q < \text{or} = x, T < \text{or} = t)$ which is used for characterizing low flows, the theoretically true exponential distribution of the periods without runoff and the depletion curves were used, the latter described by an exponential function. When the starting value Q of the depletion curve is constant or fixed, the probability distribution of the lowest flows can be described by a power function, while, when the starting value is exponentially distributed, the probability distribution can be characterized by a distribution composed of an exponential function, a power function and various gamma functions. Several methods have been derived for the estimation of the various distribution functions. These estimates are obtained from statistical samples for both function types. The distribution function of two variables can be obtained by repeated application of the equation of the depletion curve. (Bell-Cornell)
W77-10297

ANALYSIS OF THE STOCHASTIC COINCIDENCE OF CERTAIN HYDROLOGICAL PROCESSES,
J. Deri.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 289-298, 1974. 7 fig, 5 ref.

Descriptors: *Hydrology, *Stochastic processes, *Markov processes, Probability, Rivers, Equations, Mathematical models, Systems analysis.
Identifiers: Correlation coefficient, Correlation functions.

This paper discusses the use of correlation coefficients and correlation functions for practical purposes. After giving the definition of the indicator functions of the low stages of two watercourses, the probability of coincidence of the low-stage periods of two streams is defined. Next, the paper enlarges upon the two-dimensional model based on the Markov hypothesis. After giving the definition of the process of drought and low stage, the empirical state-transition-frequency matrix referring to the drought and low-stage coincidence is defined. (Bell-Cornell)
W77-10299

A STOCHASTIC MODEL FOR THE SIMULATION OF THE TEMPERATURE OF A WATERCOURSE,
Electricite de France, Chatou. Div. Exchanges Atmospheriques.
For primary bibliographic entry see Field 2A.
W77-10300

PROBABILISTIC MODELS FOR MULTIPLE AND SYNTHETIC HYDROLOGIC VARIABLES,
Electricite de France, Chatou, France. Service Technologie Generale Applications de l'Electricite et Hydraulique.
For primary bibliographic entry see Field 2A.
W77-10301

END DEPTH UNDER ZERO-INERTIA CONDITIONS,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-10302

MODEL STUDIES OF DENVER WHITEWATER CHANNEL,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W77-10304

APPLICATION OF SOME STATISTICAL METHODS FOR THE ESTIMATION OF MINIMUM FLOW,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
N. P. Artemieva, and V. G. Nikitin.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 1-5, 1975. 4 tab, 5 ref.

Descriptors: *Low flow, *Streamflow, *Mathematical models, *Statistical methods, Analytical techniques, Equations, Evaluation, Flow, Monthly, Seasonal, Summer, Winter, Simulation analysis, Foreign research, Foreign countries.
Identifiers: *USSR, Daily low flow.

The statistical homogeneity of observational data on low flows in the Polesskaya Lowland was analyzed by statistical criteria. Spatial generalization of observational data were studied with the help of nonparametric criteria of Kolmogorov and Allexeev. Empirical distributions of modulus coefficients of summer and winter minimum flow (daily and monthly) follow the general probability distribution type common for the majority of gauge lines, i.e., a three parametric gamma distribution with parameters practically equal. The authors determined the parameters of unified curves and their relative errors with regard to the intraserial relations. The paper also gave estimates of the reliability of the results of a combined analysis by several simulated series of empirical distributions of low flow differing in the number of gauge lines under study and the period of observations. Multiple linear regression equations were developed to interrelate the moduli of summer and winter minimum flow (daily and monthly) and the main flow formation factors. (See also W77-10419) (Humphreys-ISWS)
W77-10420

A YEAR ROUND WATER BALANCE MODEL, ITS APPLICATION AND ITS FUTURE,
Ceskoslovenska Akademie Ved, Prague. Inst. of Hydrodynamics.
For primary bibliographic entry see Field 2A.
W77-10421

A HYDROLOGICAL MODEL WITH PHYSICALLY REALISTIC PARAMETERS,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2A.
W77-10428

MATHEMATICAL SIMULATION MODELS OF HYDROLOGICAL PROCESSES IN TURKEY,
Egean Univ., Bornova (Turkey). Faculty of Engineering Sciences.
For primary bibliographic entry see Field 2A.
W77-10430

STATISTICAL MODELLING OF RIVER FLOW BY THE MONTE CARLO METHOD AND EVALUATION OF DISTRIBUTION PARAMETERS AND QUANTITIES,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. V. Rozhdestvensky, and V. M. Zvereva.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 203-218, 1975. 5 tab, 6 ref.

Descriptors: *River flow, *Statistical models, *Model studies, *Statistical methods, Hydrology, Stream flow, Markov processes, Monte Carlo method, Stochastic processes, Time series analysis, Frequency analysis, Correlation analysis, Foreign research.
Identifiers: *USSR.

Using the Monte Carlo method for modelling river flow, displacement and random scatter of sampling parameters and frequency curve ordinates were established. A fundamental basis for the normalization of river flow was developed. The computation scheme for the estimation of distribution parameters and frequency curve ordinates was simulated. The sequence of a simple Markov chain is modelled in two ways: (1) With the help of normal correlation for normally distributed random variables-the obtained sequence being transformed into the given distribution law. (2) With the help of normal correlation for non-normal distributions. Numerical realization of the given computation scheme by means of electronic computers made it possible to eliminate the bias (systematic errors) of sampling parameters and frequency curve ordinates and to estimate their random variance. (See also W77-10419) (Humphreys-ISWS)
W77-10433

STOCHASTIC PROPERTIES OF THE PROCESSES TRANSFORMED IN LINEAR HYDROLOGICAL SYSTEMS,
Polish Academy of Sciences, Warsaw. Inst. of Geophysics.
For primary bibliographic entry see Field 2A.
W77-10436

APPLICATION OF CONCEPTUAL RAINFALL-RUNOFF MODELS IN A COMPLEX PROGRAM,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 2A.
W77-10437

A MATHEMATICAL MODEL OF FLOOD WAVES MOVING ALONG A CASCADE OF RESERVOIRS ON A LARGE RIVER,
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
I. A. Zheleznyak, and L. B. Byshovets.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 279-283, 1975. 1 fig, 5 ref.

Descriptors: *Flood waves, *Mathematical models, *Rivers, *Reservoirs, Runoff, Flood routing, Watersheds(Basins), Flood stages, Model studies, Foreign countries, Foreign research.
Identifiers: *USSR, *Dnieper River(USSR).

The characteristics of flood waves moving along rivers and reservoirs were described. The main equations of the water movement were developed, and they were applied in calculations of flood runoff transformation in the limits of a river section and a large reservoir. A mathematical model was given for a large cascade of reservoirs (the lower Dnieper was used as an example). The operational experiences of the water management organization during periods of very high flow (the flood of 1970) and very low flow (1972) were described. (See also W77-10419) (Humphreys-ISWS)
W77-10438

STRUCTURE OF NATURAL HYDROLOGIC TIME PROCESSES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10440

GENERATION OF HYDROLOGIC AND WATER RESOURCES SAMPLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10441

DATA COLLECTION, ANALYSIS AND INSTRUMENTATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10442

LONG-RANGE CHANGES,
Department of the Environment, Ottawa (Ontario). Inland Water Directorate; Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2A.
W77-10443

FLOOD-PRONE AREAS OF JACKSONVILLE, DUVAL COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
R. B. Stone, L. V. Causey, and D. F. Tucker.
Water-Resources Investigation 76-54 (open-file report), 1976. 1 sheet, 2 fig, 1 tab, 5 ref.

Descriptors: *Floods, *Florida, *Flood forecasting, *Flood profiles, Maps, Flood recurrence interval, Land use, *Jacksonville(Fla).

Floods in the consolidated city of Jacksonville, Duval County, Florida, are caused directly by rainfall which, when combined with storm driven tides, causes rivers or other bodies of water to flood the low lying parts of the county. This map report supplies information on areas subject to floods of 100-year frequency; the information will permit evaluation of alternative uses of such areas. The extent of the 100-year flood is shown on the large-scale map accompanying the report. Also included is an index map showing sections of Duval County where more detailed information on the 100-year flood can be obtained. The major flood of record in the county occurred in 1964 when Hurricane Dora crossed the area. (Woodard-USGS)
W77-10557

MISSOURI RIVER TEMPERATURE EFFECTS IN THE TRANSITION FROM DUNES TO PLANE BED,
Colorado State Univ., Fort Collins; and Geological Survey, Lakewood, Colo. Water Resources Div.
H. Y. Chen, and C. F. Nordin, Jr.
U.S. Army Engineer District, Omaha, December 1976. 41 p, 12 fig, 24 ref, append. M.R.D. Sediment Series No 14.

Descriptors: *Sediment transport, *Water temperature, *Correlation analysis, *Uniform flow, *Open channel flow, Sedimentation, River beds, Navigable rivers, Forecasting, Analytical techniques, Channel morphology, Flow rates.

Seasonal water-temperature changes influence stage-discharge and depth-discharge relations in rivers and in conveyance channels and navigation channels where water discharge is constant. The major influence is related to changes in bed configuration which accompanies water-temperature changes. Stability analysis provides a theoretical basis for predicting bed-configuration changes, and using the theoretical relations with one empirical coefficient defined from field data, graphical relations are developed to use as design curves for estimating the velocity and flow depth, given the design unit water discharge, bed material size distribution, water temperature, and channel slope. The design curves are for channels with bed materials from 0.1 to 0.3 mm median diameters, water temperatures for 0 to 30 deg C, and slopes from 0.00005 to 0.0012. (Woodard-USGS)
W77-10572

IDENTIFICATION OF STRUCTURE AND PARAMETERS OF HYDROLOGIC RUNOFF-MODELS (IDENTIFIKATION VON STRUKTUR UND PARAMETERN HYDROLOGISCHER ABFLUSSMODELLE),
G. Marr.
Wasserwirtschaft, Vol. 67, No. 4, p 94-97, April, 1977. 2 fig, 1 tab, 6 ref.

Descriptors: *Model studies, *Runoff, *Hydrologic data, Equations, Mathematical models, Surface runoff, Urban runoff, Physical properties, Waste water treatment.

A study of hydrologic models was presented. The identification of their structure and relevant parameters was reviewed. Mathematical equations were used to define the parameters by hydraulic values. The models were approximations of the differential equations developed for non-steady runoff. The validity of the results was checked by the use of a transfer function which was derived from measured data. (Collins-FIRL)
W77-10594

A HYDROMETEOROLOGICAL RESEARCH PROGRAM,
Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
For primary bibliographic entry see Field 2B.
W77-10658

OPERATIONAL USE OF LANDSAT IMAGERY FOR THE ESTIMATION OF SNOW AREAL EXTENT,
California Univ., Berkeley. Remote Sensing Research Program.
For primary bibliographic entry see Field 7B.
W77-10671

A PROCEDURE FOR THE SELECTION OF OBJECTIVE FUNCTIONS FOR HYDROLOGIC SIMULATION MODELS,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
M. H. Diskin, and E. Simon.
Journal of Hydrology, Vol 34, No 1/2, p 129-149, July 1977. 3 fig, 5 tab, 15 ref, 3 append.

Descriptors: *Model studies, *Hydrology, *Mathematical models, Watersheds(Basins), Runoff, Storage, Evaporation, Precipitation(Atmospheric), Simulation analysis, Civil engineering.
Identifiers: *Model comparisons, Model selection.

Hydrologic simulation models were calibrated by comparing observed data with data generated by the models. The comparison was made in an optimization which is a subset of all data available or observable. The choice of the set of data and of the objective function to be used for any given model is a subjective decision which influences the values of the model parameters and the performance of the model. The set of data used should be comparable to the engineering application for which the model is intended. The objective function can be chosen by a procedure outlined in the article in which a number of possible functions are considered and compared with reference to one or more engineering applications. (Sims-ISWS)
W77-10767

ANALYTICAL EVALUATION OF TECHNIQUES FOR USE OF A LASER DOPPLER VELOCIMETER TO MEASURE FLOW AND TURBULENCE,
Colorado State Univ., Fort Collins. Dept. of Physics.
C. Y. She, and L. S. Wall.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-007 490. Price codes: A02 in paper copy, A01 in microfiche. Report ARO 11876.1-GS, Reprint from Journal of the Optical Society of America, Vol 65, No 1, p 69-77, January 1975. 5 fig, 6 tab, 22 ref.

Descriptors: *Flow, *Turbulence, *Instrumentation, Measurement, Streamflow, Equipment, Analytical techniques, Currents(Water), Model studies, Mathematical models, Mathematical studies, Optical properties.
Identifiers: *Velocimeters, *Doppler effects, Lasers.

Results of autocorrelation functions and power spectral densities of laser Doppler velocimeters in the reference-beam-heterodyning and the cross-beam-mixing mode were derived to handle turbulence measurements, Doppler ambiguity, spatial coherence, and effects of particle concentration and detection aperture. A useful definition of signal-to-noise ratio was given for both correlation and spectral analyses. The signal-to-noise calculation provides a direct comparison of the figures of merit between various arrangements of a laser Doppler velocimeter with methods for signal processing to measure optically the flow properties of a fluid under given experimental conditions. (Sims-ISWS)
W77-10784

SOME REMARKS ON THE STATISTICAL THEORY OF EXTREME VALUES,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 2A.
W77-10786

FLOODS AND DROUGHTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, and P. Todorovic.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 16, Colorado State University, Fort Collins, p 16-1 - 16-31, 1976. 11 fig, 3 tab, 51 ref.

Descriptors: *Floods, *Droughts, *Stochastic processes, *Model studies, Forecasting, Theoretical analysis, Mathematical models, Mathematical studies, Statistical methods, Time series analysis, Distributions, Distribution patterns, Analytical techniques.
Identifiers: *Extreme values, Gumbel Distributions, Pearson Type III Distributions.

The main purpose of a statistical theory of extreme values is to forecast future extremes by analyzing observed extremes. The extreme values analysis can be applied to floods, droughts, precipitants, wind speeds, etc. However, in this chapter only floods and droughts were discussed. Stochastic approaches to flood prediction discussed included the Gumbel Distribution, Pearson Type III Distribution, and a method developed by the authors and their co-workers (See also W77-10439) (Humphreys-ISWS)
W77-10788

MODELING OF STREAM GEOMETRY AND ITS APPLICATIONS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
C-L. Chiu.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 23, Colorado State University, Fort Collins, p 23-1 - 23-27, 1976. 14 fig, 15 ref.

Descriptors: *Model studies, *Streams, *Shape, *Stochastic processes, Rivers, Mathematical models, Velocity, Distribution patterns, Roughness(Hydraulic), Steady flow, Unsteady flow, Hydrographs, Simulation analysis, Analytical techniques, Statistical models, Dispersion.
Identifiers: Stream geometry, Secondary flow.

A technique developed for stochastic modeling and Monte Carlo simulation of irregular channel cross sections was described. Stochastic simulation can be used to generate any number of sets of irregular stream cross sections, which are equally likely to represent a stream. The different sets of cross sections tend to yield different values of a variable of a transport process, for the same time, at the same station, which are scattering around the predicted mean, with variance representing uncertainty in prediction for each time point at each station. Examples of stochastic simulation of irregular cross sections of a stream were coupled with deterministic system models to obtain velocity distributions, flow profile at a gaging station, dispersion in unsteady flow, and secondary flow in a stream. (See also W77-10439) (Humphreys-ISWS)
W77-10791

2F. Groundwater

TRITIUM IN THE MONITORING OF WATER SUPPLY.
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
South African Journal of Science, Vol. 72, No. 7, p 195-196, July 1976. 1 fig, 3 ref.

Descriptors: *Aquifers, *Groundwater recharge, Measurement, *Rainfall, Rain water, Geohydrology, *Tritium, Nitrates, Agricultural runoff, Groundwater quality, Management, Heavy water, Flow, *Monitoring, Water supply, Path of pollutants.
Identifiers: Southern Africa, Botswana, Kalahari, Yorkshire.

The measurement of tritium in rainwater over the past 20 years shows definite peaks during 1958-59 and 1964-65. The tritium concentration of water can be used as an accurate means of investigating water flow through acquifers and the recharge of groundwater by rainfall. (So African Water Info Center)
W77-10196

EFFECT OF VISCOSITY RATIO ON THE RECOVERY OF FRESH WATER STORED IN SALINE AQUIFERS,
Louisiana Water Resources Research Inst., Baton Rouge.
For primary bibliographic entry see Field 4B.
W77-10264

CONTRIBUTION OF LATERAL SOIL WATER MOVEMENT ABOVE A FRAGIPAN TO STREAMFLOW,
Delaware Valley Coll. of Science and Agriculture, Doylestown, Pa. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-10312

METHOD FOR ROUGHLY ESTIMATING THE WATER EXCHANGE OF A RESERVOIR WITH AN AQUIFER HYDRAULICALLY CONNECTED WITH IT,
For primary bibliographic entry see Field 4B.
W77-10321

PROBLEMS OF HEAT STORAGE IN AQUIFERS,
Eidgenoessische Technische, Zurich (Switzerland). Institut fur Geophysik.
For primary bibliographic entry see Field 5B.
W77-10332

THE USE OF NATURAL TRITIUM FOR EVALUATING AQUIFER RECHARGE,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils.
G. B. Allison
Water (Journal of the Australian Water and Waste water Association), V. 4, No. 1, p 19-21, March 1977. 2 fig, 13 ref.

Descriptors: *Tritium, *Groundwater movement, *Natural recharge, Tracers, Radioisotopes, Groundwater recharge, Aquifers, Mathematical models, Reviews.

Inhomogeneities in aquifer materials often make regional estimates of aquifer parameters difficult or impossible to determine. Tritium is an ideal tracer for investigating water movement, as it is incorporated in the water molecule and moves very much as water does. The possibility thus arises of obtaining estimates, particularly of recharge rate, by studying the variation of tritium concentration within the aquifer. To obtain quantitative information by this method, a historical record of tritium concentration in the recharge input sources is required, together with hydrogeological information to allow an approximate mathematical model of water movement to be developed. Appropriate models are reviewed, and their application to the determination of recharge rates described. (CSIRO)
W77-10372

HYDRAULIC DESIGN DATA FOR WATER WELLS IN UNCONSOLIDATED SEDIMENTS,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 8B.
W77-10377

EFFECTS OF SILTATION ON RATES OF RECHARGE,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia).
For primary bibliographic entry see Field 4B.
W77-10378

ANALYSIS OF THE MOVEMENT OF WATER FROM RECHARGE CHANNELS AND PITS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-10379

MATHEMATICAL MODELLING OF THE RETURN WATERS RUNOFF,
Laboratory of Mathematical Modelling of Hydrological Processes, Samigmi, Tashkent (USSR).
For primary bibliographic entry see Field 4B.
W77-10423

APPLICATION OF DYNAMIC PROGRAMMING TO MODEL TRI-DIMENSIONAL FLOW IN POROUS MEDIA (APPLICATION DE LA PROGRAMATION DYNAMIQUE AUX MODELES TRIDEMENSIONNELS DE CALCUL DES ECOULEMENTS DANS LES MILIEUX POREUX),
Tehran Univ. (Iran), Dept. of Irrigation.
M. Mirabzadeh.
In: Application of Mathematical Models in Hydrology and Water Resources System; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 168-175, 1975. 7 ref.

Descriptors: *Groundwater movement, *Potential flow, *Mathematical studies, *Model studies, Porous media, Flow, Equations, Mathematical models, Hydraulics, Analytical techniques, Dynamic programming, Equations, Mathematics, Foreign research.
Identifiers: *Iran, Three dimensional flow.

Dynamic programming was applied to three-dimensional flow problems in porous media. For this case, the inversion of the (L-1) matrix with the dimensions square of (MN) (L, M, and N are the numbers of nodes along space coordinates OX, OY, and OZ) becomes essential. If M and N are large, the method may result in difficulties concerning the accuracy of computations, memory storage, and/or computer time. For these reasons, the dynamic programming techniques, the hydrodynamical potential was solved for each layer of the porous media, and, with iteration on the layers, the value of the potential on each node in the flow region was determined. (See also W77-10419) (Humphreys-ISWS)
W77-10429

DISTRIBUTION OF NITRATE IN GROUND WATER, REDLANDS, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-10558

CHARACTERISTICS OF AQUIFERS IN THE NORTHERN UINTA BASIN AREA, UTAH AND COLORADO,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
W. Hood.
Utah Department of Natural Resources Technical Publication No 53, 1976. 71 p, 23 fig, 3 plates, 6 tab, 42 ref, append.

Descriptors: *Aquifer characteristics, Geohydrologic units, *Aquifer testing, Hydrogeology, Hydraulic conductivity, Specific capacity, Specific yield, Transmissivity, Utah, Colorado, *Northern Uinta Basin.

Within the 5,200 square miles of the northern Uinta Basin area, the composite geologic section is about 58,000 feet thick. All but the uppermost 200 feet consists of consolidated rock. Only seven formations are considered to be important aquifers--unconsolidated glacial outwash and related deposits, the Duchesne River, Uinta, and Currant Creek Formations, the Glen Canyon Sandstone, Weber Quartzite, and rocks of Mississippian age. Eight other formations are considered to be important aquifers only in some areas. The remaining formations all contain water, but most have low permeability or degrade the chemical quality of water because of evaporite content. Hydraulic conductivity of unconsolidated deposits ranged from 2 to 1,800 feet per day; the average specific yield is estimated to be 0.10. In the consolidated rocks, horizontal hydraulic conductivity ranged from 0.000021 to 600 feet per day; the wide range results from the fracturing of rocks that have low primary permeability. Specific yields in the consolidated aquifers were estimated to range from 0.001 to more than 0.01. Rocks of Mississippian age have low permeability and store relatively little water, but they take in recharge through cavernous zones and deliver the water downdip and upward to younger formations through fracture zones. (Woodard-USGS)
W77-10559

LONGITUDINAL DISPERSION IN POROUS MEDIA WITH VARIABLE POROSITY,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
S. H. Lin.
Journal of Hydrology, Vol 34, No 1/2, p 13-19, July 1977. 3 fig, 13 ref.

Descriptors: *Porous media, *Porosity, *Dispersion, Aquifers, Groundwater, Saline water intrusion, Hydrology, Equations, Model studies, Mathematical studies, Oil reservoirs.
Identifiers: *Longitudinal dispersion, Variable porosity, Porosity equations, Coastal aquifers.

An analytical procedure was developed for predicting the solute dispersion in porous media with variable porosity and constant volumetric seepage flow rate. Several porosity equations, which may represent the possible porosity variation as a function of spatial coordinate, were suggested and used to test how well the predicted solute concentration using a constant average porosity is when compared to the prediction using a prescribed porosity function. It was found that the predictions by using an average porosity are within 15% of those predictions using a linear or a slightly curved porosity functions. However, the discrepancy between the two predictions is very substantial as the porosity function becomes a strong nonlinear one. For this instance, prediction of the solute concentration using an average porosity is rather poor, and a numerical method is needed if a reliable prediction is to be obtained. (Lee-ISWS)
W77-10659

A SIMPLE EFFECTIVE METHOD FOR THE COMPUTER SIMULATION OF GROUNDWATER STORAGE AND ITS APPLICATION IN THE DESIGN OF WATER RESOURCE SYSTEMS,
Department of the Environment, Reading (England). Central Water Planning Unit.
A. B. Birtles, and M. J. Reeves.
Journal of Hydrology, Vol. 34, No. 1/2, p 77-96, July 1977. 10 fig, 3 tab, 18 ref.

Descriptors: *Groundwater, *Water storage, *Model studies, Storage, Underground storage, Aquifers, Seepage, Foreign research, Recharge, Foreign countries, Springs, Glacial drift, Infiltration, Sandstones, Baseflow, Flow, Streamflow, Rivers, Hydrology, *Simulation analysis, *Computer models.
Identifiers: *Groundwater models, *England.

The use of quasi-lumped parameter groundwater models in water resource system evaluation and design was described. Results were given of a range of applications which demonstrate the versatility of the technique. Examples were drawn from the Chalk of the River Hull catchment and from the Triassic sandstones in the Vale of York (Sims-ISWS)
W77-10660

MODELING OF UNCONFINED GROUNDWATER SYSTEMS,
Lehigh Univ., Bethlehem, Pa. Dept. of Civil Engineering; and Lehigh Univ., Bethlehem, Pa. Fritz Engineering Lab.
W. A. Murray, and R. L. Johnson.
Ground Water, Vol. 15, No. 4, p 306-312, July-August 1977. 2 fig, 1 tab, 34 ref, 2 append.

Descriptors: *Groundwater, *Equations, *Model studies, Groundwater movement, Dupuit-Forchheimer theory, Mathematical models, Water table, Hydrology, Base flow.
Identifiers: *Unconfined groundwater systems, Polubarinova-Kochina, Unconfined groundwater flow, Groundwater hydrology.

Mathematical modeling of regional unconfined groundwater flow is accomplished most often by using a linearized Dupuit-Forchheimer (DF) equation. The depth of flow, h, in the general DF equation appears as a squared h term and also as a linear term of h. Linearization of the DF equation generally is accomplished with the first method of linearization presented by Polubarinova-Kochina (PK), in which squared h is replaced with h times some average depth of flow. The resulting equation is then linear in h. The second method of linearization described by PK is accomplished by replacing h with squared h, divided by an average flow depth, and hence the resulting equation becomes linear in squared h. If the second method of linearization is used, the same heat conduction type equation is obtained as that from the first method of linearization, but it tends to yield more accurate predictions of water table locations. Furthermore, by simply altering the numerical values of boundary condition constants, most existing mathematical models, based on the first method of linearization can be easily converted to yield solutions to the more accurate equation linearized by the second method. (Lee-ISWS)
W77-10661

ANALYTICAL SOLUTION FOR STEADY INTERFACE FLOW IN A COASTAL AQUIFER INVOLVING A PHREATIC SURFACE WITH PRECIPITATION,
Rijkswaterstaat, Rijswijk (Netherlands) Data Processing Div.
P. Van Der Veer.
Journal of Hydrology, Vol 34, No 1/2, p 1-11, July 1977. 6 fig, 14 ref.

Descriptors: *Saline water-freshwater interfaces, *Coasts, *Water table aquifers, Steady flow, Precipitation(Atmospheric), Mathematical models, Equations, Groundwater movement, Seepage, Darcys law, Flow nets, Boundary processes, Equilibrium.
Identifiers: *Ghyben-Herzberg relationship, Hydrostatic equilibrium, Hydraulic head.

The problem of determining the steady position of an interface and a phreatic surface in a coastal aquifer was investigated. Fresh groundwater flows towards the sea over salt groundwater which is at rest. The upper boundary of the flow region is a phreatic surface with precipitation. The analytical solution for this problem was a non-linear algebraic expression of complex parameters. Expressions for the position of the interface and the phreatic surface were given. The results were compared with the one-dimensional approach according to Badon Ghyben and Herzberg. For a special case of the general solution the interface as well as the phreatic surface forms a straight line. (Visocky-ISWS)
W77-10762

GROUND SUBSIDENCE DUE TO NONLINEAR FLOW THROUGH DEFORMABLE POROUS MEDIA,
Indian Inst. of Tech. Kanpur (India). Dept. of Civil Engineering.
M. R. Madhav, and P. Basak.
Journal of Hydrology, Vol 34, No 1/2, p 21-33, July 1977. 3 fig, 1 tab, 39 ref.

Descriptors: *Land subsidence, *Plastic deformation, *Groundwater movement, Aquifers, Porous media, Mathematical models, Equations, Artesian heads, Aquitards, Aqyucludes, Compaction, Effective stress, Void ratio, Compressibility, Pore pressure, Strain, Water level fluctuations.
Identifiers: Non-Darcy flow.

An analytical solution was presented for the problem of time rate of ground subsidence and piezometric pressure distribution caused by a sudden increase in the effective stress due to an instantaneous lowering of the groundwater table in an aquifer-aquitard-aquiclude system of finite thickness, obeying a nonlinear flow law of the type $v = Mi$ to the n power. Unlike for Darcian flow, the degree of subsidence and the nondimensional pore pressure distribution were found to be dependent on both the amount of groundwater fall and the thickness of the deforming medium. (Visocky-ISWS)
W77-10763

PUMP TESTING IN HETEROGENEOUS AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vandenberg.
Journal of Hydrology, Vol 34, Vol 1/2, p 45-62, July 1977. 12 fig, 1 tab, 11 ref, append.

Descriptors: *Aquifers, *Pump testing, *Model studies, Transmissivity, Groundwater, Hydrology, Drawdown, Equations, Theis equation, Wells.
Identifiers: *Finite-difference model, Pumped wells, Transmissivity distribution.

A finite-difference model of an infinite horizontal non-leaky aquifer was used to simulate a constant-rate pump test in a heterogeneous aquifer; the values of transmissivity specified for the nodes of the finite-difference grid were chosen at random from a uniform distribution over the interval 0-0.1 sq m/min and the ratio transmissivity/storativity was kept constant. The spacing of the finite-difference grid was 10 m in the vicinity of the pumped well at the center of the grid and became progressively wider towards the boundaries of the square area. The boundaries were located at a distance of 23 km from the well. Simulated time-drawdown curves for 624 nodes within 1,000 m of the well were analyzed using the Theis equation for drawdown in a infinite homogeneous aquifer and a least-squares technique to obtain the best values of transmissivity and storativity. Calculated transmissivities and storativities were distributed almost normally in a narrow range about the average of the values assigned to the nodes. Statistically, the pump tests yielded increasingly consistent results both as the observation node was removed farther and farther from the pumped well and as the points on the time-drawdown curve selected for the analysis represented later and later times. It was concluded that, at least for the type of hypothetical transmissivity distribution utilized, drawdown curves will not clearly reveal the inhomogenous nature of the aquifer. Thus, standard analytical aquifer-test techniques can be applied safely in such circumstances. (Lee-ISWS)
W77-10764

PERMISSIBLE MESH SPACING IN AQUIFER PROBLEMS SOLVED BY FINITE DIFFERENCES,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton, and L. M. Tomlinson.
Journal of Hydrology, Vol 34, No 1/2, p 63-76, July 1977. 6 fig, 4 tab, 12 ref, append.

Descriptors: *Aquifers, *Groundwater, *Model studies, Mathematical models, Finite element analysis, Groundwater movement, Analytical techniques, Computer models, Hydrology.
Identifiers: *Groundwater models, Mesh spacings, Finite-difference equations.

The maximum acceptable mesh spacing for finite-difference models of groundwater flow problems was investigated by analyzing a range of problems for which alternative solutions are available. It was shown that, for long time periods or for problems in which the head variation is smooth, a few mesh subdivisions are often acceptable; but for other problems, many mesh subdivisions are essential. Recommendations were given for the design of a mesh; the validity of the design was tested in the solution of two field problems. (Sims-ISWS)
W77-10765

COMPUTER MODELLING OF REGIONAL GROUNDWATER SYSTEMS IN THE CONFINED-UNCONFINED FLOW REGIME,
Department of the Environment, Reading (England). Central Water Planning Unit.
A. B. Birtles, and M. J. Reeves.
Journal of Hydrology, Vol 34, No 1/2, p 97-127, July 1977. 13 fig, 47 ref.

Descriptors: *Groundwater, *Groundwater movement, *Model studies, Mathematical models, Aquifers, Sandstones, Infiltration, Discharge(Water), Flow, Foreign research, Computer models, Recharge, Water levels, Pumping, Leakage, Hydrology.
Identifiers: *Groundwater models, *England, Finite-difference equations.

The concepts and philosophies underlying the development of general purpose computer programs for the simulation of groundwater flow in regional aquifer systems operating in the confined-unconfined flow regime were described. The most important of the many variables at play in such systems and the mechanisms by which they interact were identified, and the data required for the numerical definition of the hydrological system were reviewed. Emphasis was laid upon the importance of modelling physical processes as precisely as possible when computer predictions outside the scope of natural hydrological events are to be attemped. An example was given of an application of the computer programs and techniques to the investigation of a proposed river regulation scheme using groundwater abstractions. (Sims-ISWS)
W77-10766

INVESTIGATION OF THE HYDROLOGICAL BALANCE IN A PEAT SWAMP,
Brussels Univ. (Belgium).
F. DeSmedt, A. VanderBeken, and G. Demaree.
Journal of Hydrology, Vol 34, No 1/2, p 151-160, July 1977. 5 fig, 2 tab, 5 ref.

Descriptors: *Swamps, *Water levels, *Model studies, Mathematical models, Peat, Wetlands, Foreign countries, Groundwater movement, Water balance, Hydrology, Hydraulics.
Identifiers: *Belgium, *DeZegge Swamp(Belgium).

The soil of the bird sancturary 'DeZegge' consists of an alluvion layer over a peat layer. A hydrological balance of the area was constructed with the aid of weekly measurements of water or groundwater levels at several places in the swamp. In a first model, only horizontal groundwater flow in the alluvion layer was taken into consideration. The calibration of the model was executed with a linear regression. The model was strongly improved when vertical flow in and out of the peat layer was taken into account. The vertical flow was assumed to be proportional with the difference in hydraulic head. Again, linear regression was used to calibrate the model. In a third non-linear model, the flow in the peat was assumed to be non-Darcian. With pattern search, a non-linear optimization technique, it was shown that the model is not better than the foregoing model. (Sims-ISWS)
W77-10768

STATISTICAL APPLICATIONS IN GROUNDWATER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
D. K. Sunada.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 20, Colorado State University, Fort Collins, p 20-1 - 20-17, 1976. 7 fig, 2 tab, 16 ref.

Descriptors: *Groundwater, *Porous media, *Statistical methods, *Model studies, Reviews, Groundwater movement, Aquifer characteristics, Monte Carlo method, Numerical analysis, Aquifer systems, Analytical techniques, Dispersion, Water tables, Physical properties, Permeability.

Traditionally, the applications of probabilistic statistic and stochastic methods have been oriented towards evaluation of microscopic properties of the flow and the physical properties of the porous medium. On a much larger scale, the analysis of a groundwater aquifer has been based primarily upon deterministic methods for solving the general differential equation describing the flow behavior. Temporal variables such as recharge to the aquifer and spatial variables such as permeability are usually treated in terms of 'averages', even if a sufficient sample size is not available to define these averages. The applications of statistics in the groundwater area reviewed were: (1) Evaluation of the microscopic behavior of flow through porous media, (2) Evaluation of data for use of groundwater systems, and, (3) Simulation of groundwater aquifers. (See also W77-10439) (Humphreys-ISWS)
W77-10789

2G. Water In Soils

DETERMINATION OF DIMETHYL NITROSAMINE IN AIR, WATER, AND SOIL BY THERMAL ENERGY ANALYSIS: MEASUREMENTS IN BALTIMORE, MD.,
Thermo Electron Research Center, Waltham Mass.
For primary bibliographic entry see Field 5A.
W77-10129

HYDRODYNAMIC DISPERSION IN POROUS MATERIALS,
Agricultural Research Council, Littlehampton (England). Glasshouse Crops Research Inst.
D. A. Rose.
Soil Science, Vol 123, No 5, p 277-283, May 1977. 5 fig, 1 tab, 13 ref.

Descriptors: *Dispersion, *Hydrodynamic, *Tracers, *Porous media, Diffusion, Convection, Mathematical models, Equations, Curves, Theoretical analysis, Porosity, Aggregates.
Identifiers: *Superposition, Breakthrough curve, Pulse input, Periodic input, Dimensionless parameters, Peclet number.

Some aspects are considered of the hydrodynamic disperison of tracer which occurs under the combined influence of molecular diffusion and convection when a fluid flows through a finite column of porous material. In particular, the paper discussed (1) the use of the principle of superposition to obtain breakthrough curves for pulsed a

periodic inputs of tracer, (2) the form of dispersion coefficients in terms of dimensionless groups of parameters, and (3) the mechanisms underlying dispersion. (Visocky-ISWS)
W77-10131

EFFECT OF ANTECEDENT CONDITIONS ON FROZEN GROUND FLOODS,
daho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2C.
W77-10175

RELATION OF CLIMATE TO LEACHING OF OLUTES AND POLLUTANTS THROUGH OILS,
Visconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-10187

HE RELEASE OF NITROGEN FROM SUL-UR-COATED UREA AS AFFECTED BY SOIL IOISTURE, COATING WEIGHT, AND ETHOD OF PLACEMENT,
Voods (M. J.) and Associates, Dublin (Ireland).
I. Prasad.
oil Science Society of America Journal, Vol. 40, o. 1, p 134-136, January-February 1976. 5 tab, 13 f.

escriptors: *Nitrogen, *Ureas, *Soil moisture, alcareous soils, Soil investigations, Nitrification, itrite, Volatility.
dentifiers: Ammonia volatilization, Sulf-coated rea.

nformation on the release of N from sulfur-oated urea (SCU) as affected by soil moisture in e aerated range is lacking. Laboratory incuba-on experiments were therefore conducted on two ils to study the release of N from SCU as af-cted by soil moisture in the aerated range, coat-g weight (SCU-28 and SCU-9), and method of acement (In one soil only). In the calcareous inces Town soil the release of N from SCU in-eased with increasing moisture throughout the 9 eeks of study. In acid Talparo soil similar trends ere present up to 3 weeks, but at 6 and 9 weeks aximum release of N occurred at medium oisture (soil moisture at pF 2.4) and minimum lease at low moisture (soil moisture at pF 3.5). kogerboe-Colorado State).
77-10270

HE RESISTANCE OF INTACT MAIZE ROOTS O WATER FLOW,
niversity of New England, Armidale (Australia).
ept. of Agronomy and Soil Science.
B. So, L. A. G. Aylmore, and J. P. Quirk.
il Science Society of America Journal, Vol. 40, o. 2, p 222-225, March-April 1976. 2 fig, 3 tab, 9 .

scriptors: *Tensiometers, *Root systems, Soil ter, *Soil water movement, *Corn(Field), In-umentation.
ntifiers: Root tissue.

ing a novel tensiometer-potometer system the ationship between the root resistance to water w of maize and the water potential of the root ue has been examined. Over the range of water entials used a linear relation has been observed contrast to previous observations. Calculations ng published data indicate that the rhizosphere istance is of the same order of magnitude as the t resistance when the soil moisture potential of rhizosphere is about -1 to -2 bars. (Skogerboe-orado State)
7-10271

DENITRIFICATION KINETICS IN SOIL SYSTEMS: THE SIGNIFICANCE OF GOOD FITS OF DATA TO MATHEMATICAL FORMS,
Washington Univ., St. Louis, Mo. Dept. of Biology.
D. H. Kohl, F. Vithayathil, P. Whitlow, G. Shearer, and S. H. Chien.
Soil Science Society of America Journal, Vol. 40, No. 2, p 249-253, March-April 1976. 5 fig, 10 ref.

Descriptors: *Denitrification, *Kinetics, Soils, Soil properties, Saturation, *Illinois, *Nitrogen.
Identifiers: Glucose.

The loss of NO3(-) added to two central Illinois soils was determined in experiments in which the soils were incubated under waterlogged conditions. The loss was measured as a function of substrate concentration in one experiment in which samples were incubated for a single time (24 hours) and as a function of time in a second experiment in which the concentration of the added NO3(-) was held constrant (200 ppm NO3(-) -N). The rate of loss of NO3(-) was about 5.5 times higher in one of the soils than in the other. This difference was largely overcome by the addition of glucose (1% with respect to the soil) which also greatly enhanced the rate of denitrification in both soils. The experimental points representing the rate of NO3(-) loss plotted as a function of the concentration of added NO3(-), were equally well fit by Michaelis-Menten and expotential equations as well as by the solution to a pair of nonlinear differential equations representing a system in which the product of one reaction is a substrate in a second sequence. (Skogerboe-Colorado State)
W77-10272

AN EVALUATION OF JOB'S METHOD OF CONTINUOUS VARIATIONS AS APPLIED TO SOIL ORGANIC MATTER-METAL ION INTERACTIONS,
Georgia Univ., Athens. Dept. of Chemistry.
P. McCarthy, and H. B. Mark, Jr.
Soil Science Society of America Journal, Vol. 40, No. 2, p 267-276, March-April 1976. 5 fig, 31 ref.

Descriptors: *Organic matter, *Ions, *Soil chemistry, Soil properties, Soil investations, *Metals, Absorption, *Methodology, Evaluation.
Identifiers: *Soil organic matter, *Job's method.

The literature dealing with the application of Job's method of continuous variations to the study of soil organic matter-metal ion interactions has been reviewed, and an introduction to the fundamental chemistry necessary for an understanding of these interactions is presented. The method of continuous variations was applied to simple systems consisting of metal ions and mixtures of discrete ligands. The behavior of these 'model' systems was compared to that of the more complicated soil organic matter systems. Following a consideration of the fundamental principles of job's method and of its boundary conditions and limitations, it was concluded that this method is not directly applicable to the study of soil organic matter-metal ion interactions. This conclusion was substantiated by experiments carried out on the simple 'model' systems as well as those on fulvic acid itself. Explanations are proposed to account for the deceptive results which were obtained when this method was erroneously applied by other workers to the investigation of soil organic matter-metal ion interactions in the past. Possible interferences, due to scattering of light, during the study of soil organic matter-metal ion reactions by UV-visible absorption spectroscopy are considered. (Skogerboe-Colorado State)
W77-10273

INFLUENCE OF SOIL PH ON THE AVAILABILITY OF ADDED BORON,
Wisconsin Univ., Madison. Dept. of Soil Science; and Wisconsin Univ., Madison. Dept. of Horticulture.
L. A. Peterson, and R. C. Newman.
Soil Science Society of America Journal, Vol. 40, No. 2, p 280-282, March-April 1976. 1 fig, 3 tab, 13 ref.

Descriptors: *Boron, Fescue, Soil properties, Greenhouses, *Soil chemistry, Soils, Soil investigations, Hydrogen ion concentration.
Identifiers: Herbage yields.

A Plano silt loam with five relatively constant pH levels (4.7, 5.3, 5.8, 6.3, 7.4) was used to study the influence of soil pH on the availability of added B. A greenhouse study was conductedusing tall fescue with five soil pH levels, and four rates of applied B essentially equivalent to 0. 5, 10, and 20 kg/ha, and five herbage harvests. Herbage yields of tall fescue were not affected by either soil pH or B treatments; however, tissue B concentrations ranged from 8 to 739 ppm for the five harvests. Boron uptake by tall fescue was relatively uniform for soil pH levels of 4.7, 5.3, 5.8, and 6.3 within each level of B availability. Recovery percentages of 30 to 50% of the added B by five cuttings of forage indicate a soil fixation of B. Highest recovery percentage was associated with the highest rate of added B. A 2.5-fold drop in B uptake occurred at pH 7.4 as compared with the other soil pH levels indicating substantial fixation of B. Hot-water-soluble B content of the soil generally increased with an increase in pH and with added B. The soluble B test did not predict the low recovery of B at pH 7.4 (Skogerboe-Colorado State)
W77-10274

PHOSPHORUS SORPTION AND DESORPTION CHARACTERISTICS OF SOIL AS AFFECTED BY ORGANIC RESIDUES,
Idaho Univ., Moscow. Dept. of Plant and Soil Sciences.
B. B. Singh, and J. P. Jones.
Soil Science Society of America Journal, Vol 40, No 3, p 389-394, May-June 1976. 7 fig, 1 tab, 31 ref.

Descriptors: *Phosphorus, *Sorption, *Organic matter, Soils, Soil investigations, Soil properties, Alfalfa, Beans, Barley, Farm wastes, Mineralization, Fertilizers, Fertilization.
Identifiers: Desorption.

The influence of seven organic residues on sorption and desorption of P by a high P-fixing soil was determined after 30, 75, and 150 days of incubation. After incubating for 30 days, all residues decreased the amount of P sorbed by the soil, resulting in higher equilibrium solution P levels. However, after incubating for either 75 or 150 days, the P content of the organic residues had a marked influence on sorption of added P and desorption of sorbed P. The critical value of P in organic residues which resulted in no tie-up of soil P was 0.3%. Sawdust, wheat straw, and cornstalks which contained $< 0.3\%$ P decreased labile soil P and increased sorption by soil after incubating for 75 or 150 days. Alfalfa, barley, beans, and poultry manure that contained P in excess of 0.3% decreased sorption of P. The results suggest that P fertilizer rates estimated from sorption isotherms may need to be modified following addition of organic residues. (Skogerboe-Colorado State)
W77-10275

EXCHANGE AND HYDRATION PROPERTIES OF CU(2+) ON MIXED-ION NA(+) - CU(2+) SMECTITES,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept. of Agronomy.
M. B. McBride.
Soil Science Society of American Journal, Vol 40, No 3, p 452-456, May-June 1976. 4 fig, 1 tab, 20 ref.

Descriptors: *Cation adsorption, *X-ray diffraction, Clays, Montmorillonite, Soils, Soil investigations, Soil properties, Soil chemistry, *Ion exchange, Ions, *Copper, *Sodium, *Hydration.

The exchange of Na(+)-montmorillonite with Cu(2+) was studied using X-ray diffraction, electron spin resonance (ESR) and a specific Cu(2+) electrode in order to investigate the hydration and exchange properties of mixed Cu(2+) - Na(+) clay systems. With < 30% of the exchange sites occupied by Cu(2+), the clays behave much as pure Na(+)-montmorillonite and swell freely in water. Larger exchange levels of Cu(2+) produce more ordered interlayers at low relative humidities. At high relative humidities, this ordered structure is reduced and a solution-like environment is produced as the aluminosilicate sheets further separate. Exchange isotherms demonstrate a large preference for Cu(2+) over Na(2+) at low Cu(2+) exchange levels but preference for Na(+) at high Cu(2+) levels. In contrast, Cu(2+) - Mg(2+) exchange does not show this effect, indicating that certain exchange sites on the silicate structure preferentially adsorb divalent cations. Thus, Cu(2+) ions are effectively removed from solution by Na(+)-monmorillonite, but are not adsorbed in preference to other divalent cations. (Skogerboe-Colorado State)
W77-10276

POTASSIUM RELEASE FROM SAND, SILT, AND CLAY SOIL SEPARATES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
D. A. Munn, L. P. Wilding, and E. O. McLean.
Soil Science Society of America Journal, Vol 40, No 3, p 364-366, May-June 1976. 6 tab, 10 ref.

Descriptors: Soils, Soil investigation, *Potassium, Soil texture, Soil properties, *Soil chemistry, Nutrients, Soil chemical properties, Particle size, *Clays.
Identifiers: *Soil separates.

Four Ohio soils of divergent mineralogy were fractionated into sand, silt, and clay-sized separates after dispersion with an ultrasonic probe. Samples were extracted for 10 days with 0.01M CaCl2 with the solution being changed each day. There was a wide range in daily and cumulative K release among the four soils for the same particle size and for different particle sizes within the same soil. When weighted according to particle size distribution of the soil, the clay was found to contribute 30-74%; silt 24-56%; and sand 3-21% of the total K released by the sum of the three separates. In all four soils, the clay separate released the most K per unit weight. The apparent rate constants for K release from the sand and clay separates were similar and generally higher than that for the silt separates. (Skogerboe-Colorado State)
W77-10277

THEORETICAL CONSIDERATION ON NITRITE SELF-DECOMPOSITION REACTIONS IN SOILS,
Ghent Rijksuniversiteit (Belgium). Lab. of Physical and Radiobiological Chemistry.
O. Van Cleemput, and L. Baert.
Soil Science Society of America Journal, Vol 40, No 1, p 322-324, March-April 1976. 3 fig, 10 ref.

Descriptors: Soils, Soil investigations, Soil properties, *Nitrites, Reactions, *Degradation(Decomposition).
Identifiers: Reaction equilibrium, *Nitrous acid.

The spontaniety of different nitrous acid self-decomposition reactions was calculated for different sets of activities of the participating components at pH 4, 7, and 9. These calculations showed that nitrous acid preferentially decomposes spontaneously to NO and NO3(-) instead of self-decomposition to NO and NO2 or N2O4. The higher the pH the larger the region of nitrous acid stability. Theoretical evidence for the reaction of nitrous and nitric acid with formation of NO2 was obtained. (Skogerboe-Colorado State)
W77-10279

A TECHNIQUE TO DETERMINE IRON EFFICIENCY IN PLANTS,
Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.
J. C. Brown, and W. E. Jones.
Soil Science Society of America Journal, Vol. 40, No. 3, p 398-405, May-June 1976. 6 fig, 3 tab, 16 ref.

Descriptors: *Iron, *Crop response, *Fertilization, *Soil tests, Soil investigations, Nutrients, Crop production, Plant growth.

Soil tests should predict crop response to fertilization. In the case of Fe, plant factors seem to affect the use of Fe by the plant; thus, soil tests may not be reliable. Use of soil Fe by plants is genetically controlled by an adaptive mechanism which is activated in Fe-efficient plants in response to Fe-stress, but remains inactive if Fe is sufficient. Fe-inefficient plants develop less Fe-stress response than Fe-efficient plants. Using this range of Fe-stress response in plants as a basis, a technique was developed to screen plants for Fe efficiency. A limited supply of Fe and some control of pH in the growth medium were required in this technique. The pH was controlled by using nutrient solutions, N only as NO3, and N as NH4 and NO3, and by varying the CaCO3 and P concentrations in the solutions. The optimum supply of Fe (0.2 mg Fe/liter) was determined by growing the plants at different Fe concentrations. (Skogerboe-Colorado State)
W77-10280

CORRELATION OF PLANT MANGANESE WITH EXTRACTABLE SOIL MANGANESE AND SOIL FACTORS,
Minnesota Univ., Waseca. Southern Experiment Station.
G. W. Randall, E. E. Schulte, and R. B. Corey.
Soil Science Society of America Journal, Vol. 40, No. 2, p 282-287, March-April 1976. 6 tab, 19 ref.

Descriptors: *Manganese, Soils, Soil properties, *Soil chemical properties, Oats, *Organic matter, Greenhouses, Soil investigations, *Wisconsin, Soil chemistry.
Identifiers: Ryegrass.

The availability of Mn on 37 low and 20 high organic matter in Wisconsin soils was determined by growing oats and ryegrass, respectively, in consecutive greenhouse studies. The Mn uptake values were used to develop prediction equations by means of multiple regression analysis with Mn extracted by various extracting solutions (18 extractants for the low and 13 for the high organic matter soils) plus various functions of soil pH and organic matter as the independent variables. On the low organic matter soils (O.M. < 6%), using only the Mn test, the best prediction values with uptake were obtained with total Mn, and with the 0.1N H3PO4 and 0.01M EDTA in 1N NH40Ac extractants (sq R=57, 50 and 49%, respectively). Inclusion of soil pH and organic matter with the soil test values resulted in Mn uptake being predicted best by the 0.01M and 0.05M EDTA extractants (sq R=68% for both). The contribution of the soil test in the prediction equation was strongest when the 0.1N H3PO4, 0.01M EDTA in 1N NH40Ac, 0.05M EDTA or DTPA (pH7.3) extractants were used. (Skogerboe-Colorado State)
W77-10281

INFLUENCE OF SALT AND ALKALI ON IONIC EQUILIBRIA IN SUBMERGED SOILS,
International Rice Research Inst., Los Banos, Laguna (Philippines).
N. S. Pasricha, and F. N. Ponnamperuma.
Soil Science Society of America Journal, Vol. 40, No. 3, p 374-376, May-June 1976. 4 tab, 15 ref.

Descriptors: *Salts, Salinity, *Alkali, *Clays, Sodium, Sampling, Ions, Iron, Manganese, Soils, *Soil investigations, Soil properties.
Identifiers: Exchangeable sodium.

To clarify the effects of salt and alkali on Fe(2+) and Mn(2+) equilibria in submerged soils, Maahas clay (a Haplustalf) was amended with NaCl and NaHCO3 to give initial electrical conductivities of 5, 10, 20, and 25 mmhos/cm at 25C and exchangeable Na percentages of 5, 10, 15, 20, and 25, respectively. The amended soils and an untreated control were kept submerged in 16-liter pots in a greenhouse at 25-30C. The soil solutions, drawn anoxically by gravity, were analyzed fortnightly for Eh, pH, CO2, and the major ions. As the salt level increased, pH decreased and the concentrations of all cations increased. As alkalinity increased, the concentrations of all cations except K(+) and Na(+) decreased. In spite of wide variations in pH, Eh, ionic strength, and the concentrations of Fe(2+) and Mn(2+) in the soil solutions, the values of the expressions, pE - pFe(2+) + 3 pH, pE - 1.5 pFe(2+) + 4 pH, pE + pH, and pH - 0.5 pMn(2+) - 0.5 pCO2 were nearly equal to 17.9, 23.3, 7.3, and 4.1, respectively, indicating that even in the salt and alkali treated soils, the Fe(OH)3-Fe(2+) and Fe3(OH)8-Fe(2+) system controlled the solubility of Fe(2+) while the MnCO3-H2O-CO2 system regulated the solubility of Mn(2+). (Skogerboe-Colorado State)
W77-10282

AN EVALUATION OF SULFUR-COATED UREA AS A PREPLANT TOTAL SEASON NITROGEN SUPPLY FOR TRELLISED TOMATOES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W77-10283

ZINC ADSORPTION ISOTHERMS FOR SOIL CLAYS WITH AND WITHOUT IRON OXIDE REMOVED,
Georgia Univ., Athens. Dept. of Agronomy.
L. M. Shuman.
Soil Science Society of America Journal, Vol. 40, No. 3, p 349-352, May-June 1976. 2 fig, 3 tab, ref.

Descriptors: *Zinc, *Adsorption, *Georgia, *Clays, Soils, Soil properties, *Iron oxides, Soil investigations.

The clay fraction from four predominant Georgia soils sampled at two depths was separated and the iron oxides removed from a portion of each clay sample. These clays were equilibrated with five Zn solutions to measure Zn adsorption. The data conformed to the Langmuir adsorption isotherm. Langmuir coefficients were used to evaluate the Zn adsorptive capacities of the clays and the bonding energies for Zn. Adsorptive capacities and CEC values for the clays from Decatur cl and Leefield is soils were higher than those for clays from the Cecil sl and Norfolk ls soils. Differences in adsorptive capacities were not consistent between depths nor between samples with and without Fe oxides. However, removal of the iron oxides increased the capacity to adsorb Zn in most instances than it decreased this capacity. Zinc adsorptive capacities were directly related to the CEC values for the clays. When comparing the samples with and without Fe oxides removed, bonding energies were inversely related to adsorptive capacities. (Skogerboe-Colorado State)
W77-10284

INFLUENCE OF ROW SPACING AND STRAW MULCH ON FIRST STAGE DRYING,
Agricultural Research Service. Temple. Southern Region.
For primary bibliographic entry see Field 2D.
W77-10286

GASEOUS LOSS OF AMMONIA FROM SULFUR-COATED UREA, AMMONIUM SULFATE AND UREA APPLIED TO CALCAREOUS SOIL (PH 7.3),
Woods (M. J.) and Associates, Dublin (Ireland).

M. Prasad.
Soil Science Society of America Journal, Vol. 40, No. 1, p 130-134, January-February 1976. 7 tab, 20 ref.

Descriptors: *Ureas, Nitrogen, Temperature, Calcareous soils, Soil moisture, *Ammonia, Nutrients, *Sulfates, Pollutant identification, Water pollution.
Identifiers: *Sulfur-coated ureas.

Laboratory incubation experiments were conducted to study the comparative volatilization loss of NH3 in a calcareous soil from sulfur-coated urea (SCU) with fast (F), medium (M), and slow (S) dissolution rates, ammonium sulfate (AS) and urea, at two temperatures 22 and 32C, and at three soil moisture levels 25, 50, and 80% of the water holding capacity of the soil. The effect of the addition of organic amendment (filter press mud) to soil on NH3 loss from these N-sources was also studied. Losses were studied up to 21 days. At both temperatures increasing soil moisture levels led to reduction of NH3 loss regardless of the N-source, despite the fact that the soil analysis showed higher dissolution of N from SCU at high soil moisture. (Skogerboe-Colorado State)
W77-10287

COMPARISON OF NUMERICAL SIMULATION MODELS FOR ONE-DIMENSIONAL INFILTRATION,
Universite Scientifique et Medicale, Grenoble (France). Institut de Mecanique.
L. Haverkamp, M. Vauclin, J. Touma, P. J. Wierenga, and G. Vachaud.
Soil Science Society of America Journal, Vol. 41, No. 2, p 285-294, March-April 1977. 6 fig, 4 tab, 34 ref, 1 append.

Descriptors: *Model studies, *Mathematical models, *Infiltration, Numerical analysis, Soil water movement, Soils, Sands, Clays, Profiles, Moisture content, Hydraulic conductivity, Computer models, Equations, Soil science, Simulation analysis.

Six models, employing different ways of discretization of the nonlinear infiltration equation, were compared in terms of execution time, accuracy, and programming considerations. All models yielded excellent agreement with water content profiles measured at various times in a sand column. The two explicit models, the theta-based SWMP model and the h-based explicit model, used between 5 and 10 times more computer time than the implicit models. Results obtained with the two models which used the Kirchhoff integral transformation were no better than results obtained with the two h-based implicit models. The implicit schemes with implicit or explicit evaluation of the hydraulic conductivity and water capacity functions appear to have the widest range of applicability for predicting water movement in soil with both saturated and nonsaturated regions. Excellent agreement was obtained among water content distributions, infiltration rates, and cumulative infiltration volumes calculated with the implicit finite difference model and with Philip's quasi-analytical solution. (Sims-ISWS)
W77-10310

LATERALLY CONFINED, STEADY FLOWS OF WATER FROM SOURCES AND TO SINKS IN UNSATURATED SOILS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
D. R. Nielsen, and P. A. C. Raats.
Soil Science Society of America Journal, Vol. 41, No. 2, p 294-304, March-April 1977. 8 fig, 36 ref.

Descriptors: *Soil water movement, *Irrigation, Model studies, Mathematical models, Soils, Unsaturated flow, Subsurface irrigation, Equations, Agriculture.
Identifiers: *Lateral flow, Plane flow, Axisymmetric flow.

The application of water along lines and at points is of interest in connection with furrow, subsurface, and drip irrigation. The removal of water along lines and at points is of interest in connection with uptake of water by plant roots and a variety of devices used to extract water and measure fluxes in the laboratory and in the field. Laterally confined, steady flows from line and point sources at arbitrary distances below the soil surface and to line and point sinks at arbitrary distances above an impermeable base were analyzed on the basis of the assumption that the hydraulic conductivity is an exponential function of the pressure head. The results included expressions describing the flow pattern, the distribution of the components of the flux, and the distributions of matric flux potential, pressure head, water content, and total head. The horizontal variations were described by trigonometric functions in problems involving line sources and sinks and by Bessel functions in problems involving point sources and sinks. The regions below and above the sources and sinks were treated separately, subject, of course, to matching along the interface between the two regions. The vertical variations were described by exponential dampings and by surface and base reflections. For the flows to sinks, with each flow pattern there is associated an infinite variety of distributions of the matric flux potential, etc., corresponding to different suctions applied at the sinks. Some problems involving partial supply by sources and interception by sinks also were treated. (Sims-ISWS)
W77-10311

CONTRIBUTION OF LATERAL SOIL WATER MOVEMENT ABOVE A FRAGIPAN TO STREAMFLOW,
Delaware Valley Coll. of Science and Agriculture, Doylestown, Pa. Dept. of Agronomy.
W. E. Palkovics, and G. W. Petersen.
Soil Science Society of America Journal, Vol. 41, No. 2, p 394-400, March-April 1977. 7 fig, 2 tab, 31 ref.

Descriptors: *Soil water movement, *Streamflow, *Perched water, Groundwater, Groundwater movement, Subsurface waters, Base flow, Streams, Wells, Observation wells, Drainage, Hydraulic conductivity, Water balance, Water table, Hydrology.
Identifiers: *Lateral flow.

A water balance approach to the hydrologic budget on a small mountainous watershed in central Pennsylvania was used to determine if lateral water flow perched above a soil fragipan could be quantitatively related to streamflow. Perched water table fluctuations were measured using a grid of 60 observation wells, and streamflow was recorded using a weir. The site was monitored in mid-November when evapotranspiration was at a minimum and when no precipitation was recorded. Soil water yield due to perched water table decline was calculated, hydraulic conductivity and the rate of water movement through the soil computed, and the zone of water contribution to streamflow determined. Results indicated that water yield from the soil aquifer explained streamflow. Saturated water flow was shown to be the main mechanism of water movement, although unsaturated flow may have been significant for short distances under low tensions. The major zone of soil water contribution to streamflow was the more poorly drained soils adjacent to the stream. Unsaturated soils on the upper mountain flanks had little effect upon streamflow because of low gradient and large distance from the stream. (Sims-ISWS)
W77-10312

WATER MOVEMENT THROUGH PEDAL SOILS: I. SATURATED FLOW,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. L. Anderson, and J. Bouma.
Soil Science Society of America Journal, Vol. 41, No. 2, p 413-418, March-April 1977. 4 fig, 4 tab, 24 ref. EPA R802874.

Descriptors: *Soil water movement, *Saturated flow, *Clay loam, Hydraulic conductivity, Dispersion, Soils, Laboratory tests, Tracers, Chlorides, Soil structure, Groundwater, Groundwater movement, Hydrodynamics, Soil science.
Identifiers: *Pedal soils, Hydrodynamic dispersion, Breakthrough curves.

Apparent dispersion coefficients were determined with a chloride tracer in 55-cm long undisturbed columns from four pedal soil horizons of three pedons. Five medium subangular blocky structures were compared with five coarse prismatic structures, all with a silty clay loam texture. Dispersion coefficients (D), which could not always be calculated due to 'nonideal' behavior to the flow system, were significantly different for the two types of structures. Application of an unlimited quantity of traced water to drained columns resulted in very high dispersion, particularly for the subangular blocky structures. Some practical implications of the occurrence of hydrodynamic dispersion were discussed. (See also W77-10314) (Sims-ISWS)
W77-10313

WATER MOVEMENT THROUGH PEDAL SOILS II. UNSATURATED FLOW,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. L. Anderson, and J. Bouma.
Soil Science Society of America Journal, Vol. 14, No. 2, p 419-423, March-April 1977. 6 fig, 4 tab, 7 ref. EPA R802874.

Descriptors: *Soil water movement, *Unsaturated flow, *Clay loam, Hydraulic conductivity, Dispersion, Soils, Laboratory tests, Tracers, Chlorides, Soil structure, Groundwater, Groundwater movement, Hydrodynamics, Soil science.
Identifiers: *Pedal soils, Hydrodynamic dispersion, Breakthrough curves.

Very high hydrodynamic dispersion, occurring during application of an unlimited dose of chloride-traced water to 10 drained 55-cm long columns with undisturbed pedal soils, was strongly reduced by a daily application of 1 cm of water. Dispersion in five columns with subangular blocky structures remained significantly higher than that measured in five columns with prismatic structures. Differences were explained by a hypothetical analysis of flow patterns in both types of structure. Application of a surface crust strongly reduced dispersion in the subangular blocky structures, even though the flow rate remained approximately 1 cm/day. This was attributed to lack of flow into the larger vertical pores extending through the columns. Pronounced differences in terms of hydrodynamic dispersion were found between two types of structures from three soil series, all with a silty clay loam texture, thereby demonstrating the potential usefulness of routine soil structure descriptions as a correlative tool for predicting certain aspects of physical behavior. (See also W77-10313) (Sims-ISWS)
W77-10314

SOIL AERATION,
Edinburgh Univ. (Scotland). School of Agriculture.
K. A. Smith.
Soil Science, Vol. 123, No. 5, p 284-291, May 1977. 4 fig, 49 ref.

Descriptors: *Soil gases, *Aeration, *Diffusion, *Soil aggregates, Anaerobic conditions, Soil structure, Size, Gradation, Climates, Compacted soils, Cultivation, Drainage, Denitrification, Theoretical analysis, Oxygen, Nitrogen, Equations, Mathematical models, On-site investigations, Air pollution effects.
Identifiers: Ethylene.

Recent models of gaseous diffusion in soils have taken account of the effects of soil structure, and have explained the development of anaerobic zones within aggregates. Aggregate sizes commonly fit log-normal distributions. In clayey soils, anaerobic conditions persist for long periods in the larger aggregates, but quantitative assessment of anaerobic volumes is complicated by uncertainty about the value of the diffusion coefficient for oxygen in wet soils. Methods of measuring soil aeration and the results of field studies were reviewed. It was concluded that climatic factors have more effect than cultivation or compaction, and drainage produces little improvement in the heaviest soils. Under these conditions considerable losses of nitrogen occur by denitrification, and significant concentrations of physiologically active compounds such as ethylene are released. (Visocky-ISWS)
W77-10325

HERBICIDE TRANSPORT IN SOIL UNDER CENTER PIVOT IRRIGATION SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-10366

TRANSPORT OF NITRATE ION IN UNSTEADY, UNSATURATED FLOW IN POROUS MEDIA,
Texas Univ. at Austin. Dept. of Chemical Engineering.
M. A. Hildebrand, and D. M. Himmelblau.
AIChE Journal, Vol 23, No 3, p 326-335, May, 1977. 8 fig, 1 tab, 39 ref.

Descriptors: *Ion transport, *Nitrates, *Leaching, *Infiltration, *Mathematical models, Water pollution sources, Time, Flow rates, Chemical properties, Waste disposal, Movement, Waste water treatment.

A simplified model of nitrate ion transport was described for unsteady, unsaturated flow in porous media. The model was used to gain information on the pollution of ground and surface waters, especially through leaching and infiltration. The water content of the sand and the nitrate ion concentrations in the water phase were important variables. They had to be measured for less than saturated flow. Model-based predictions were compared to data on nitrate movement in sand columns. Profiles of nitrate concentrations as a function of time and distance showed good agreement with model-based data. The nitrate dispersion front velocity and the nitrate dispersion coefficient proved to be functions of time and flow rate. A correlation was developed between the nitrate dispersion coefficient and cumulative average seepage velocity. This allowed application of the model to media other than sand. The agreement between predicted values of the nitrate concentration and the experimental values was found satisfactory when subjected to an F test. (Collins-FIRL)
W77-10595

LONGITUDINAL DISPERSION IN POROUS MEDIA WITH VARIABLE POROSITY,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2F.
W77-10659

USE OF LABORATORY EXTRACTION DATA TO PREDICT LOSSES OF DISSOLVED INORGANIC PHOSPHATE IN SURFACE RUNOFF AND TILE DRAINAGE,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 5A.
W77-10734

DETERMINATION OF INORGANIC PHOSPHORUS IN OXALATE EXTRACTS OF SOILS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W77-10797

2H. Lakes

GRAVITATIONAL OSCILLATIONS OF LAKE HURON, SAGINAW BAY, GEORGIAN BAY, AND THE NORTH CHANNEL,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
D. J. Schwab, and D. B. Rao.
Journal of Geophysical Research, Vol. 82, No. 15, p 2105-2115, May 20, 1977. 12 fig, 3 tab, 16 ref.

Descriptors: *Seiches, *Lake Huron, *Great Lakes, *Model studies, Mathematical models, On-site investigations, Water levels, Lakes, Data processing, Analytical techniques, Limnology.
Identifiers: *Gravitational oscillations, *Lake oscillations, Power spectra, Oscillation modes.

Periods and structures of gravitational free oscillations in Lake Huron, Saginaw Bay, Georgian Bay, and the North Channel were determined from theoretical calculations. The calculations took into account the bathymetry and shape of the Huron system and also the effect of the earth's rotation. Time series analyses were performed on water level data from 13 stations around the lake. The power and coherence spectra exhibited peaks corresponding to diurnal and semidiurnal forcing and various modes of free oscillation of the lake. Both theory and observations showed that Saginaw Bay, Georgian Bay, and the North Channel each have a fundamental frequency of oscillation lower than the frequency of Lake Huron's first longitudinal oscillation. There was reasonable agreement between theoretical and observed characteristics for several of the free modes of the Lake Huron system. (Sims-ISWS)
W77-10109

EFFECT OF WIND AND RAIN ON SURFACE REAERATION,
Universidad Nacional Autonoma de Mexico Inst. of Engineering.
R. B. Banks, and F. F. Herrera.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE3, Proceedings Paper No. 13013, p 489-504, June 1977. 9 fig, 3 tab, 20 ref, 2 append.

Descriptors: *Reaeration, *Rainfall intensity, *Dissolved oxygen, *Aeration, Winds, Analysis, *Lakes, Turbulence, Mixing, Diffusion, *Lagoons, Raindrops.
Identifiers: *Oxygen transfer, *Aeration coefficients.

Much information is now available to determine the surface reaeration coefficient in rivers and estuaries. In contrast, not much is yet known about the magnitude of this coefficient in lakes and lagoons. Some studies indicate that wind action is important in establishing the rate of oxygen transfer across the surface of a lake or lagoon. In addition, it appears that the effect of rainfall may be important in reaeration in some lakes. In the present study, analyses were made of the effects of wind and rain on reaeration. Expressions were developed relating the rate and power of a rainfall to the surface reaeration coefficient. It also was determined that the direct addition of oxygen from oxygen-saturated raindrops can be an important factor in reaeration. (Adams-ISWS)
W77-10115

EFFECTS OF ACID PRECIPITATION ON A SMALL ACID LAKE IN SOUTHERN NORWAY,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5B.
W77-10127

SOME EFFECTS OF AGRICULTURAL DEVELOPMENT AND FLUCTUATIONS IN WATER LEVEL ON THE PHYTOPLANKTON PRODUCTIVITY AND ZOOPLANKTON OF A NEW ZEALAND RESERVOIR,
Otago Univ., Dunedin (New Zealand). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10137

EFFECTS OF ARTIFICIALLY INTRODUCED GROUND WATER ON THE CHEMICAL AND BIOCHEMICAL CHARACTERISTICS OF SIX HILLSBOROUGH COUNTY (FLORIDA) LAKES,
University of South Florida, Tampa. Dept. of Chemistry.
D. F. Martin, D. M. Victor, and P. M. Dooris.
Water Research, Vol. 10, No. 1, p. 65-69, 1976. 2 fig., 4 tab., 10 ref.

Descriptors: *Lakes, *Groundwater, *Aquatic weeds, *Growth rates, Dissolved oxygen, Water chemistry, Plant growth, Hardness(Water).
Identifiers: *Hydrilla verticillata.

To learn if proliferation of Hydrilla verticillata was related to maintenance of water levels by additions of groundwater, a study of six adjacent Florida lakes in Hillsborough County compared two lakes that had never received groundwater, two that had recent additions, one that had sporadic additions and one that had continuous groundwater additions. The hydrilla growth rate was characterized as per-cent dissolved oxygen increase. Based on the growth characteristic and water hardness, the data indicated that those lakes not receiving groundwater had comparatively low hardness values (30 ppm) and about a 19% increase in dissolved oxygen; the lakes that received groundwater had 68 ppm hardness and about a 74% increase in dissolved oxygen. Groundwater additions increased the hardness, magnesium and inorganic carbon levels of the lakes. Results indicate that groundwater additions have been less significant in changing the water chemistry than the fact that groundwater added it all. The ability of hydrilla to use dissolved carbon dioxide and bicarbonate in its photosynthesis and as adjuncts to favorable growth in hard water is an implication to be considered in lake implementation from sources containing calcium carbonates and inorganic carbo
(Auen-Wisconsin)
W77-10139

LIMNOLOGICAL STUDIES IN A LARGE DEEP, OLIGOTROPHIC LAKE (LAKE OHRID YUGOSLAVIA). EVALUATION OF NUTRIENT AVAILABILITY AND CONTROL OF PHYTOPLANKTON PRODUCTION THROUGH IN SITU RADIOBIOASSAY PROCEDURES,
Dartmouth Coll., Hanover, N.H. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-10141

CHEMICAL INPUTS BY A COLONY OF FRANKLIN'S GULLS NESTING IN CATTAILS,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
For primary bibliographic entry see Field 5C.
W77-10142

THE EFFECT OF ENVIRONMENTAL FACTORS ON ESTIMATED VIABLE AND TOTAL POPULATIONS OF PLANKTONIC BACTERIA IN LAKES AND EXPERIMENTAL ENCLOSURES,
Freshwater Biological Association, Windermere (England).
For primary bibliographic entry see Field 5C.

W77-10147

UTILIZATION OF ALGAE BY SOME COMMON FISHES OF TWO PONDS,
Christ Church Coll., Kanpur (India). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-10148

MERCURY IN WATERWAYS THAT DRAIN INTO THE WASH, IN EASTERN ENGLAND,
Institute of Terrestrial Ecology, Huntingdon (England). Monks Wood Experimental Station.
For primary bibliographic entry see Field 5B.
W77-10152

THE DETERMINATION OF DISSOLVED INORGANIC CARBON, A POSSIBLE SOURCE OF ERROR IN DETERMINING THE PRIMARY PRODUCTION OF LAKE WATER PHYTOPLANKTON,
Helsinki Univ., Lammi (Finland). Lammi Biological Station.
For primary bibliographic entry see Field 5C.
W77-10153

A FIELD AND LABORATORY STUDY OF OXYGEN UPTAKE BY PLANKTONIC BLUE-GREEN ALGAE,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5C.
W77-10154

MASS MORTALITIES OF LATES (PISCES: CENTROPOMIDAE) IN LAKE ALBERT,
Ministry of Agriculture and Natural Resources, Monkey Bay (Malawi). Fisheries Research Unit.
D. H. Eccles.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1, p 7-10, 1976. 19 ref.

Descriptors: *Mortality, Earthquakes, *Fishkill, Oxygen, Limnology, *Respiration, Buoyancy, Migration, Hypoxia, Anoxic, Fish migration, Africa.
Identifiers: *Lakes, *Lake Albert(Africa), Centropomidae.

Mass mortalities of fish in Lake Albert are confined to the genus Lates and appear to be size-selective. The attribution of a mass mortality of late by Parker (1971) to the shock effect of a simultaneous earthquake is questioned. A consideration of the limnology of the lake and of limitations to the ability of fish to adjust their buoyancy suggest that the immediate cause of the mortality could have been loss of hydrostatic equilibrium, caused by a forced rise of the fish due to a surge of oxygen-depleted water from the bottom. Such surges can be initiated by meteorological factors, density currents or earthquakes. (So. African Water Infor. Center)
W77-10191

LARGE SCALE MORTALITY OF FISH AT ST LUCIA,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Zoology.
J. Blaber, and A. K. Whitfield.
South African Journal of Science, Vol. 72, No. 7, p 198, July 1976. 2 tab, 4 ref.

Descriptors: *Fishkill, Temperature effects, Salinity, *Salt tolerance, Lakes, Fish, Mortality, Angi.
Identifiers: *Lake St Lucia(South Africa), Osmoregulation.

A May 1976 unexplained mortalities of fish were reported from parts of the St Lucia Lake system and by the beginning of July 1976 aerial reconnaissance showed that a vast mortality had occurred over the entire lake. It was estimated that at least 100 000 fish died. The fish kills coincided with a period of very low salinities in the St Lucia system which were due to unusually high rainfall in the catchment area. It is suggested that the large mortality at St Lucia was due to either a lethal combinations of low salinities and low temperatures leading to osmoregulatory failure, or if the fish survived those conditions, to fungal infection of the skin lesions which usually follow severe osmoregulatory stress. (So African Water Info Center)
W77-10197

THE REPRODUCTION OF BARBUS CF. KIMBERLEYENSIS (PISCES, CYPRINIDAE) IN THE HARDAP DAM, SOUTH WEST AFRICA,
Fort Hare Univ. (South Africa). Dept. of Zoology.
I. G. Gaigher.
Zoologica Africana, Vol. 11, No. 1, p 97-110, 1976. 6 fig, 1 tab, 14 ref.

Descriptors: *Reproduction, Fish growth, Dams, *Spawning, Seasonal, Breeding, Growth rate, Fish, Environmental effects, Killifishes.
Identifiers: Barbus kimberleyensis, South Africa, *Hardap dam(South West Africa).

Only one large yellowfish species occurs in the Hardap Dam, apparently closely related to Barbus kimberleyensis. Though smaller than this species in the Vaal River, it is nevertheless a valuable and abundant angling fish. After maturity, reached in females at 26 cm and in males at 18 cm fork length, females outnumber males by 9:1 beyond 30 cm. Main spawnings occur between February and April, some four months later than in the Vaal River, being correlated with peak seasonal rains in both cases. A minor spawning later in the year is usual, with improved fry survival due to warmer weather conditions reducing the winter mortality of the earlier spawned young. Breeding sites are probably in lentic gravelly-bottomed areas within the dam. Egg production increases from 5-6 000 in 30 cm fish to ca 47 000 in 60 cm females, with strong relationship between cube of fish length and fecundity. (So African Water Info Center)
W77-10218

MALACOLOGICAL STUDIES IN THE LUFIRA (KATANGA) ARTIFICIAL LAKE AREA: DISTRIBUTION AND ECOLOGY OF AQUATIC MOLLUSCS: EPIDEMIOLOGICAL ROLE OF INTESTINAL AND URINARY BILHARZIOSIS VECTORS, (IN DANISH),
For primary bibliographic entry see Field 5C.
W77-10238

EVALUATION OF FRESHWATER WETLANDS DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
W. C. Kennard, and M. Wm. Lefor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 776, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, June 1977. 60 p, 15 fig, 9 tab, 3 ref, 2 append. OWRT A-058-CONN(2), 14-31-0001-4007.

Descriptors: *Wetlands, *Remote sensing, Aerial photography, Data processing, *Evaluation, *Classification, New England, *Connecticut, Vegetation, *Computer programs, Soil types, Soil moisture, Water table, *Land use.
Identifiers: *Freshwater inland wetlands, *Forested wetlands, *Wetlands delineation, Falsecolor infrared aerial photography, Image analysis, *Photointerpretation, Discriminant analysis, Vegetation analysis, Southern New England.

A three-year study on freshwater inland wetlands was conducted covering photointerpretation of low altitude falsecolor infrared (FCIR) aerial photography, field studies, and computer processing of digitized imagery. The study area was a 45 sq mi section of east-central Connecticut, which is representative in type and extent of freshwater inland wetlands in southern New England. With photointerpretation techniques, FCIR imagery can be used to delineate inland wetlands accurately. Photographs taken in the leafless season provided more detail than those taken in the summer. Wetland delineations from FCIR were more accurate than existing wetland maps. Field studies of vegetation showed that certain species and associations are good indicators of wetlands presence. Other parameters investigated were soil pH, depth to water table, soil type, and soil moisture content. It was concluded that a comprehensive definition based upon soils, hydrology, and vegetation was best. Highly accurate classifications of wetlands and open water were obtained with three-dimension digitized FCIR imagery. Also, other types of land use, including paved, urban, and agricultural areas, were detected and classified with a high degree of accuracy. Computer programs were developed for automated land use detection and delineation. (deLara-Conn)
W77-10267

CHARACTERISTICS OF INTERNAL OSCILLATIONS IN LAKE ONTARIO,
New York State Dept. of Environmental Conservation, Albany. Div. of Air Resources.
S. T. Rao, U. Czapski, and L. Sedefian.
Journal of Geophysical Research, Vol. 82, No. 12, p 1725-1734, April 20, 1977. 5 fig, 4 tab, 17 ref.

Descriptors: *Seiches, *Lake Ontario, *Great Lakes, Water levels, Measurement, Sampling, Data processing, Analytical techniques, Lakes, Winds, Currents(Water), Limnology.
Identifiers: *Internal oscillations, *Lake oscillations, Power spectra, Rotary spectra.

The structure of larger-scale motions in Lake Ontario, which are under the influence of the earth's rotation, was analyzed by the application of (1) rotary spectrum analysis, (2) 'constant phase' shape or 'harmonic lock' representation, and (3) bispectrum analysis. A set of continuous wind, current, and temperature data at several depths was extracted from the records of the International Field Year for the Great Lakes network. The results indicated that apart from the well-known primary spectral peak near the inertial period, there exists a significant secondary peak at half this period. A shift of the primary peak beyond the limiting inertial period was observed near the steepest vertical temperature gradient at stations closer to shore. It was suggested that the secondary peak is due to resonant interaction of spectral components near the inertial frequency and that the observed frequency shift below the inertial frequency is due to interaction between the low-frequency waves of the Kelvin type and the Poincare type waves near the inertial frequency. (Sims-ISWS)
W77-10331

FIELD STUDY OF EVAPORATION - ANALYSIS OF DATA FROM EUCUMBENE, CATARACT, MANTON AND MUNDARING,
Bureau of Meteorology, Melbourne (Australia).
For primary bibliographic entry see Field 2D.
W77-10376

CABORA BASSA FISH POPULATIONS BEFORE AND DURING THE FIRST FILLING PHASE,
Grahamstown (South Africa). J.L.B. Smith Inst. of Ichthyology.
P. B. Jackson.
Zoologica Africana, Vol. 11, No. 2, p 373-397, 1976. 13 tab, 3 fig, 22 ref.

Descriptors: *Fish populations, Impoundments, Discharge(Water), Dry seasons, Vegetation, Fish survival, Growth rates, Feeding habits, Reproduc-

tion, Limnology, Fish migration, *Pre-impoundment, *Surveys.
Identifiers: Cabora Bassa, Zambesi River, Lake Kariba, Sarotherodon, Labeo, Hydrocynus, Eichhornia, Salvinia, Southern Africa.

Pre-impoundment surveys were made in 1973-4. The regulatory effect of continual water discharge from Kariba resulted in extensive dry-season aquatic, rooted, vegetal growth and a comparatively high small-fish population. Of a maximum of 38 species found, one, Sarotherodon andersoni, was a new Middle Zambezi record. Lotic and shallow-water species were abundant; gill-nets showed moderately high catches per unit effort. In early November 1974 two-month-old Hydrocynus vittatus juveniles were present indicating an abnormal spawning time. Post-impoundment data from closure on 5 December 1974, to mid-August 1975 are given. The dam filled extremely rapidly to within 10 m of retention level but was thereafter drawn down by heavy floodgate discharge, resulting in continuous slow water-flow and the absence of any stratification or explosive plankton reproduction. Small lotic species, previously abundant, immediately disappeared or became scarce. There was a very high survival of new-spawned young of many migratory species. Growth rates, and abnormal feeding habits caused by post-impoundment stresses, of some of these are described. There was relatively poor reproduction of cichlid species. Soon after closure the first year-class predominated over all other age-groups; these juveniles, and small adult species, concentrated under mats of Eichhornia crassipes. One further species new to the area, Haplochromis carlottae, is recorded. (So. African Water Info. Center)
W77-10380

COMMENTS ON 'FISH COMMUNITIES IN TROPICAL FRESH WATERS' BY R. H. LOWE-MCCONNELL,
Albany Museum, Grahamstown (South Africa).
R. A. Jubb.
Journal of the Limnological Society of South Africa, Vol. 2, No. 1, p 35-36, 1976. 14 ref.

Descriptors: Fish, *Freshwater fish, *Fish migration, *Fish taxonomy, Fish harvest, Larvae, Pumping, Tailraces, Hydroelectric powerplants, Dams.
Identifiers: Zambezi River, Rhodesia, Zambia, Labeo, Barbus, Alestes, Tilapia, Anguilla, Cichlids, Eels, Southern Africa, *Lake Kariba.

Comment is presented on certain statements by R. H. Lowe-McConnell in 'Fish communities in Tropical Freshwaters' (Longman, London, 1975). The validity of statements on the new fish arrivals in Lake Kariba is questioned. The list of newcomers is reduced to six species; the scientific evidence for this statement is discussed. The published accounts of Balon (1972, 1974) and Jackson (1959, 1961) on the fish fauna of Lake Kariba are discussed in some detail. (So African Water Info Center)
W77-10382

THE BEHAVIOUR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, I. BIOLOGICAL TRANSPORT, SEASONAL CYCLING, AND RESIDENCE TIMES IN THE WATER COLUMN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10400

THE BEHAVIOR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, II. PATTERNS OF DEPOSITION IN THE SEDIMENTS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10401

WETLANDS REGULATION: THE TAKING PROBLEM AND PRIVATE PROPERTY INTERESTS,
For primary bibliographic entry see Field 6E.
W77-10461

SHORE STABILITY AND BEACH AND BLUFF PROTECTION METHODS FOR THE ILLINOIS SHORE OF LAKE MICHIGAN.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 2J.
W77-10502

HYDROGEOLOGIC, GEOLOGIC, AND ENGINEERING ASPECTS OF LAKE MICHIGAN SURFICIAL DEPOSITS,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources
For primary bibliographic entry see Field 2J.
W77-10503

LIVING WITH THE LAKE. A GUIDE TO ILLINOIS LAKESHORE MANAGEMENT.
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources
For primary bibliographic entry see Field 5G.
W77-10504

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM: COMPONENT STUDY OF BIOLOGICAL COMMUNITIES.
Illinois Natural History Survey, Urbana.
Illinois Coastal Zone Management Program. Second Year Work Product. Volume IV: Coastal Biological Studies, September 1976. 111 p, 9 tab.

Descriptors: *Ecosystem, *Baseline studies, *Illinois, *Lake Michigan, Ecology, Aquatic populations, Oligotrophy, Great Lakes.
Identifiers: Coastal zone management, Oligotrophic lakes.

Objectives of this study of the Illinois coastal zone ecosystem were: to provide historical perspective to the present state of the shore and nearshore ecosystem; to provide an inventory of plant and animals species of the project; to identify threatened or endangered species of the project area; to identify unusual natural areas within the Illinois coastal zone; to make specific recommendations and to provide general guidelines for the preservation, management, or restoration of the shore and nearshore ecosystem; and to provide a bibliography of biological studies of the shore and nearshore of the Illinois portions of Lake Michigan. During the inventory portion of the study, more than 1,800 species of plants, selected invertebrates, and vertebrates were recorded from the project area. An annotated bibliography of selected biological studies of the shore and nearshore ecosystem, intended to serve as a guide to the literature for the CZM staff and consultants, is included in this report. References are grouped generally by principal subject. (NOAA)
W77-10505

MAPS OF SHORE AND NEARSHORE STRUCTURES, SHORE AND BLUFFLINE POSITIONS, THE 100-YEAR ANTICIPATED RECESSION LINE AND SHORE OWNERSHIP,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
For primary bibliographic entry see Field 2J.
W77-10506

LAKE ONTARIO ATLAS: LAKE TEMPERATURES,
New York Sea Grant Inst., Albany.
E. Chermack.
Lake Ontario Atlas No. NYSSGP-OA-77-008, 1977. 45 p, 25 fig, 2 tab, 10 ref.

Descriptors: *Air temperature, *Water temperature, *Baseline studies, *Lake Ontario, Temperature, *Maps.

The Lake Temperatures Monograph provides a composite of measurements taken by surface craft, aircraft and intakes. Also included are detailed analysis of surface temperatures by months, vs. air temperatures, bu cumulative frequencies, vs. distance offshore and vs. depth. A slight downward trend in water temperature since the 1930's exists. This monograph will be useful for physical, chemical and biological limnological studies as well as the planning of water and/or sanitary sewer systems. (NOAA)
W77-10508

GREAT LAKES WATER TEMPERATURES, 1966-1975,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
J. L. Grumblatt.
NOAA Technical Memorandum ERL GLERL-11-1 (Paper copy) NOAA Technical Memorandum ERL GLERL-11-2 (Full Microfiche Edition), August 1976. 132 p.

Descriptors: Data collections, Temperature, Temperature distribution, Limnology, Lakes, *Great Lakes, *Water temperature.

A 10-yr bank of water temperature data has been accumulated from a network of stations located at intervals along the United States shores of the Great Lakes and is presented in various tables. For each station, summaries of hourly, daily, and monthly mean data are included as well as tables of the frequency distribution of dail mean water temperatures on an annual basis. (NOAA)
W77-10510

MODEL FOR EVALUATING THE EFFECTS OF DIKES ON THE WATER AND SALT BALANCE OF GREAT SALT LAKE, UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
K. M. Waddell, and F. K. Fields.
Utah Geological and Mineral Survey Water Resources Bulletin 21, January 1977. 54 p, 12 fig, 19 tab, 15 ref, append.

Descriptors: *Salt balance, *Model studies, *Great Salt Lake, *Hydrologic budget, Analytic techniques, Inflow, Evaporation, Precipitation(Atmospheric), Saline water barriers, Dikes, Mixing, Saline lakes, Hydraulics.

A model for predicting the water and salt budg for various diking options was developed for Gre Salt Lake. The water budget was computed for month intervals during a base period of 1931-7 The storage change during each month of the ba period was computed from a budget of surface flow, ground-water inflow, precipitation on t lake surface, and outflow from evaporation. T total annual inflow (including the inflow deficit determined during the model calibration) to Gre Salt Lake ranged from about 1.5 to 5 million ac feet. The Bear River contributes the largest p centage of measured surface inflow. The total nual outflow (evaporation) ranged from about to 4.0 million acre-feet during 1931-73. T average annual evaporation was 2.98 million ac feet or 45 inches per year. The options provided the model for diking include combinations of ei areas east of a line joining Antelope Island, F mont Island, and the Promontory Mountai Another option includes that part of Great S Lake that lies north of the Southern Pacific Tra portation Co. causeway, which divides the m body of the lake into north and south parts. T salt balance of the diked areas is treated from

tandpoint of an inflow-outflow balance with
omplete mixing, and no allowances are made for
ny stratification or chemical changes due to in-
eraction with the sediments or solution of en-
apped brines or residual salts. (Woodard-USGS)
77-10563

**CTIVITY OF PHYTOPLANKTON EXCRETED
Y FISH,**
okyo Metropolitan Univ. (Japan). Faculty of
ience.
or primary bibliographic entry see Field 5C.
77-10642

**OLONIZATION OF IMPERILED PLANTS IN
REDGED LAKES OF THE UPPER RHINE
LAIN, (IN GERMAN),**
uenlandwirtschaft Futerbau, Aulendorf (West
ermany). Staatliche Versuchsanstalt.
. Krause.
eitr Naturkd Forsch Suedwestdtsch 34, p 187-
9, 1975.

escriptors: *Vegetation effects, *Lakes,
redging, *Artificial lakes, Vegetation, Shores,
ydrogeology, Environmental effects, Gravels,
nt growth, Grasslands, Groundwater.
entifiers: Chara braunii, Elatine trianora, West
rmany, Myricaria germanica, Nitella tenuis-
ma, Plain, Rhine.

e artificial waters described do not correspond
the normal types of modern dredged lakes. A
row shore line, which sheltered a single am-
bious community with Eleocharitetum acicu-
is was present on Kondringer Lake (West Ger-
ny). In it Elatine trianda and Chara brunii can
found. Wide uneven shoreline, which rises a lit-
over the ground water level, forms a graded
bitat, the gravel pit in the deep basin extends to
Kunheimer with Nitella tenuissima and a
ing flood extends to the gravel bank with
ricaria germanica. The dredged lakes of the
ne meadow, Freistetter Upper Lake, and Kun-
mer gravel pit belong to a region which formed
a rapidly disappearing and newly rising base.
lake dredgers covered the old, established
a. There is a small irregular habitat in a newly
ned nucleus. M. Germanica was found. It be-
ged to the old original plants of the Rhine
dow which have not been seen between Basel
Strassburg for 40 yr. Freisteller Upper Lake
able to refill the groundwater within less than
ar. The freshwater state was maintained for 20
ithout massive plant growth.
7-10730

**RODUCTION MODEL FOR MYRIOPHYL-
M SPICATUM L.,**
consin Univ., Madison. Dept. of Botany; and
Ridge National Lab., Tenn.
primary bibliographic entry see Field 5C.
-10731

**ECTS OF ACIDITY ON THE
TOPLANKTON AND PRIMARY PRODUC-
TY OF SELECTED NORTHERN ONTARIO
ES,**
lph Univ. (Ontario). Dept. of Zoology.
primary bibliographic entry see Field 5C.
-10733

**ROBIOLOGIC DATA ON THE LAKE OF
PALA, STATE OF JALISCO (MEXICO),
PANISH),**
tuto Politecnio Nacional, Mexico City. Dept.
ology.
Chavez.
Soc Mex Hist Nat 34, p 125-146, 1973.

riptors: *Lakes, *FIsh populations, *Water
nth, *Data collections, *Economic impact,
water fish, Transpiration, Aquatic habitats,
robiology, Fishing, Recreation.
Identifiers: Eichhornia crassipes, Fish species, Jalisco, *Mexico(Lake of Chapala), Biological data.

Chapala lake is the largest in Mexico; fish production was the highest of Mexican freshwater until a few years ago. The biological data available specifically concerned with the water hyacinth problem (Eichhornia crassipes) which has been a problem to fishing, sailing and tourism. Data on transpiration and economical implications of increased area occupied by the water hyacinth and dimished fish catches between 1959-1962 are given. A list of fishes known from the lake is presented.
W77-10736

THE ABUNDANCE OF DIATOMS IN THE SOUTHWESTERN NEARSHORE REGION OF LAKE ONTARIO DURING THE SPRING THERMAL BAR PERIOD,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
For primary bibliographic entry see Field 5C.
W77-10741

INFLUENCE OF SEDIMENT INFLOW IN PHYTOPLANKTON PRIMARY PRODUCTIVITY IN LAKE TAHOE (CALIFORNIA-NEVADA),
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10743

ORTHOPHOSPHATE TURNOVER IN EAST AFRICAN LAKES,
Munich Univ. (West Germany). Zoologisches Institut.
For primary bibliographic entry see Field 5C.
W77-10752

NITROGEN UPTAKE AND RELEASE IN A FORESTED WATERSHED, LAKE TAHOE BASIN, CALIFORNIA,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10753

DRY DEPOSITION LOADING OF LAKE MICHIGAN BY AIRBORNE PARTICULARATE MATTER,
Governors State Univ., Park Forest South, Ill. College of Environmental and Applied Sciences.
For primary bibliographic entry see Field 5A.
W77-10758

LAKE MAHEGA: A MESOTHERIC, SULPHATO-CHLORIDE LAKE IN WESTERN UGANDA,
Duke Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10759

INVESTIGATION OF THE HYDROLOGICAL BALANCE IN A PEAT SWAMP,
Brussels Univ. (Belgium).
For primary bibliographic entry see Field 2F.
W77-10768

PRODUCTION OF JUVENILE ALEWIVES, ALOSA PSEUDOHARENGUS, AT LOVE LAKE, WASHINGTON COUNTY, MAINE,
Maine Dept. of Inland Fisheries and Game, Augusta. Fisheries Research Management Div.
K. A. Havey.
Trans Am Fish Soc. Vol 102, No 2, p 434-437, 1973.

Descriptors: Mortality, Maine, *Juvenile fish, Migration.
Identifiers: *Alewives, Alosa-Pseudoharengus, Washington County(Maine), Love lake(Maine).

From 1960-71, 4601 adult anadromous alewives were counted as they entered Love Lake (Maine), to spawn. At the 0.05 probability level the observed numbers of males and females did not differ from a 1:1 ratio. Males averaged 295 + 1.2 mm and females 305 + 1.3 mm in total length. The length difference between sexes was significant at the 95 percent (range 66.6 percent to 100 percent). Between 1960-71, 1,026386 juveniles emigrated from Love Lake. Emigrations varied from 220 in 1962 to 439,062 in 1967. Mathematically weighted mean weight of emigrants for the years 1961, 1963-69, and 1971 was 3.5 g. Weight of emigrants (kg/ha) varied from 0.018-4.794/yr. Number of emigrants/ha/yr varied from 0.81-1614.19. Emigrants/female/yr ranged from 12-3,209. Weight of emigrants/female/yr ranged from 0.09-21.50 kg. There is a significant linear relationship between number of juvenile emigrants and number of adult immigrants 4 yr later. There is also a significant linear relationship between log of magnitude of female escapement and log of numbers of juvenile emigrants produced.--Copyright 1973, Biological Abstracts, Inc.
W77-10779

HYDRAULIC MODELING OF MIXING IN STRATIFIED LAKES,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
P. M. Moretti, and D. K. McLaughlin.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY4, Proceedings Paper 12868, p 367-380, April 1977. 14 fig, 1 tab, 11 ref, 2 append. OWRT A-050-OKLA(5).

Descriptors: *Destratification, *Dispersion, *Estuaries, *Hydraulic models, *Lakes, Mixing, Model studies, Laboratory tests, Stratification, Water resources, Oklahoma.
Identifiers: *Hydrodynamics, Mechanical destratification flows, Richardson number, Non-dimensional parameters, Ham's Lake(Okla).

Criteria were developed for laboratory modeling of stratified lake inflows and of mechanical destratification flows. Density measurements and flow visualization were performed in two inflow lake models, which were identical in horizontal dimensions but which differed by a factor of two in vertical dimensions. It was determined that the vertical dispersion process could be accurately modeled if the fundamental modeling parameter was the Richardson number. Similarly, horizontal dispersion could be accurately modeled. Also, a vertically exaggerated model of Ham's lake was constructed, and experiments were run on the mechanical destratification of the model. Surprisingly accurate modeling of the prototype destratification experiments was achieved by using the overall Richardson number as the fundamental non-dimensional parameter. (Roberts-ISWS)
W77-10798

SORPTION AND HYDROLYSIS OF ADDED ORGANIC PHOSPHORUS COMPOUNDS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W77-10799

2I. Water In Plants

A QUANTITATIVE SAMPLER FOR SUBMERGED AQUATIC MACROPHYTES,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
For primary bibliographic entry see Field 7B.
W77-10226

THE EFFECT OF FIRE ON THE CALIFORNIA CHAPARRAL VEGETATION,
Academia Sinica, Taipei (Taiwan). Inst. of Botany.
For primary bibliographic entry see Field 5C.
W77-10324

MODIFICATION OF ISLAND VEGETATION AFTER RISING GROUNDWATER LEVELS ON THE DANUBE ISLANDS AT OFFINGEN, (IN GERMAN),
Forstliche Forschungsanstalt, Munich (West Germany). Weldbauinstitut.
P. Seibert.
Beitr Naturkd Forsch Suedwestdtsch 34, p 329-343, 1975.

Descriptors: *Vegetation effects, *Groundwater, *Surface-groundwater relationships, *Islands, *Water table, Vegetation, Rivers, Dams, Ash trees, Forests, Ecology, Shoreline cover, Plant groupings.
Identifiers: Box, Danube, Elm, West Germany, Ground, Haulm, Offingen, Reeds, Sedge, Forest economy, *Site damage.

On the Danube islands near Offingen (West Germany), the ash-elm islands (Querco-Ulmetum minoris) prevail on the sediment of the stream, on the base of the slopes the cover gravel bordering the island was replaced by giant box haulm-ash woods (Carici-remotae-Fraxinetum). Different reed-banks and high sedge reeds were found along stagnant waters. The groundwater level in a part of the island forest region increased to 60-80 cm after the damming of the Danube. The local situation, changed in this way, lead to an extension of the formation of ash-elm islands and to an advancement of reed-bank communities as shown by vegetation photographs and maps. The forest economy suffered permanent site damage with decreased potential yield because of the premature death of the older ash.
W77-10725

COLONIZATION OF IMPERILED PLANTS IN DREDGED LAKES OF THE UPPER RHINE PLAIN, (IN GERMAN),
Gruenlandwirtschaft Futerbau, Aulendorf (West Germany). Staatliche Versuchsanstalt.
For primary bibliographic entry see Field 2H.
W77-10730

EXPERIENCE IN CULTIVATION OF SPHAGNUM MOSSES IN AN ISOLATED MEDIUM, (IN RUSSIAN),
P. L. Bogdanov.
Bot Zh (Leningr) Vol 61, No 8, p 1166-1168, 1976.

Descriptors: *Mosses, Algae, Bacteria, Fungi, Insects, Nematodes.
Identifiers: Capeognata, Infusoria, Sphagnum-Angustifolium.

In a study of the ability of sphagnum mosses to survive, 70 shoots of Sphagnum angustifolium (Russ.) Jens were saturated with water and sealed inside a 1 l jar. On the Surface of the moss were bacteria, hyphae and spores of fungi, single-celled algae and eggs of various insects. The jar was placed in a window in diffused sunlight and observed for 7 yr. The moss began growing from the 1st day and continued to grow throughout the period, with the shoot ends remaining green while the rest turned light brown. On the damp sides of the jar a colony of algae appeared and developed, together with fungal hyphae. A colony of beetles (Capeognata) developed and fed on the hyphae. This and other experiments proved that, with limited water, air and minerals, sphagnum mosses are able to continue living and developing by drastically changing their morphological structure. Fungi, algae, bacteria, infusorians, numatodes and several species of insects are able to coxist in such an isolated non-sterile medium in which a microbiocenosis is established.--Copyright 1977, Biological Abstracts, Inc.
W77-10754

WATER REQUIREMENTS FOR MESQUITE (PROSOPIS JULIFLORA),
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2D.
W77-10770

2J. Erosion and Sedimentation

SPATIALLY AVERAGED FLOW OVER A WAVY SURFACE,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2E.
W77-10103

THE MOTION OF A SMALL SPHERE IN A ROTATING VELOCITY FIELD: A POSSIBLE MECHANISM FOR SUSPENDING PARTICLES IN TURBULENCE,
California Univ., San Diego, La Jolla. Inst. of Marine Research; and Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-10108

INCIPIENT TRANSPORT OF FINE GRAINS AND FLAKES BY FLUIDS-EXTENDED SHIELDS DIAGRAM,
Imperial Coll. of Science and Technology London (England). Dept. of Civil Engineering.
P. A. Mantz.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY6, Proceedings Paper 12992, p 601-615, June 1977. 4 fig, 3 tab, 30 ref, 2 append.

Descriptors: *Bed load, *Hydraulics, *Sedimentation, *Shear stress, *Cohesionless soils, Streamflow, Silts, Laboratory tests, Sediments, Data collections.
Identifiers: *Shields diagram, *Incipent transport, Flakes, Flat beds.

Experiments on the incipient transport from flat sediment beds in water streams of four grades of fine cohesionless granular solids and six grades of fine cohesionless flaky solids were reported. The fine granular data were compared with data obtained from recent smaller-scale laboratory experiments, and all data were plotted on a Shields diagram. An 'extended Shields diagram,' which is applicable to cohesionless solids only, was proposed. The fine flaky data were compared with collected data concerned with the incipient transport of coarse two-dimensional solids or flakes. The data again were adapted to the Shields representation. The incipient transport fluid conditions for granular and flaky solids (which solids were chosen as being representative of extreme shape limits) were contrasted. (Singh-ISWS)
W77-10116

PROPORTIONAL WEIRS AS VELOCITY CONTROLLING DEVICES,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-10118

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W77-10123

SHORELINE FORMS AND SHORELINE DYNAMICS,
Virginia Univ. Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2L.
W77-10130

THE PLAN SHAPE OF CURRENT RIPPLES I RELATION TO FLOW CONDITIONS,
Reading Univ. (England). Dept. of Geology.
J. R. L. Allen.
Sedimentology, Vol 24, No 1, p 53-62, Februar 1977. 2 fig, 1 tab, 14 ref.

Descriptors: *Flow characteristics, *Bed *Streams, *Width, *Depth, Wavelengths, Hydra lics, Environment, Sedimentation, Fluvial sed ments, Waves(Water).
Identifiers: *Palaeohydraulics, Plan geometry ripples.

Two sets of empirical data on the relationship the plan shape of current ripples to flow conditio previously thought incompatible were reconcil by taking explicit and necessary account of the fects of flow width relative to flow depth. T aspects of plan shape considered were the me streamwise ripple wavelength and the wavelengt measured across the flow, of longitudinal featu due to centrifugal instability formed on the bac of the ripples. A regression analysis connecti these attributes with flow conditions including width-effect showed that the amount of un plained variability is of the same order as the ac mulated experimental errors, and suggested t the two sets of data are in excellent agreeme The relationship of the plan geometry to flow c ditions is less simple than has sometimes been s posed, but ways were suggested in which the perimental results can be used to establish hydraulics of past environments. (Bhown ISWS)
W77-10132

HEAVY METALS IN CHESAPEAKE BAY SE MENTS,
Maryland Univ., College Park. Water Resou Research Center.
For primary bibliographic entry see Field 5B.
W77-10174

SIMULATION OF THE SEDIMENTOLOGY SEDIMENT DETENTION BASINS,
Kentucky Water Resources Research Inst., ington.
For primary bibliographic entry see Field 5G.
W77-10185

SEDIMENTS, STRUCTURAL FRAMEWO AND EVOLUTION OF DELAWARE BA TRANSGRESSIVE ESTUARINE DELTA,
Delaware Univ., Newark. Coll. of Marine Stud
For primary bibliographic entry see Field 2L.
W77-10186

A COASTAL ENGINEERING STUDY OF I AN RIVER INLET, DELAWARE,
Delaware Univ., Newark. Dept. of Civil Engi ing; and Delaware Univ., Newark. Coll. of M Studies.
For primary bibliographic entry see Field 8B.
W77-10189

TRIPOLYPHOSPHATE PYROPHOSPHATE HYDROLYSIS IN S MENTS,
Monsanto Philippines Inc., Makati.
For primary bibliographic entry see Field 5B.
W77-10285

PEED OF INERTIAL BED LOAD ISTURBANCES,
entral Water and Power Research Station, Poona ndia).
r primary bibliographic entry see Field 8B.
77-10305

IANNEL SILTATION DETERMINED WITH DE-SCAN SONAR,
my Engineer District, Portland, Oreg. Dredging erations Div.
r primary bibliographic entry see Field 8B.
77-10315

TIMATES OF CENOZOIC OCEANIC SEDI-ENTATION RATES,
ddlebury Coll., Vt. Dept. of Geology.
r primary bibliographic entry see Field 2L.
7-10320

ANSPORT PHASES OF TRANSITION ETALS IN THE AMAZON AND YUKON VERS,
aware Univ., Lewes. Marine Studies Complex.
. Gibbs.
ological Society of America Bulletin, Vol. 88, 6, p 829-843, June 1977. 15 fig, 8 tab, 35 ref.

criptors: *Sediment transport, *Rivers, etals, Sediments, Suspended solids, Trace ele-nts, Chromium, Manganese, Iron, Cobalt, kel, Copper, Sampling, On-site data collec-s, Data processing.
ntifiers: *Amazon River, *Yukon River, nsition metals.

ples representing yearly averages of material sported by the Amazon and Yukon Rivers e analyzed to separate the transition metals Mn, Fe, Co, Ni, and Cu) into the following sport phases: (1) crystalline particles, (2) metal oxide coatings, (3) solid organic material, (4) ed material, and (5) those in solution. The or transport phases are crystalline particles metal hydroxide coatings, which when com-d carry 65 to 92% of the transition metals sported. Solid organic material, the next most ortant phase, transports between 5 and 19% of otal transported. Material carried in solution sports 0.6 to 17% of the total transported. ed transition metals account for between 0.02 % of the total transported. Metal hydroxide ngs represent the major transporting anism potentially available to organisms, , for the Amazon and Yukon Rivers respec-, 87 and 78% of the Fe, 69 and 73% of the and 71 and 69% of the Ni are transported in orm. Comparing the concentrations of transi-metals carried to the oceans with the concen-ns on the continents, a high Cu ratio (5 to 7) ates continental depletion or river output en-ent; a moderate ratio (1.1 to 1.7) for Ni, Co, Cr indicates intermediate depletion or en-ent, and a near-unity ratio for Fe and Mn in-es little depletion or enrichment. The sedi-s transport more than 97% of the total mass nsition metals to the world's oceans. (Sims-)
10328

BEHAVIOUR OF PLUTONIUM AND ER LONG-LIVED RADIONUCLIDES IN MICHIGAN, I. BIOLOGICAL TRANS-, SEASONAL CYCLING, AND RE-NCE TIMES IN THE WATER COLUMN,
ne National Lab., Ill. Radiological and En-nental Research Div.
imary bibliographic entry see Field 5B.
0400

BEHAVIOR OF PLUTONIUM AND R LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, II. PATTERNS OF DEPOSITION IN THE SEDIMENTS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10401

CONSEQUENCES DU DEPLACEMENT DES SEDIMENTS SUR LA DISPERSION DES RADIONUCLEIDES, (THE EFFECT OF SEDIMENT DISPLACEMENT ON THE DISPERSAL OF RADIONUCLIDES),
Electricite de France, Chatou.
For primary bibliographic entry see Field 5B.
W77-10402

SHORE STABILITY AND BEACH AND BLUFF PROTECTION METHODS FOR THE ILLINOIS SHORE OF LAKE MICHIGAN.
Army Engineer District, Chicago, Ill.
Illinois Coastal Zone Management Program, Second Year Work Product. Volume III: Beach and Bluff Protection Technical Appendix, July 1976. 245 p, 9 fig, 16 tab, 41 ref, 106 plates.

Descriptors: *Shore protection, *Environmental effects, *Erosion, *Illinois, *Lake Michigan, Social impact, Cost analysis.
Identifiers: Bluff instability, Engineering design, Coastal Zone Management.

The purpose of the study was to investigate shore erosion and bluff instability problems along the Illinois shore of Lake Michigan, and to develop preliminary engineering designs and cost estimates for suitable methods of shore protection. The report discusses the following items: (1) the general factors influencing shore erosion and bluff instability; (2) specific shore processes occurring along the Illinois shore; (3) the general types of engineering and management techniques available for reducing shoreland erosion damages; (4) preliminary engineering designs for suitable methods of shore protection along the endangered shoreland reaches within the study area; (5) the impacts of these measures on the adjacent shores; (6) preliminary cost estimates for the shore protection methods considered; and (7) the general environmental and social impacts of these methods. (NOAA)
W77-10502

HYDROGEOLOGIC, GEOLOGIC, AND ENGINEERING ASPECTS OF LAKE MICHIGAN SURFICIAL DEPOSITS,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
P. B. DuMontelle, K. L. Stoffel, and J. J. Brossman.
Illinois Coastal Zone Management Program, Second Year Work Product. Volume II: Coastal Geological Studies, (1976). 98 p, 17 fig, 2 tab, 19 ref, 2 append.

Descriptors: *Lake Michigan, *Erosion, *Shore protection, *Illinois, Drainage, Groundwater, Rainfall.
Identifiers: Coastal Zone Management.

The basic characteristics that determine erosion susceptibility, foundation stability, weathering qualities, slump resistance, and drainage performance of the Illinois Lake Michigan shore bluffs were studied in detail. Groundwater data (hydrological data) were gathered from weather records, from piezometer installations at Lake Bluff, and from bluff-line seep studies along the entire shore. These indicate the presence of drainage problems most of which are related to above-average rainfall conditions. Geologic data derived from bluff exposures and fourteen research boreholes describe the stratigraphic sequence in detail. Foundation strengths, unconfined compressive strengths, moisture content, liquid limits, plasticity indices, shear strengths and wet and dry densities were measured. Slope failure is related to groundwater pore pressure which correlates directly to maximum annual groundwater levels but not directly to regional precipitation - annual fluctuation in pore pressure being partly dependent on the effects of vegetation. (NOAA)
W77-10503

MAPS OF SHORE AND NEARSHORE STRUCTURES, SHORE AND BLUFFLINE POSITIONS, THE 100-YEAR ANTICIPATED RECESSION LINE AND SHORE OWNERSHIP,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
P. L. Drake, C. K. Anchor, R. C. Berg, and C. Collinson.
Illinois Coastal Zone Management Program, Second Year Work Product, Volume II Appendix: Map Atlas Lake Michigan Shore in Illinois, (1976). 56 p, entirely maps.

Descriptors: *Maps, *Shore protection, *Engineering structures, Coasts, Beach erosion, *Lake Michigan, *Illinois.
Identifiers: Coastal zone management.

Basic reference maps were compiled through the use of data, maps and photos from other projects at the planning scale of 1 in. = 200 ft (1/2400). The maps, based on aerial orthophotographs taken in April 1975, were compared with low level oblique aerial photographs and brought up-to-date for the summer of 1976. The maps show all groins, riprap and rubble, bulkheads, retaining walls, sheet piling, piers and jetties as well as unidentifiable submerged structures. Most street names and all streets are shown, as are property boundaries, municipal boundaries, section corners and reservations such as the Great Lakes facility and Fort Sheridan. Parks and beaches, as well as sanitary and water supply facilities are shown along with major buildings on the shore. The April 1975 shore and blufflines are shown along with the anticipated 100-year recession line (2075 AD). (NOAA)
W77-10506

MISSOURI RIVER TEMPERATURE EFFECTS IN THE TRANSITION FROM DUNES TO PLANE BED,
Colorado State Univ., Fort Collins; and Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-10572

STORM MANAGEMENT PROGRAM IS MODEL FOR OTHERS,
Georgia Inst. of Tech., Atlanta. Dept. of City Planning.
For primary bibliographic entry see Field 4A.
W77-10612

PREDICTION OF VELOCITY DISTRIBUTION IN A VORTEX TUBE SEDIMENT TRAP WITH TURBULENCE MODELS,
Nebraska Univ. Panhandle Station at Scottsbluff.
For primary bibliographic entry see Field 4D.
W77-10657

GENETIC ANALYSIS OF THE SUSPENDED LOAD DISCHARGE OF MOUNTAIN RIVERS,
Tashkent Univ. (USSR).
O. P. Shcheglova.
Soviet Hydrology. Selected Papers, Issue No 4, p 271-277, 1975. 6 fig, 1 tab, 9 ref. Translated from News of the USSR Academy of Sciences, Geographic Series (Izvestiya Akad. nauk SSSR. Ser. geograf.), No 5, p 100-109, 1975.

Descriptors: *Suspended load, *Sediment discharge, *Rivers, *Asia, Mountains, Foreign countries, Erosion, Scour, Channel erosion, Rain water, Snowmelt, Glaciers, Currents(Water), Sediment yield, Data collections.
Identifiers: *USSR.

The formation of the suspended load discharge of mountain rivers, particularly those of Soviet Central Asia, has not been given much attention by researchers. Analysis of extensive data on the rivers of Soviet Central Asia showed that difficulties are frequently involved in classifying the nature of the increase in suspended particle concentration on its chronological graph. The thermal analysis method was used in analyzing the origin of the increase in suspended particle concentration on its chronological graph. The thermal analysis method was used in analyzing the origin of the increase in suspended particle concentration. The method was based on the construction and subsequent interpretation of the relation of suspended particle concentration (or water discharge) to air temperature. Thermal analysis made it possible to determine the origin of the suspended particle concentration of meltwater or rain floods. A table gave the percentage of various supply sources of the suspended load discharge for the mountain rivers of Soviet Central Asia. Correlation among the three components of basin erosion, i.e., rain water, snowmelt water, and glacial water, varied within broad limits. (Humphreys-ISWS)
W77-10778

WATERSHED SEDIMENT YIELD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
For primary bibliographic entry see Field 4D.
W77-10790

STOCHASTIC ASPECTS OF INCIPIENT GRAIN MOTION ON RIVERBEDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. Gessler.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 25, Colorado State University, Fort Collins, p 25-1 - 25-26, 1976. 12 fig, 1 tab, 20 ref, 1 append.

Descriptors: *Model studies, *Sediment transport, *River beds, *Stochastic processes, Traction, Movement, Sediments, Sediment sorting, Turbulent flow, Mathematical models, Evaluation, Boundary processes, Sediment-water interfaces.
Identifiers: Incipient motion, Armor coat.

The development of an armor coat in a flume experiment is clearly a very dynamic, unsteady process. Any attempt to explain such a development, which is most closely related to the incipient motion problem, by means of a steady model must have severe shortcomings. A new model presented took into account the development in time of the armor coat, but it was lacking in many respects. For one, experimental data necessary for a true testing of the model is not available. The purpose of presenting the new model is twofold: (1) to show that there are still other stochastic models, not necessarily more complicated than existing models; and (2) should the analytical result explain some yet unexplained characteristics, the model may point out a direction for future research. It was assumed in developing the model: (1) that grains are removed due to the turbulent fluctuations in velocity rather than the steady-state average shear stress; (2) that a grain is removed if the shear stress exceeds some critical value; (3) that the length scale of the flow field involved is the size of the largest grains on the bed, which is quite well established through the observation of the controlling roughness height with respect to the friction factor; (4) that the time scale is established through the ratio of maximum grain size and shear velocity. (See also W77-10439) (Humphreys-ISWS)
W77-10792

SEDIMENT TRANSPORT MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
H. W. Shen.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 26, Colorado State University, Fort Collins, p 26-1 - 26-33, 1976. 9 fig, 1 tab, 47 ref.

Descriptors: *Model studies, *Sediment transport, *Stochastic processes, *Alluvial channels, Mathematical studies, Mathematical models, Theoretical analysis, Sediment load, Suspended load, Bed load, Equations, Flow, Rivers, Streambeds, River beds, Movement, Saltation, Sand waves, Statistical methods, Shape.
Identifiers: Flat bed, Bed profile.

This chapter discussed the sediment transport capability of a given flow for cohesionless sediments only. Some advantages of a probabilistic approach to sediment transport rate are: (1) Sediment motion and bed form development are random processes, and thus the stochastic process is the most natural approach. The stochastic approach follows the actual movements of particles. (2) The stochastic approach is perhaps the only potentially fruitful approach to sediment with a large range of size distributions. (3) Theoretically, the stochastic approach allows much more freedom in fitting experimental curves than does a pure dimensional analysis. (4) Normally the stochastic approach is best suited to an extremely complex process, and sediment transport is certainly very complex. (5) The dispersion of the bed load particles (or a certain portion of them) must be studied from a stochastic approach. (See also W77-10439) (Humphreys-ISWS)
W77-10793

DETERMINISTIC AND STOCHASTIC APPROACHES FOR MODELLING OF LONGITUDINAL DISPERSION IN A TURBULENT OPEN CHANNEL FLOW,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 5B.
W77-10794

DISPERSION OF SEDIMENT PARTICLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 28, Colorado State University, Fort Collins, p 28-1 - 28-26, 1976. 13 fig, 1 tab, 27 ref.

Descriptors: *Dispersion, *Sediments, *Stochastic processes, *Open channel flow, *Model studies, Sedimentation rates, Movement, Suspended solids, Beds, Flow, Theoretical analysis, Analytical techniques, Laboratory tests, Alluvial channels, Path of pollutants, Bed load, Mathematical models, Graphical analysis.

This chapter described and developed mathematical models for the settling of suspended sediment particles and the dispersion of sediment bed particles which move as bed load. Solid particle settlement in turbulent flow is a random phenomenon, and therefore, the analysis for mean settling length was based on a random walk model with the use of currently available Eulerian flow information. The analysis for dispersion of contaminated sediment bed particles was based on a stochastic model, and the shape factor in the Gamma distribution was allowed to take on integral values from one to three. For a given degree of pollution, the critical duration increases downstream, and the increase is in direct proportion to the square root of the distance from the source where the normality approximation is satisfactory. With radioactive contaminants, the absorption rate is given by the inverse square law. Owing to mathematical complexity, the critical durations for given adsorption levels were presented graphically. (See also W77-10439) (Humphreys-ISWS)
W77-10795

SORPTION AND HYDROLYSIS OF ADDED ORGANIC PHOSPHORUS COMPOUNDS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W77-10799

2K. Chemical Processes

VARIATION IN CHEMICAL COMPOSITION OF THE RIVER FROME, ENGLAND, FROM 1965 TO 1972,
Freshwater Biological Association, East Stok (England).
For primary bibliographic entry see Field 5C.
W77-10138

EFFECT OF SURFACTANTS ON THE DETERMINATION OF ALUMINUM IN WATERS,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
For primary bibliographic entry see Field 5A.
W77-10151

THE DESIGN OF A FULLY AUTOMATIC LIQUID INJECTION APPARATUS FOR USE WITH A CARBON ANALYSER,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W77-10209

THE RELEASE OF NITROGEN FROM SULFUR-COATED UREA AS AFFECTED BY SOIL MOISTURE, COATING WEIGHT, AND METHOD OF PLACEMENT,
Woods (M. J.) and Associates, Dublin (Ireland).
For primary bibliographic entry see Field 2G.
W77-10270

AN EVALUATION OF JOB'S METHOD OF CONTINUOUS VARIATIONS AS APPLIED TO SOIL ORGANIC MATTER-METAL ION INTERACTIONS,
Georgia Univ., Athens. Dept. of Chemistry.
For primary bibliographic entry see Field 2G.
W77-10273

INFLUENCE OF SOIL PH ON THE AVAILABILITY OF ADDED BORON,
Wisconsin Univ., Madison. Dept. of Soil Science and Wisconsin Univ., Madison. Dept. of Horticulture.
For primary bibliographic entry see Field 2G.
W77-10274

EXCHANGE AND HYDRATION PROPERTIES OF CU(2+) ON MIXED-ION NA(+) - CU SMECTITES,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-10276

POTASSIUM RELEASE FROM SAND, SILT AND CLAY SOIL SEPARATES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-10277

THEORETICAL CONSIDERATION OF NITRITE SELF-DECOMPOSITION REACTIONS IN SOILS,
Ghent Rijksuniversiteit (Belgium). Lab. of Physical and Radiobiological Chemistry.
For primary bibliographic entry see Field 2G.
W77-10279

CORRELATION OF PLANT MANGANESE WITH EXTRACTABLE SOIL MANGANESE AND SOIL FACTORS,
Minnesota Univ., Waseca. Southern Experiment Station.
For primary bibliographic entry see Field 2G.
W77-10281

NFLUENCE OF SALT AND ALKALI ON IONIC EQUILIBRIA IN SUBMERGED SOILS,
nternational Rice Research Inst., Los Banos, Laguna (Philippines).
For primary bibliographic entry see Field 2G.
W77-10282

INC ADSORPTION ISOTHERMS FOR SOIL CLAYS WITH AND WITHOUT IRON OXIDES EMOVED,
eorgia Univ., Athens. Dept. of Agronomy.
or primary bibliographic entry see Field 2G.
77-10284

ISSOLVED SOLIDS, HARDNESS, AND RTHOPHOSPHATE OF SURFACE-WATER UNOFF IN THE SUWANNEE RIVER WATER ANAGEMENT DISTRICT, FLORIDA,
eological Survey, Tallahassee, Fla. Water esources Div.
or primary bibliographic entry see Field 5B.
77-10556

EACTIONS OF METAL IONS AT SURFACES F HYDROUS IRON OXIDE,
eological Survey, Menlo Park, Calif. Water sources Div.
D. Hem.
eochimica et Cosmochimica Acta, Vol 41, p 527-8, 1977. 12 fig, 41 ref, append.

scriptors: *Geochemistry, *Heavy metals, hemical reactions, *Iron oxides, *Aqueous utions, Oxidation-reduction potential, Solubili- Sorption, Iron, Manganese, Copper, Chromi-, Molybdenum, Silver, Vanadium, Arsenic.

dox processes involving ferrous iron and drous ferric oxide may be coupled to chemical ctions of other elements to decrease their solu-ty in aqueous systems. Processes considered : (1) Reduction of Ag, Cu, and Cr coupled to dation of Fe, (2) Catalysis of oxidation of Mn, Precipitation of ferrous vanadate or molybdate, (4) Coprecipitation by incorporation of metal s in altered ferric hydroxide crystal structure. ncentrations below one microgram per liter are inable for almost all the elements considered ough these processes. (Woodard-USGS)
7-10566

OCHEMISTRY OF GEOPRESSURED OTHERMAL WATERS FROM THE FRIO AY IN THE GULF COAST REGION OF XAS,
logical Survey, Menlo Park, Calif. Water ources Div.
. Kharaka, E. Callender, and R. H. Wallace,

logy, Vol 5, p 241-244, April 1977. 1 tab, 25 ref.

criptors: *Geochemistry, *Thermal water, emical analysis, *Oil fields, Salinity, Dis-ed solids, Geothermal studies, *Formation r, *Gulf coast(Tex).

iled chemical analyses of 54 formation-water ples from the Frio Clay from 11 oil and gas s in the Houston-Galveston and Corpus sti areas, Texas, indicate that the salinity of r in the geopressured zone ranges from about 0 to 70,000 mg/liter dissolved solids. Samples many gas wells yield low salinities that are epresentative of the true salinity of formation r because of dilution by condensed water vapor produced with natural gas. Quartz and Na-K-Ca geothermometers are used in conjunction with the measured subsurface temperatures to identify the diluted samples and to estimate their true salinities. Better understanding of the geochemistry of geopressured geothermal waters is needed to minimize the problems associated with their use as a source of energy. (Woodard-USGS)
W77-10568

CHEMISTRY AND VEGETATION OF HIGHLY ACIDIC STREAMS,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5A.
W77-10744

2L. Estuaries

THE SACRAMENTO-SAN JOAQUIN DELTA AND THE EVOLUTION AND IMPLEMENTATION OF WATER POLICY: AN HISTORICAL PERSPECTIVE,
California Univ., Davis. Dept. of History.
For primary bibliographic entry see Field 6E.
W77-10101

BUOYANT SURFACE DISCHARGE AND SMALL-SCALE OCEANIC FRONTS: A NUMERICAL STUDY,
Catholic Univ. of America, Washington, D.C. Dept. of Civil Engineering.
T. W. Kao, C. Park, and H-P. Pao.
Journal of Geophysical Research, Vol. 82, No. 12, p 1747-1752, April 20, 1977. 8 fig, 8 ref. NSF ENG75-09347, ONR N00014-77-C-0017.

Descriptors: *Water circulation, *Coasts, *Estuaries, Model studies, Mathematical models, Flow, Rivers, Brackish water, Density, Salinity, Inflow, Currents(Water), Turbulent flow, Turbulence, Oceans, Oceanography.
Identifiers: Fronts(Oceanic).

A study was made of the two-dimensional buoyant surface discharge into an ambient body of water. The numerical study was based on an initial boundary value problem using the full Navier-Stokes and diffusion equations. A turbulence model using the Munk-Anderson parameterization formula for density stratification effect also was incorporated. The results showed the establishment of a surface density current with strong surface convergence and downwelling near the front. Comparison was made with the field experiments of Garvine and Monk on a small-scale oceanic front in Long Island Sound. Excellent agreement was obtained. (Sims-ISWS)
W77-10104

EVIDENCE FOR BAROCLINIC INSTABILITY OF THE NORWEGIAN CURRENT,
British Columbia Univ., Vancouver. Dept. of Mathematics; and British Columbia Univ., Vancouver. Inst. of Oceanography.
L. A. Mysak, and F. Schott.
Journal of Geophysical Research, Vol. 82, No. 15, p 2087-2096, May 20, 1977. 9 fig, 2 tab, 15 ref.

Descriptors: *Ocean currents, *Variability, *Model studies, Mathematical models, On-site investigations, Current meters, Oceans, Circulation, Ocean circulation, Temperature, Water temperature, Salinity, Density, Oceanography.
Identifiers: *Norwegian Current.

Hydrographic and current observations of the Norwegian Current showed a considerable amount of low-frequency variability; in particular, many of the current spectra are broadly peaked at around 2-3 days. In this paper, a number of simple barotropic and baroclinic instability models of the mean flow in an attempt to explain these fluctuations are considered. The theoretical results suggest that the current fluctuations most likely are due to baroclinic instability of the mean flow. (Sims-ISWS)
W77-10107

THE MOTION OF A SMALL SPHERE IN A ROTATING VELOCITY FIELD: A POSSIBLE MECHANISM FOR SUSPENDING PARTICLES IN TURBULENCE,
California Univ., San Diego, La Jolla. Inst. of Marine Research; and Scripps Institution of Oceanography, La Jolla, Calif.
P. F. Tooby, G. L. Wick, and J. D. Isaacs.
Journal of Geophysical Research, Vol. 82, No. 15, p 2096-2100, May 20, 1977. 4 fig, 12 ref.

Descriptors: *Suspended solids, *Turbulence, *Laboratory tests, Eddies, Turbulent flow, Reynolds number, Drag, Viscosity, Movement, Water circulation, Erosion, Sediments, Velocity, Surf, Coasts, Beaches, Oceanography.

The diffusion and transport of particles suspended in turbulent flows depend on the interaction between the particles and the turbulence. To investigate a possible particle-turbulence interaction, particle trajectories were observed in a rotating fluid with a solid body velocity profile, as might occur in the core of a vortex or an eddy. The experiments were conducted with a series of single small spheres (with low particle Reynolds numbers) sinking or rising in a horizontal cylinder rotating about its central axis at a constant speed. Each sphere was found to follow a nearly circular orbit in a vertical plane perpendicular to the cylinder axis. The orbit center lay very near the horizontal plane through the axis of the cylinder and was at the point in the fluid where the velocity of the fluid as equal and opposite to the terminal velocity of the particle. The particle trajectories also evolved slowly, spiraling either inward or outward. A theoretical description of the particle motion shows that the two principal forces on the particle, fluid drag and gravity-buoyancy, account for the circular motion. A force due to particle inertia (a centrifugal force from the center of its orbit), a small position-dependent wall effect on drag, a very small force (also affected by the walls), and a very small centrifugal buoyancy force account for the long-term inward or outward spirals. This kind of systematic interaction in which particles seek and remain in fluid closely opposing their own motion could have a role in the suspension of small particles in some turbulent flows. (Sims-ISWS)
W77-10108

OXYGEN-SAG IN A TIDAL RIVER,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-10114

THE SEA SURFACE TEMPERATURE DEVIATION AT VERY LOW SPEEDS; IS THERE A LIMIT,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
K. B. Katsaros.
Tellus, Vol 29, No 3, p 229-239, June 1977. 1 fig, 3 tab, 44 ref. ONR N00014-67-A-0103-0014, NSF GA-40324.

Descriptors: *Water temperature, *Heat balance, *Boundary layers, *Winds, Evaporation, Radiation, Temperature, Heat transfer, Water bodies, Oceans, Convection, Turbulence, Surface tension, On-site investigations, Laboratory tests, Oceanography.

Laboratory and field measurements of the temperature drop across the boundary layer at the upper surface of evaporating and cooling water in turbulent free convection showed that greater values are possible than previously indicated. An

upper limit on the surface temperature deviation is imposed only by the maximum heat loss occurring in the earth's most extreme climates. (Sims-ISWS)
W77-10120

PLUTONIUM AND AMERICIUM ACTIVITIES IN THE NORTH SEA AND GERMAN COASTAL REGIONS,
Deutches Hydrographisches Institut, Hamburg (West Germany).
For primary bibliographic entry see Field 5B.
W77-10122

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W77-10123

RELATIONSHIP BETWEEN NITROGEN FIXATION (ACETYLENE REDUCTION) AND THE C:N RATIO IN A POLLUTED CORAL REEF. ECOSYSTEM, KANEOHE BAY, HAWAII,
Hawaii Univ., Honolulu. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-10124

SOMALI CURRENT: RECENT MEASUREMENTS DURING THE SOUTHWEST MONSOON,
Woods Hole Oceanographic Institution, Mass.
J. G. Bruce.
Science, Vol 197, No 4298, p 51-53, July 1, 1977. 2 fig, 5 ref. ONR N00014-74-C-0262, NSF ATM74-22226A01.

Descriptors: *Currents(Water), *Ocean currents, *Water temperature, *Indian Ocean, Monsoons, On-site data collections, Winds, Sampling, Surveys, Bathymetry, Ocean circulation, Oceanography.
Identifiers: *Somali Current.

The Somali current was measured at approximately maximum strength for the year during the southwest monsoon on 11 and 12 August 1975 (approximately 1 1/2 days) at stations spaced 20 to 35 km apart. The measurements permit a nearly synoptic detailed mapping of the temperature structure of a major western boundary current. (Sims-ISWS)
W77-10128

SHORELINE FORMS AND SHORELINE DYNAMICS,
Virginia Univ. Charlottesville. Dept. of Environmental Sciences.
R. Dolan, B. Hayden, J. Heywood, and L. Vincent.
Science, Vol 197, No 4298, p 49-51, July 1, 1977. 4 fig, 13 ref. NASA NAS5-20999.

Descriptors: *Shores, *Atlantic Ocean, *Beaches, Erosion, Beach erosion, Geomorphology, Coasts, Islands, Barrier islands, Storm surge, Dynamics.
Identifiers: *Shoreline forms, *Shoreline dynamics, *Assateaque Island(Md-Va), *Capes.

Atlantic coast barrier-island shorelines are sinuous in plain view, with curvatures ranging in size from cusps to capes. The orientation of shoreline segments within the larger of these sinuous features (10 to 15 km between apexes) is significantly related to shoreline dynamics. (Sims-ISWS)
W77-10130

PRIMARY PRODUCTION STUDIES IN PORTO NOVO WATERS, S. INDIA,
Centre of Advanced Study in Marine Biology, Porto Novo (India).
For primary bibliographic entry see Field 5C.
W77-10140

ULTRA-VIOLET ABSORPTION CHARACTERISTICS OF WATERS IN AN INDUSTRIALIZED ESTUARY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W77-10145

THE INFLUENCE OF SALINITY ON THE GROWTH OF SOME PLANKTON DIATOMS FROM BRACKISH WATER,
Oslo Univ. (Norway). Section of Marine Botany.
For primary bibliographic entry see Field 5C.
W77-10146

SEASONAL CHANGES IN TWO ALGAL POPULATIONS FROM THE COASTAL WATERS OF WASHINGTON STATE,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-10150

HEAVY METALS IN CHESAPEAKE BAY SEDIMENTS,
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-10174

SEDIMENTS, STRUCTURAL FRAMEWORK, AND EVOLUTION OF DELAWARE BAY, A TRANSGRESSIVE ESTUARINE DELTA,
Delaware Univ., Newark. Coll. of Marine Studies.
C. B. Weil.
Sea Grant Technical Report No. DEL-SG-4-77, (1977). 199 p, 70 fig, 6 tab, 128 ref, 2 append. SG-2-35-233; NSF-GH-109, NSF-GB-27725.

Descriptors: *Estuarine environment, *Deltas, *Sedimentation, *Geomorphology, Bays, Erosion, Circulation, Salt marshes, Sediment distribution, Sea level, Tidal effects, Geologic history, Mudflats, Bottom sediments.
Identifiers: *Delaware Bay, Tidal currents.

Grain-size analyses of 411 bottom surface sediments from Delaware Bay show a distinctive pattern of progressive sorting, with grain size decreasing in the upbay direction and toward shore. The texture pattern is produced by tidal currents and is related to bathymetry. The relationships of transgressive Holocene estuarine deltaic environments in the subsurface are complex because different parts of the sedimentary record may be present or absent depending upon the extent of erosion at the shoreline, deposition and sediment reworking on the subtidal flats, and deposition of linear sand shoals associated with tidal channel development. The major sedimentary environments of the tide-dominated transgressive Delaware delta include: (1) the subaerial tidal marshes and washover barrier beaches in the lower bay; (2) the fine-grained deposits of the subtidal flats; (3) the linear sand shoals; and (4) the estuary mouth shoal complex with mutually evasive tidal channels and flood tidal delta. The Delaware Estuary, characterized by a low supply of coarse sediment, rising relative sea level, and intensive sediment reworking by tidal currents, is a depositional model for the transgressive estuarine delta. (NOAA)
W77-10186

DELAWARE BAY ICE CONDITIONS, 1977,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas, R. R. Rumer, G. R. Davis, and R. Crissman.
Sea Grant Technical Report No. DEL-SG-9-77, (1977). 34 p, 32 fig, 8 ref.

Descriptors: *Delaware River, *Ice cover, *Damages, Weather data, Shellfish, Clams, Crabs, Oysters.
Identifiers: *Delaware Bay, Cold weather.

As a result of the extreme cold weather during the 1976-1977 winter, an unusually large amount of ice formed in the Delaware Bay and River. By the first of February an estimated $115,000 in damage and lost time had been suffered by Delaware's crab, clam, and oyster fishermen. To map the extent and type of ice cover, four flights were made over the area from the Delaware Memorial Bridge to the mouth of Delaware Bay. Visual observations were recorded on maps of the area and color and black and white photographs were taken to back up the observations. (NOAA)
W77-10188

A COASTAL ENGINEERING STUDY OF INDI AN RIVER INLET, DELAWARE,
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 8B.
W77-10189

SYNERGISTIC EFFECTS OF MARINE POLLUTION,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5C.
W77-10202

CADMIUM CONCENTRATIONS IN THE TISSUES OF BULLIA DIGITALIS (PROSOBRANCHIATA) FROM THE SOUTH AFRICAN WEST COAST,
Cape Town Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10203

METALS IN ORGANISMS FROM SALDANHA BAY AND LANGEBAAN LAGOON PRIOR TO INDUSTRIALIZATION,
Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries.
For primary bibliographic entry see Field 5C.
W77-10205

THE ZOOPLANKTON OF MSIKABA ESTUARY,
Port Elizabeth Museum (South Africa).
T. Wooldridge.
Zoologica Africana, Vol. 11, No. 1, p 23-44, 19 6 fig, 4 tab, 12 ref.

Descriptors: *Zooplankton, *Estuari *Stratification, Vertical distribution, Season Biomass, Rainfall, Geomorphology, Salini Temperature distribution, Plankton, Ecolo Sampling, Distribution patterns.
Identifiers: South Africa, *Msikaba est ry(Transkei).

Msikaba Estuary is situated in the northern s tropical area of the Transkei coastal region, So Africa, at latitude 31 degrees 19'S. It is possi the deepest South African estuary with a m imum recorded depth of 35 m. A recurved sand is well-established at the mouth and the estuar connected to the sea by a relatively narrow shallow channel. Stratification is well develope Msikaba estuary and has a major influence on distribution of the zooplankton. The oligoha zooplankton component does not become established, while marine zooplankton organis penetrate relatively far up the estuary in the b salinity bottom waters. The euryhaline compon becomes relatively well established near mouth and it would appear that these organi maintain their position within the estuary by v cal migration between inflowing bottom and flowing surface waters. Seasonal means zooplankton biomass were similar and ran between 16 mg/m3 of water during winter an

ng/m during summer. (So African Water Info Center)
W77-10214

NDICATORS OF HEAVY-METAL CONAMINATION IN THE LOOE ESTUARY CORNWALL) WITH PARTICULAR REGARD O SILVER AND LEAD,
Marine Biological Association of the United Kingom, Plymouth (England). Plymouth Lab.
or primary bibliographic entry see Field 5A.
W77-10228

HE MACROBENTHIC FAUNA OF ROCKS ND BOULDERS IN THE LUBECK BAY WESTERN BALTIC SEA) INVESTIGATED ROM THE UNDERWATER LABORATORY IELGOLAND',
rondheim Univ. (Norway). Biological Station.
or primary bibliographic entry see Field 5C.
W77-10232

URVIVAL OF MARINE PHYTOPLANKTON IN IGH CONCENTRATIONS OF HEAVY ETALS, AND UPTAKE OF COPPER,
arine Lab., Aberdeen (Scotland).
or primary bibliographic entry see Field 5C.
W77-10233

HE EFFECT OF A NO. 2 FUEL OIL AND OUTH LOUISIANA CRUDE OIL ON THE EHAVIOR OF THE SOFT SHELL CLAM, YA ARENARIA L.,
utgers - The State Univ., Newar, N. J. Dept. of ology and Physiology.
or primary bibliographic entry see Field 5C.
W77-10234

FECTS OF LIGHT AND AMMONIUM ON TRATE UPTAKE BY TWO SPECIES OF TUARINE PHYTOPLANKTON,
ty Coll., New York. Dept. of Biology.
r primary bibliographic entry see Field 5C.
W77-10241

DESCRIPTIVE EVALUATION OF THE EFCTS OF NO. 2 FUEL OIL ON THE TISSUES THE SOFT SHELL CLAM, MYA ARENARIA
dustrial Environmental Research Lab.-Cincini, Edison, N.J. Oil and Hazardous Materials lls Branch.
r primary bibliographic entry see Field 5C.
W77-10243

E ECOLOGY OF EELGRASS, ZOSTERA RINA (L.), FISH COMMUNITIES. I. STRUCRAL ANALYSIS,
tional Marine Fisheries Service, Beaufort, N.C. antic Estuarine Fisheries Center.
primary bibliographic entry see Field 5C.
W77-10244

E EFFECTS OF TEMPERATURE AND LINITY ON THE EMBRYONIC DEVELOPNT OF HYDROBIA ULVAE (PENNANT),
versity Coll. of Wales, Aberystwyth. Dept. of logy.
primary bibliographic entry see Field 5C.
W77-10245

FECTS OF FISH FACTORY EFFLUENT ON E BENTHIC MACROFAUNA OF SALDANHA ,
e Town Univ. (South Africa). Dept. of Zoolo- and Department of Planning and the Environt, Capetown (South Africa).
primary bibliographic entry see Field 5C.
W77-10246

UPTAKE FROM SEA WATER AND CLEARANCE OF 14C-P,P'-DDT BY THE MARINE COPEPOD CALANUS FINMARCHICUS,
Bedford Inst. of Oceanography, Dartmouth (Nove Scotia).
For primary bibliographic entry see Field 5C.
W77-10249

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS-III, EFFECTS OF OILSPILL EMULSIFIERS AND SURFACTANTS ON THE GROWTH OF PORPHYRA-LAVER, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10254

HEAVY METALS IN THE GASTROPOD MOLLUSC HALIOTIS TUBERCULATA (L.),
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W77-10256

HEALTH AND ECOLOGICAL ASPECTS OF COBALT-60 TRANSFER IN SEAWATER FOOD CHAIN TYPICAL OF AN INTERTIDAL MUDFLAT,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Section de Radioecologie.
For primary bibliographic entry see Field 5C.
W77-10257

CRITICAL THERMAL MAXIMA OF TWO SPECIES OF ESTUARINE FISH,
Environmental Research Lab., Narragansett, R.I.
For primary bibliographic entry see Field 5C.
W77-10258

POLYCHLORINATED BIPHENYLS IN COASTAL MARINE ZOOPLANKTON: BIOACCUMULATION BY EQUILIBRIUM PARTITIONING,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-10259

ANALYTICAL MODEL OF DISPERSION IN TIDAL FJORDS,
Nova Scotia Technical Coll., Halifax. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W77-10303

CHANNEL SILTATION DETERMINED WITH SIDE-SCAN SONAR,
Army Engineer District, Portland, Oreg. Dredging Operations Div.
For primary bibliographic entry see Field 8B.
W77-10315

AUTOMATED HYDROGRAPHY FOR CHANNEL DREDGING,
Army Engineer District, Philadelphia, Pa. Survey Branch.
For primary bibliographic entry see Field 8B.
W77-10316

BREAKING WAVES,
Institute of Oceanographic Sciences, Wormley (England).
For primary bibliographic entry see Field 8B.
W77-10317

ACOUSTIC OCEANOGRAPHY,
Scripps Institution of Oceanography, La Jolla, Calif.
W. H. Munk, and G. O. Williams.
Nature, Vol. 267, No. 5614, p 774-778, June 30, 1977. 5 fig, 16 ref.

Descriptors: *Oceans, *Surveys, *Acoustics, Measurement, Monitoring, Sound waves, Water properties, On-site investigations, Fluctuations, Oceanography.
Identifiers: *Oceanic finestructure.

Measurements of ocean finestructure (with typical time scales of 15 min to 1 d, spacial scales of 10 to 100 m vertically and 1 to 10 km horizontally) are consistent with the measured variability in the transmission of acoustic signals through the ocean volume. The observations suggested that the statistics of acoustic fluctuations can be used to monitor the statistics of ocean finestructure. Further, fluctuations in the travel time are largely a measure of temperature fluctuations along the acoustic path, and the difference in reciprocal travel times is a measure of the component, along the path, of current and current shear. Such acoustic measurements give integrals along the paths, with the attendant advantages and disadvantages as compared with the traditional 'spot' measurements; precision promises to be comparable or better. (Sims-ISWS)
W77-10318

ANOXIC, HYPERSALINE BASIN IN THE NORTHERN GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
R. F. Shokes, P. K. Trabant, B. J. Presley, and D. F. Reid.
Science, Vol. 196, No. 4297, p 1443-1446, June 24, 1977. 3 fig, 1 tab, 11 ref.

Descriptors: *Brines, *Basins, *Gulf of Mexico, Surveys, Sampling, On-site investigations, Salinity, Oxygen, Temperature, Nitrates, Phosphates, Silicates, Chemicals, Bathymetry, Oceanography.
Identifiers: *Hypersaline basins, *Anoxic basins, *Red Sea.

A 400 sq km depression in the continental slope of the northern Gulf of Mexico (approximately 27 deg N, 91 deg W) was found to contain anoxic, hypersaline (approximately 250 g per kg) water in the bottom 200 m. The interface between the brine and overlying seawater acts as a midwater seismic reflector similar to those seen in the Red Sea. The bulk chemical composition of the brine is similar to that from the Red Sea, but differences between the two in both heat content and geomorphological setting indicate different modes of origin. (Sims-ISWS)
W77-10319

ESTIMATES OF CENOZOIC OCEANIC SEDIMENTATION RATES,
Middlebury Coll., Vt. Dept. of Geology.
T. A. Davies, W. W. Hay, J. R. Southam, and T. R. Worsley.
Science, Vol 197, No 4298, p 53-55, July 1, 1977. 1 fig, 8 ref. NSF DES74-02824, DES75-04066.

Descriptors: *Sedimentation rates, *Oceans, *Cenozoic era, *Atlantic Ocean, *Indian Ocean, *Pacific Ocean, Sedimentation, Precipitation(Atmospheric), Carbonates, Cores, Core logging, Sampling, Sediments, Climates, Climatology, Geologic history, Geology, Oceanography.
Identifiers: *Oceanic sedimentation.

Estimation of average Cenozoic sedimentation rates for the Atlantic, Indian, and Pacific oceans indicated global synchronous fluctuations. Paleocene-early Eocene and late Eocene-early Miocene rates are only a fraction of middle Eocene and middle Miocene-Recent rates. The

changes must reflect significantly different modes of continental weathering, which may be due to alternate states of atmospheric circulation marked by reduction of global precipitation. (Sims-ISWS)
W77-10320

GLOBAL MASS AND ENERGY REQUIREMENTS FOR GLACIAL OSCILLATIONS AND THEIR IMPLICATIONS FOR MEAN OCEAN TEMPERATURE OSCILLATIONS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2B.
W77-10327

GROWTH OF AN ESTUARINE PSEUDOMONAS SP. ON POLYCHLORINATED BIPHENYL,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-10362

THE EFFECTS OF ORGANIC POLLUTION ON BENTHIC ORGANISMS NEAR MARSEILLE,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-10365

ETUDE DE LA CONTAMINATION DE CONSTITUANTS DU MILIEU MARIN PAR DES FORMES SOLUBLES ET INSOLUBLES DE RADIONUCLIDES, (STUDY OF THE CONTAMINATION OF COMPONENTS OF THE MARINE ENVIRONMENT BY SOLUBLE AND INSOLUBLE FORMS OF RADIONUCLIDES),
CEA Centre de la Hague, Cherbourg (France). Laboratoire de Radioecologie Marine.
For primary bibliographic entry see Field 5C.
W77-10388

BEHAVIOUR OF CAESIUM-137 IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Haifa (Israel). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10389

STUDIES ON RARE EARTH ELEMENTS IN SEAWATER AND UPTAKE BY MARINE ORGANISMS,
National Inst. of Radiological Sciences, Chiba (Japan).
For primary bibliographic entry see Field 5C.
W77-10390

A TRACE ELEMENT STUDY IN THE THAMES ESTUARY,
Royal Naval Coll., Greenwich, London (England). Dept. of Nuclear Science and Technology.
For primary bibliographic entry see Field 5C.
W77-10391

PLUTONIUM ISOTOPES IN AQUATIC FOODCHAINS IN THE BALTIC SEA,
Helsinki Univ., (Finland). Dept. of Radiochemistry.
For primary bibliographic entry see Field 5C.
W77-10395

EXPERIMENTAL STUDIES ON PLUTONIUM KINETICS IN MARINE BIOTA,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-10396

ADSORPTION-DESORPTION CHARACTERISTICS OF PLUTONIUM AND AMERICIUM WITH SEDIMENT PARTICLES IN THE ESTUARINE ENVIRONMENT, STUDIES USING PLUTONIUM-237 AND AMERICIUM-241,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-10397

SOME INVESTIGATIONS INTO THE BEHAVIOR OF PLUTONIUM IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5C.
W77-10398

BEHAVIOR OF DISCHARGED RADIONUCLIDES FROM FUEL REPROCESSING OPERATIONS IN THE AQUATIC ENVIRONMENT OF BOMBAY HARBOUR BAY,
Bhabha Atomic Research Centre, Bombay (India). Environmental Studies Section.
For primary bibliographic entry see Field 5C.
W77-10403

UPTAKE OF COBALT-60 FROM SEA WATER AND FROM LABELLED FOOD BY THE COMMON SHRIMP CRANGON CRANGON (L),
Reactor Centrum Nederland, Petten.
For primary bibliographic entry see Field 5C.
W77-10407

HEALTH CRITERIA FOR ESTIMATING ACCEPTABLE CONTAMINATION OF COASTAL WATERS BY RADIONUCLIDES,
Ministerstvo Zdravookhraneniya SSR, Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5B.
W77-10408

PUBLIC LAW ALLOWS MITIGATION OF SHORE EROSION DAMAGE BY CORPS OF ENGINEERS,
Office of the Chief of Engineers (Army), Washington, D.C. Construction Operations Div.
For primary bibliographic entry see Field 6E.
W77-10450

DREDGE RIVER CHANNEL: NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT (FINAL SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT).
Naval Facilities Engineering Command, Philadelphia, Pa. Northern Div.
For primary bibliographic entry see Field 6G.
W77-10454

WETLANDS REGULATION: THE TAKING PROBLEM AND PRIVATE PROPERTY INTERESTS,
For primary bibliographic entry see Field 6E.
W77-10461

PUBLIC ACCESS TO RECEDING BEACHES,
For primary bibliographic entry see Field 6E.
W77-10462

PHOTOSYNTHETIC PROPERTIES OF MARINE BENTHIC GREEN ALGAE FROM DIFFERENT DEPTHS IN THE COASTAL AREA, (IN JAPANESE),
Tokyo Univ. of Education (Japan). Shimoda Marine Biological Station.
For primary bibliographic entry see Field 5C.
W77-10466

RED TIDE IN THE SETO INLAND SEA, (IN JAPANESE),
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
For primary bibliographic entry see Field 5C.
W77-10509

A BIBLIOGRAPHY OF ESTUARINE RESEARCH IN OREGON,
Oregon State Univ., Corvallis. Sea Grant Coll. Program.
J. B. Morgan, and R. L. Holton.
Sea Grant Publication No. ORESU-L-77-001, April 1977. 141 p, append. Also as: Oregon Estuarine Research Council Publication No. 1.

Descriptors: *Estuaries, *Bibliographies, *Oregon, Beaches, Dunes, Watershed(Basins), Drainage basins.
Identifiers: Coastal zone, Headlands.

References to published and unpublished literature pertaining to research conducted in Oregon's estuaries, their drainage basins, coastal beaches, dunes and headlands are given in this bibliography. The references are listed chronologically by author under three sections: Oregon Estuaries and their Drainage Basins; Oregon Coastal Beaches, Dunes and Headlands; and General Information on Oregon's Estuaries and their drainage basins. The bibliography also includes twelve maps of the estuaries, coastal drainage basins and headlands as well as a geographic index. (NOAA)
W77-10511

INFLUENCE OF DOMESTIC WASTES ON THE STRUCTURE AND ENERGETICS OF INTERTIDAL COMMUNITIES NEAR WILSON COVE, SAN CLEMENTE ISLAND,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 5C.
W77-10512

THE PRESENT STATE AND PROBLEMS OF THE RED TIDE RESEARCH IN JAPAN, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5B.
W77-10551

ANNUAL CYCLE OF PRIMARY PRODUCTION AND ITS RELATION TO THE NUTRIENTS IN CANARY ISLAND WATERS, (IN SPANISH),
Instituto Espanol de Oceanografia, Madrid (Spain).
For primary bibliographic entry see Field 5C.
W77-10598

OBSERVATION OF OSCILLATORY INSTABILITY STATES IN A SIMPLE CONVECTION EXPERIMENT,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W77-10656

THE PHYSIOLOGICAL CHARACTERISTICS OF NERITIC RED TIDE FLAGELLATES, (IN JAPANESE),
Hiroshima Univ. (Japan). Faculty of Fisheries and Animal Husbandry.
For primary bibliographic entry see Field 5C.
W77-10686

SEASONAL CHANGE OF GROWTH PROMOTING EFFECT OF MUD EXTRACTS AND SEA WATER COLLECTED DURING VARIOUS SEASONS AT ISE BAY ON A RED TI

FLAGELLATE HETEROSIGMA INLANDICA HADA, (IN JAPANESE),
Mie Prefectural Univ., Tsu (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10701

GYMNODINIUM TYPE-'65 RED TIDE IN OCCURRING ANOXIC ENVIRONMENT OF OMURA BAY, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10706

GROWTH OF GYMNODINIUM TYPE-'65, CAUSATIVE ORGANISM OF RED TIDE IN OMURA BAY, IN MEDIUM SUPPLIED WITH BOTTOM MUD EXTRACT,
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10707

POLYCHLORINATED BIPHENYL INHIBITION OF MARINE PHYTOPLANKTON PHOTOSYNTHESIS IN THE NORTHERN ADRIATIC SEA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 5C.
W77-10728

HEAVY METAL CONCENTRATIONS IN ORGANISMS FROM AN ACTIVELY DREDGED TEXAS BAY,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-10739

STUDIES ON THE MECHANISMS OF RED TIDE OCCURRENCE IN HAKATA BAY: II. GENERAL FEATURES OF RED TIDE FLAGELLATE, HETEROSIGMA SP., (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10740

SUMMER ZOOPLANKTON DISTRIBUTION IN GEORGIA ESTUARY,
Sidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-10756

PHYSIOLOGICAL STUDIES OF SUBTIDAL RED ALGAE,
New Hampshire Univ., Durham. Dept. of Botany; and Jackson Estuarine Lab.
For primary bibliographic entry see Field 5C.
W77-10757

COMPARISON OF BACTERIAL AND ALGAL UTILIZATION OF ORTHOPHOSPHATE IN AN ESTUARINE ENVIRONMENT,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10760

ANALYTICAL SOLUTION FOR STEADY INTERFACE FLOW IN A COASTAL AQUIFER INVOLVING A PHREATIC SURFACE WITH INFILTRATION,
Rijkswaterstaat, Rijswijk (Netherlands) Data Processing Div.
For primary bibliographic entry see Field 2F.
W77-10762

LEAD DISTRIBUTION IN THE CAPE FEAR RIVER ESTUARY,
Duke Univ., Beaufort, N.C. Marine Lab. and Duke Univ., Beaufort, N.C. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-10772

WIND-FORCED CONTINENTAL SHELF WAVES IN THE FLORIDA CURRENT,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
D. A. Brooks, and C. N. K. Mooers.
Journal of Geophysical Research, Vol 82, No 18, p 2569-2576, June 20, 1977. 10 fig, 2 tab, 14 ref. ONR N00014-67-A0201-0013, NSF DES72-0147 A03.

Descriptors: *Ocean currents, *Winds, *Ocean waves, *Water temperature, Sea level, On-site data collections, Data processing, Fluctuations, Continental shelf, Correlation analysis, Currents(Water), Waves(Water), Oceanography.
Identifiers: *Florida current, *Gulf Stream.

Yearlong records of sea level, oceanic temperature, winds, and atmospheric pressure provided evidence of atmospherically induced, subinertial frequency fluctuations in the Florida current. The dominant subinertial responses occurred at periods of 7-10 days in winter and 12-14 days in summer. Consistent with the theory of long stable continental shelf waves (CSW) in the Florida current, a sea level array indicated southward propagation of disturbances. The propagating disturbances had alongshore coherence scales of a few hundred kilometers and wavelengths of the order of 1000 km. The sea level and temperature fluctuations were strongly coupled, and they were coupled to both components of the wind stress. It was concluded that wind-forced southward propagating CSW's account for a significant fraction of the subinertial frequency fluctuations of the Florida current. (Sims-ISWS)
W77-10780

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

GROWTH RATE OF AN ICE CRYSTAL IN SUBCOOLED PURE WATER,
Syracuse Univ., New York. Dept. of Chemical Engineering and Materials Science.
For primary bibliographic entry see Field 1A.
W77-10796

3B. Water Yield Improvement

SETTLING VELOCITIES OF SMALL ICE CRYSTALS,
Ben Gurion Univ. of the Negev, Beer Sheva (Israel). Research and Development Authority.
For primary bibliographic entry see Field 2B.
W77-10121

CLOUD SEEDING EXPERIMENTAL PROGRAM IN RHODESIA: 1974-75,
Meteorological Service, Salisbury (Rhodesia).
D. L. McNaughton.
Journal of Weather Modification, Vol. 9, No. 1, p 79-92, April 1977. 2 fig, 6 tab, 6 ref, 2 append.

Descriptors: *Weather modification, *Cloud seeding, *Africa, Precipitation(Atmospheric), Rainfall, Distribution patterns, Aircraft, Foreign countries, Data processing, Foreign research, Analytical techniques, Cloud physics, Artificial precipitation, Nucleation, Meteorology.
Identifiers: *Rhodesia.

Using randomized instructions, isolated cumulus clouds were either left alone or were seeded near cloud top from an aircraft fitted to fire pyrotechnic cartridges. The rain falling from both seeded and untreated clouds was measured at cloud base using a rainwater collector. Seeded clouds with tops warmer than about -10C gave much the same rain as similar non-seeded clouds. With colder clouds, however, the average rainfall was greater on seeded than on non-seeded occasions. When rain falling earlier than 40 min after the start of the experiment was excluded from the calculations, then the apparent bias in favor of the seeded clouds in the two-season period 1973-74-75 was significant at the 10% level. Again excluding early rain, the six heaviest falls all came from seeded clouds; the probability that this was pure chance is less than 0.04. However, there were also several seeded clouds which failed to rain. (Sims-ISWS)
W77-10306

MELTING RATES OF VARIOUS SIZE HAILSTONES IN A LARGE VERTICAL WIND TUNNEL,
State Univ. of New York at Albany. Dept. of Atmospheric Science.
S. B. Newman, and N. R. Gokhale.
Journal of Weather Modification, Vol. 9, No. 1, p 117-124, April 1977. 3 fig, 10 ref.

Descriptors: *Hail, *Melting, *Laboratory tests, Model studies, Mathematical models, Heat transfer, Temperature, Cloud physics, Precipitation(Atmospheric), Testing procedures, Meteorology.
Identifiers: *Hailstone melting, Wind tunnel tests.

Artificially made, spherical hailstones of radius 0.50-1.75 cm were suspended in the updraft of a large vertical wind tunnel and allowed to melt for time intervals of 1 to 5 min. Until now, there have been no experimental results concerning melting of large and medium sized hail. Calculations of mass and radius melting rates were made for a 1 min time interval using the equations suggested by Macklin; however, the value of chi, the heat transfer coefficient, was recomputed. Agreement between experimental and theoretical values was within 5%. In addition, melting profiles were calculated for hailstones falling from various heights. A threshold radius of 0.69 cm for stones falling from 5000 m was found to agree well with the value of 0.73 cm calculated by Ludlam for stones falling from 5400 m. (Sims-ISWS)
W77-10307

COLLECTION KERNELS FOR THE CAPTURE OF SILVER IODIDE NUCLEI BY CLOUD WATER DROPS,
Naval Weapons Center, China Lake, Calif. Earth and Planetary Sciences Div.
L. A. Matthews, and P. St.-Amand.
Journal of Weather Modification, Vol. 9, No. 1, p 125-145, April 1977. 6 fig, 44 ref.

Descriptors: *Cloud seeding, *Silver iodide, *Nucleation, Cloud physics, Clouds, Drops(Fluids), Raindrops, Model studies, Mathematical models, Thunderstorms, Precipitation(Atmospheric), Meteorology, Weather modification.
Identifiers: *Collection kernels, Collision efficiency.

Capture of AgI nuclei by cloud drops, through the microphysical processes of inertial and interceptive impaction. Brownian Diffusion, and wake capture, was expressed in terms of a collection kernel as a function of AgI nuclei and cloud drop radii. Also, the effect of phoretic forces and turbulence on the collection kernel was assessed. For the capture of 0.01 to 10 micrometers radius AgI nuclei by cloud droplets with radii 50 micrometers or greater, the collection kernels are greater than 0.000001. The kernels are large enough to bring practical concentrations of AgI into contact with

cloud drops at a rate such as to cause rapid freezing of cloud water accompanied by a large heat release if the updraft portion of a cloud is seeded. However, impractically large amounts of nuclei may be required to contact droplets in the downdraft portion of a cloud, and more so if drop evaporation is rapid and the drops are positively charged. (Sims-ISWS)
W77-10308

CHARACTERISTICS OF SILVER IODIDE ICE NUCLEI GENERATORS CURRENTLY USED BY SO.R.E.M.,
Societa' Richerche Esperienze Meteorologiche (Italy).
A. Buscaglione.
Journal of Weather Modification, Vol. 9, No. 1, p 146-153, April 1977. 5 fig.

Descriptors: *Cloud seeding, *Silver iodide, *Equipment, Nucleation, Weather modification, Rainfall, Foreign countries, Hail, Foreign research, Precipitation(Atmospheric), Generators, Meteorology.
Identifiers: *Nuclei generators, *Italy, Cloud seeding equipment, Ice nuclei.

This paper described some technical and operational characteristics of two advanced types of ground-based AgI-generators, developed and utilized at the present in Italy for both rain-enhancement and hail-prevention campaigns. The first one (S11 type), was intended for operation from a fixed station. It is a very rugged and reliable tool and can be operated by unskilled people. The second generator (type GM 10), was conceived specially for mobile operation. It is trailer-mounted and equipped for travelling stations which are connected with the operative centre by radio-link, and directed through radar-echo observations. (Sims-ISWS)
W77-10309

PRELIMINARY EVALUATION OF THE 1976 RAIN MODIFICATION PROJECT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr., and N. G. Towery.
Journal of Weather Modification, Vol. 9, No. 1, p 66-78, April 1977. 2 fig, 6 tab.

Descriptors: *Weather modification, *Cloud seeding, *Evaluation, *Illinois, Data collections, Analytical techniques, Rain gages, Radar, Projects, Agriculture, Precipitation(Atmospheric), Rainfall, Distribution patterns, Artificial rainfall, Meteorology.
Identifiers: Central Illinois.

The first major weather modification project in Illinois was pursued in East Central Illinois during late July-August of 1976. It related to an effort to increase summer rainfall. A group of farmers and others concerned with agricultural production in a 5-county area centered on Coles County decided to raise funds and hire a cloud seeder in an effort to increase the precipitation. This report presented first information on the background of the seeding project and the organization of the evaluation effort. Results relating to the statistical evaluation of rainfall data and radar echo data (indicative of storm and rain activity aloft) were presented. The apparent enlargement of echo and rain area in the seeded storms, as hypothesized by the seeding approach, coupled with the increase in all four rain categories, suggests that rainfall has been increased by the seeding. However, the results must be considered inconclusive due to the possible bias arising from the seeding of the more favorable storms and the lack of good time resolution of the rainfall associated with the seeded and non-seeded echoes. (Sims-ISWS)
W77-10774

AN EXAMINATION OF THE RAINFALL DISTRIBUTION OVER THE TARGET AREA OF THE COLORADO RIVER MUNICIPAL WATER DISTRICT'S WEATHER MODIFICATION PROGRAM,
Colorado River Municipal Water District, Tex.
J. Girdzus, and G. W. Bomar.
Journal of Weather Modification, Vol 9, No 1, p 93-99, April 1977. 8 fig, 3 tab, 4 ref.

Descriptors: *Weather modification, *Cloud seeding, *Texas, Artificial precipitation, Nucleation, Silver iodide, Precipitation(Atmospheric), Rainfall, Distribution patterns, Data processing, Water supply, Meteorology.
Identifiers: *Colorado River(Tex).

An analysis of available data disclosed that for the 5-year period 1971-75, the target area of the District's weather modification program received more rainfall than any other similar 5-year period since 1935. Indeed, rainfall over the target area during the seeded years was at least double that observed during any other similar 5-year period during the years 1935-70. Furthermore, rainfall increases in the target area during the seeded years were 17% greater than those of the control area for the same time period. Although the findings of the examination showed that rainfall over the target area has been increased to a greater degree than that of adjacent areas, it cannot be said with certainty that the increases are related directly to the seeding of cumulus clouds. A more substantive analysis would require a greater data resource, as well as the utilization of more sophisticated statistical analytical procedures. (Sims-ISWS)
W77-10775

3C. Use Of Water Of Impaired Quality

CHEMICAL QUALITY OF IRRIGATION WATER POLLUTED WITH NITROGEN COMPOUNDS, (IN JAPANESE),
National Agricultural Experiment Station, Hokkaido (Japan).
For primary bibliographic entry see Field 5B.
W77-10156

RENOVATED WASTEWATER AS A SUPPLEMENTARY SOURCE FOR MUNICIPAL WATER SUPPLY: AN ECONOMIC EVALUATION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
R. M. Clark, J. I. Gillean, and K. Adams.
1976. 113 p, 58 fig, 25 tab, 7 ref, 3 append. EPA Technical Report EPA-600/1-76-033.

Descriptors: *Water reuse, *Water reclamation, *Cost comparisons, *Potable water, *Water management, Reclaimed water, Water supply, Dependable supply, Water quality, Waste water treatment, Water conservation, Municipal wastes.
Identifiers: San Diego(CA), Dallas(TX).

Growing concern and awareness about maintaining an adequate water supply for the future has led to an investigation into the feasibility of waste water reclamation and reuse for drinking water. Three alternatives for obtaining additional water were considered: (1) expansion of the existing water supply source; (2) treatment of processed waste water by an add-on reservoir renovated treatment system, dilution in existing reservoirs, and subsequent transport to the water treatment plant; and (3) treatment of processed waste water by an additional waste water treatment plant and subsequent transport to the headworks of the existing water treatment facility, bypassing the reservoir. The San Diego and Dallas Water Utilities, in areas where water supplies are needed, were chosen for consideration. Standardized costs were developed and comparisons were made between existing facilities and the three alternatives. Costs for acquisition, treatment, distribution, and other associated costs for the current water supply system were calculated. For both utilities, acquisition produced the greatest increase in cost over the existing system. Expansion of the existing water supply source was the most economical alternative for obtaining additional water. Reuse of waste water for drinking purposes may become advantageous when additional sources of potable water are limited. Reuse for agricultural purposes could be used to conserve existing supplies of drinking water. (Schulz-FIRL)
W77-10540

IRRIGATING WITH WASTEWATER IN SONOMA COUNTY,
California Univ., Davis. Cooperative Extension.
For primary bibliographic entry see Field 5D.
W77-10624

3D. Conservation In Domestic and Municipal Use

PROBLEMS AND POLICY ALTERNATIVES URBAN AREAS,
Envirex, Milwaukee, Wis.
For primary bibliographic entry see Field 5G.
W77-10160

DYNAMICS OF URBAN DEVELOPMENT O FLOOD PLAINS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 4A.
W77-10179

EFFECT OF LAND USE MANAGEMENT O FLOOD PREDICTIONS,
Central Shenandoah Planning District Commission, Staunton, Va.
For primary bibliographic entry see Field 4C.
W77-10181

OPTIMAL SYSTEMS OF STORM WATER D TENTION BASINS IN URBAN AREAS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 4D.
W77-10184

A SANITARY ENGINEER'S VIEWPOINT O TALL BUILDINGS,
Murray (Alex) Pty Ltd., Durban (South Africa).
For primary bibliographic entry see Field 8A.
W77-10213

EFFICIENCY IN INDUSTRIAL, MUNICIPA AND DOMESTIC WATER USE,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering
For primary bibliographic entry see Field 6D.
W77-10375

A MATHEMATICAL MODEL FOR URBAN R NOFF,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 2A.
W77-10434

AN EVALUATION OF WATER REUSE FO MUNICIPAL SUPPLY,
Southern Illinois Univ. at Carbondale.
For primary bibliographic entry see Field 5D.
W77-10444

THE APPLICATION OF SURFACE WAT RULES IN URBAN AREAS,
For primary bibliographic entry see Field 6E.

W77-10459

ALBUQUERQUE CLOSES WATER-WASTE-WATER CYCLE.
For primary bibliographic entry see Field 5D.
W77-10633

3E. Conservation In Industry

PROBLEMS AND POLICY ALTERNATIVES: MINING,
Environmental Protection Agency, Springfield, Ill.
For primary bibliographic entry see Field 5G.
W77-10163

THE APPLICATION OF ULTRASONIC LIQUID FLOW MEASUREMENT TO THE WATER AND WASTE WATER CONTROL INDUSTRY,
For primary bibliographic entry see Field 8C.
W77-10219

COMPUTER APPLICATIONS TO ACHIEVE OPTIMUM ECONOMIC LOADING OF GENERATING PLANTS,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 6A.
W77-10288

ULTRAFILTRATION--THE CURRENT STATE OF THE ART,
Abcor Environmental Systems, Ltd., Surbiton (England).
For primary bibliographic entry see Field 5D.
W77-10338

REDUCING PHOTOPROCESSING WASTES THROUGH REUSE AND RECYCLING,
Weston Environmental Consultants-Designers, New York, N.Y.
For primary bibliographic entry see Field 5D.
W77-10340

TREATING METAL FORGING AND PROCESSING WASTEWATER,
Engineering-Science, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 5D.
W77-10346

SODIUM BICARBONATE TREATS ACIDIC INDUSTRIAL WASTES,
South Carolina Univ., Columbia. Environmental Engineering Program.
For primary bibliographic entry see Field 5D.
W77-10347

SOME ASPECTS OF HIGH GRADIENT MAGNETIC SEPARATION,
International Research and Development Co., Newcastle-upon-Tyne (England).
For primary bibliographic entry see Field 5D.
W77-10349

OPERATING EXPERIENCES ON PETROCHEMICALS WASTE WATER TREATMENT PLANT OF GUJARAT AROMATICS PROJECT AT JAWAHARNAGAR,
Indian Petrochemicals Corp. Ltd. Jawaharnagar (India).
For primary bibliographic entry see Field 5D.
W77-10351

REFINERY OIL/WATER SEPARATION EQUIPMENT AND ITS APPLICATIONS,
For primary bibliographic entry see Field 5D.
W77-10352

EFFICIENCY IN INDUSTRIAL, MUNICIPAL AND DOMESTIC WATER USE,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W77-10375

WASTEWATER MANAGEMENT IN THE SOLID WOOD AND BOARD PRODUCTS INDUSTRIES: A REVIEW,
Mississippi State Univ., Mississippi State. Forest Product Lab.
For primary bibliographic entry see Field 5D.
W77-10690

PREVENTION OF SCALE FORMATION IN EVAPORATOR CHAMBERS (USTRANYAT' OBRAZOVANIE NAKIPI V KAMERAKH VYPARNOI STANTSII),
Krasnodarskii Politekhnicheskii Institut (USSR).
For primary bibliographic entry see Field 5D.
W77-10691

EXAMPLE OF PLANNING FOR ENVIRONMENTAL PROTECTION (PLANUNGSBEISPIEL ZUM UMWELTSCHUTZ).
For primary bibliographic entry see Field 5D.
W77-10694

APPARATUS FOR TREATING A LIQUID USING A PERCOLATING LAYER (APPAREIL DE TRAITMENT DE LIQUIDE A COUCHE DE PERCOLATION).
For primary bibliographic entry see Field 5D.
W77-10696

DETERMINATION OF THE DEGREE OF ACCUMULATION OF RESIDUAL LIQUOR COMPONENTS DURING RECYCLING OF THE LIQUOR (OPREDELENIE STEPENI NAKOPLENIYA KOMPONENTOV POSLEDROZHZHEVOI BRAZHKI PRI VOZVRATE EE V PROIZVODSTVENNYI TSIKL),
B. I. Tokarev, D. D. Savel'ev, I. I. Balashevich, and I. E. Zuber.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No 8, p 1-3, 1976. 2 fig.

Descriptors: *Fermentation, *Water reuse, *Industrial water, *Water pollution, *Yeasts, Recirculated water, Wastes, Industrial wastes, Water pollution sources, Water conservation, Water pollution control, Freshwater, Toxicity, Plant growth, Inhibitors.
Identifiers: Dilution water, Concentration(Chemical).

In the fermentation industry, the residual liquor from yeast production is recycled to partially replace fresh water for dilution of the hydrolyzates, for the preparation of chemical solutions, and for fermentation. Recycling causes gradual accumulation of the residual liquor components and must be controlled so that the concentration of the components does not reach a level inhibitory for yeast. In this report calculations are made of changes during recycling in the concentration of an inert component, i.e., a component that remains chemically unchanged during the process, and of a component the concentration of which undergoes either positive or negative change (e.g., a reaction by-product, a volatile substance, or a substance utilized by yeast). The formulas derived from these calculations can be used to determine the maximum permissible percentage of residual liquor that can be recycled and the point at which a given substance reaches the inhibitory level. (Stapinski-IPC)
W77-10697

ON THE PROPERTIES OF WASTE WATER PRODUCED IN OZONE BLEACHING OF KRAFT PULP (IN JAPANESE),
Government Industrial Research Inst., Takamatsu (Japan).
For primary bibliographic entry see Field 5A.
W77-10700

USE OF INORGANIC SORBENTS FOR THE PURIFICATION OF KRAFT MILL EFFLUENTS (PRIMENENIE NEORGANICHESKIKH SORBENTOV DLYA GRUBOKOI OCHISTKI VOD SUL'FAT-TSELLYULOZNOGO PROIZVODSTVA),
Leningradskii Tekhnologicheskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti (USSR).
For primary bibliographic entry see Field 5D.
W77-10709

GREAT LAKES PAPER (CO.) LAUNCHES FIRST CLOSED-CYCLE KRAFT PULP MILL.
For primary bibliographic entry see Field 5D.
W77-10710

DISCUSSION OF THE RAPSON CONCEPT FOR A CLOSED-SYSTEM BLEACHED KRAFT PULP MILL (BESEDA O RAPSONOVE PROJEKTU UZAVRENE VYROBY BELENE SULFATOVE BUNICINY).
For primary bibliographic entry see Field 5D.
W77-10711

SEPARATION OF FIBERS FROM PAPER MILL EFFLUENT WITH CONTINUOUSLY BACKWASHED, PRESSURIZED, LIQUID FILTER,
New York State Dept. of Environmental Conservation, Syracuse.
For primary bibliographic entry see Field 5D.
W77-10713

RAW WASTE LOADING CHARACTERISTICS AND EFFLUENT QUALITY IN THE WET PROCESS HARDBOARD MANUFACTURING INDUSTRY,
Vanderbilt Univ., Nashville, Tenn. Center for Environmental Quality Management.
For primary bibliographic entry see Field 5D.
W77-10715

PURIFICATION OF PULP MILL EFFLUENTS BY THE ACTIVATED SLUDGE METHOD USING PURE OXYGEN (WYNIKI BADAN OCZYSZCZANIA SCIEKOW CELULOZOWYCH METODA OSADU CZYNNEGO Z UZYCIEM CZYSTEGO TLENU),
Technical Univ. of Warsaw (Poland). Instytut Zaopatrzenia w Wode i Budownictwa Wodnego.
For primary bibliographic entry see Field 5D.
W77-10716

ROTATING BIOLOGICAL DISC SYSTEM,
MacMillan Bloedel Research Ltd., Port Alberni (British Columbia).
For primary bibliographic entry see Field 5D.
W77-10717

PULP MILL CONDENSATES CLEANED BIOLOGICALLY WITH THE AID OF BARK (MASSAFABRIKERNAS KONDENSATVATTEN RENAS BIOLOGISKT MED HJALP AV BARK).
For primary bibliographic entry see Field 5D.
W77-10719

CHARACTERIZATION OF SPENT BLEACHING LIQUORS. PART 2. DIFFERENT SEQUENCES FROM PREBLEACHING OF PINE AND BIRCH KRAFT PULP,
Swedish Forest Products Research Lab. Stockholm.

For primary bibliographic entry see Field 5A.
W77-10723

STUDIES ON COAGULATION TREATMENT OF SPENT WATER FROM PULPING PROCESS. (PART 3). COAGULATION MECHANISM OF LIGNIN (IN JAPANESE),
Tokyo Univ. (Japan).
For primary bibliographic entry see Field 5D.
W77-10761

3F. Conservation In Agriculture

PROBLEMS AND POLICY ALTERNATIVES: AGRICULTURE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-10161

THE EFFECTIVENESS OF A MIST VERSUS A LOW PRESSURE SPRINKLER SYSTEM FOR BLOOM DELAY,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
J. W. Wolfe, P. B. Lombard, and M. Tabor.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 510-513, Special Edition 1976. 4 fig, 2 tab, 7 ref.

Descriptors: *Orchards, *Oregon, *Sprinkler irrigation, Sprinkling, Irrigation effects, Irrigation practices, Irrigation, Fruit crops.
Identifiers: *Bloom delay, *Pears, *Mist irrigation.

Tests were made on a fogging or misting system installed for bloom delay in a pear orchard at Medford, in comparison with a system using small sprinklers. Conclusions include: (1) A misting system provided greater cooling for bloom delay than a low-pressure sprinkler system when the water application rate was about 3 1/s ha (19 gpm per acre). (2) A bloom delay of 11 days was observed in Bartlett trees and 9 days in Bosc under the mist system tested during a late season. To obtain more delay during an early season would likely require running the system more hours. (3) The mist system required only about 60 percent as much water per day of delay as the sprinklers did. (4) A mist-system capacity of 3 1/s ha provided almost as many degrees of cooling on a day when the maximum air temperature was 10.6 C (51 F) as on a much warmer day, suggesting that the cooling efficiency for this system had nearly reached its maximum at 10.6 C (51 F). (5) The mist system is easier to install on established hedgerows than on large trees and appears to function at least as well there. (6) The capacity of the mist system tested was less than one third the capacity of many permanent overhead sprinkler systems used for frost control by encasing the trees in ice. (7) More research is needed to develop criteria for an economical system design for mist including determining the minimum required system capacity, the optimum (minimum) pressure required for adequate breakup of drops, a satisfactory filtration system, and the least elaborate layout for placing the mist uniformly on the trees. (Skogerboe-Colorado State)
W77-10165

A WATER SPRINKLER FOR ARBITRARILY SHAPED AREAS,
Westinghouse Electric Corp., Sunnyvale, Calif.
O. Burgdorf, and J. M. Henderson.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 704-707, Special Edition 1976. 9 fig, 2 tab, 2 ref.

Descriptors: *Sprinkling, *Sprinkler irrigation, Irrigation, Irrigation systems, *Irrigation practices, Winds, Uniformiy coefficient.

The concept of watering arbitrary areas from a single moving nozzle shows reasonable promise. The average 28 percent distribution error reflects an acceptable trade-off required to gain a 13.72 m (45 ft) range capability with 0.172 MPa (25 psi) water pressure. This project has given visibility to factors important to the continuation of design of sprinklers for watering arbitrarily shaped areas: (1) trade-off considerations between coherent flow (low range, harsh water impact and high uniformity) and highly dispersed flow (higher range, soft impact and lower uniformity); (2) kinematic limitations inherent in simple devices which depend solely on water pressure for system motion and control; (3) wind influence; (4) mechanisms for perimeter specification; and (5) optimization techniques which allow synthesis of control mechanisms for best available distributions. The concept offers potential for certain agricultural applications. For example, adjacent square patterns could prove more cost effective than overlapping rotational systems. It is necessary to seek alternate designs which keep the nozzle (or nozzles) at relatively low elevation angles to minimize wind effects. (Skogerboe-Colorado State)
W77-10166

WIND EFFECTS ON WATER APPLICATION PATTERNS FROM A LARGE, SINGLE NOZZLE SPRINKLER,
Agricultural Research Service, Morris, Minn. North Central Region; and Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
H. Schull, and A. S. Dylla.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 501-504, Special Edition 1976. 4 tab, 7 ref.

Descriptors: *Sprinkling, *Sprinkler irrigation, Winds, Uniformity coefficient, Irrigation, *Irrigation practices, Irrigation effects, Irrigation systems.
Identifiers: Sprinkler tests, *Wind effects(Irrigation).

A study was conducted to determine the effects of wind on the water application pattern for a stationary, single nozzle, gun type irrigation sprinkler. The effects of wind on application uniformity were determined by comparison of the wind-affected application patterns with calculated no-wind patterns. Deviation of the measured patterns from the no-wind patterns increased as wind velocity increased. Stationary application patterns were used to calculate the water distribution if the same sprinkler were traveling down lanes in a field. The calculated distributions from a traveling sprinkler were then overlapped with different travel lane spacings, and the Christiansen coefficient of uniformity value determined for each spacing. A regression equation was developed to give maximum travel lane spacing to obtain a coefficient of uniformity value of 0.85 as a function of wind conditions and water pressures. Both wind velocity and water pressure at the sprinkler elbow influence the water distribution. Also, for a traveling gun, wind direction relative to travel direction provides an additional affect; as the wind direction more nearly approaches the travel direction land spacing must be decreased to maintain acceptable application uniformity. (Skogerboe-Colorado State)
W77-10167

EFFECTIVE PRECIPITATION OF VARIOUS APPLICATION DEPTHS,
Agricultural Research Service, Fort Collins, Colo.
D. F. Heermann, and H. H. Shull.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 708-712, Special Edition 1976. 8 fig, 3 tab, 21 ref.

Descriptors: Lysimeters, Rainfall, *Rain, Evapotranspiration, *Water requirements, *Crop production.
Identifiers: *Irrigation scheduling.

Irrigators have always questioned how effective small rains and light irrigations are in meeting crop water requirements. Data from precision weighing lysimeters indicated that very small rains offset the normal water use by the plants and, therefore, very effectively meet crop water requirements. (Skogerboe-Colorado State)
W77-10168

DEEP PERCOLATION IN A FURROW-IRRIGATED SANDY SOIL,
Agricultural Research Service, Lincoln, Nebr.
C. L. Linderman, L. N. Mielke, and G. E. Schuman.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 250-253, Special Edition 1976. 6 fig, 1 tab, 20 ref.

Descriptors: *Deep percolation, *Furrow irrigation, *Sands, Irrigation, Irrigation effects, Fertilization, Irrigation practices.

Irrigating sandy soils with shallow water tables creates a potential for deep percolation losses of water and nitrogen and consequently, nitrate pollution of groundwater. The amount and nitrate content of percolate was measured with eight vacuum extractors buried below the root zone in a sandy, furrow-irrigated cornfield. Total irrigation-season percolation was 17.6 cm, which was 25 percent of the water leaving the root zone. The maximum percolation rate was over 0.37 cm/day when the corn root system was not yet fully developed and when heavy rainfall followed irrigating. More frequent irriations with smaller amounts of water should reduce percolation. Percolation of nitrate nitrogen was 2.5 kg/ha/cm of percolate when N (67 kg/ha) was applied in slution in the irrigation water and 3.0 kg/ha/cm of percolate when anhydrous ammonia N (90 kg/ha) was sidedressed. Percolation of nitrate-nitrogen was affected more by total deep percolation of water than by the method of fertilizer application. (Skogerboe-Colorado State)
W77-10169

SIMULATING OVERLAND FLOW IN BORDER IRRIGATION,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
D. L. Bassett, and D. W. Fitzsimmons.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 666-671, Special Edition 1976. 3 fig, 2 tab, 15 ref.

Descriptors: *Border irrigation, *Surface irrigation, *Overland flow, *Simulation analysis, Mathematical models, Model studies, Irrigation, Irrigation systems.

A mathematical model of the border irrigation process is introduced. It is based on the complete equations of continuity and momentum for unsteady, spatially varied flow in open channels. The equations are solved approximately by the method of characteristics. Simulated irrigations are compared to test data. Agreement between simulated and observed data is generally satisfactory. Applications of the model are suggested. (Skogerboe-Colorado State)
W77-10170

NATIONAL AND INTERREGIONAL MODELS OF LAND USE, WATER ALLOCATION, SOIL LOSS CONTROL, AND AGRICULTURAL POLICY,
Iowa State Univ., Ames. Center for Agriculture and Rural Development.
For primary bibliographic entry see Field 6A.
W77-10171

FIELD EVALUATION OF 102-MM (4-INCH) CORRUGATED POLYETHYLENE TUBING,
Soil Conservation Service, Broomal, Pa. Dept. Water Management Engineering
For primary bibliographic entry see Field 8G.

W77-10172

THE RESISTANCE OF INTACT MAIZE ROOTS TO WATER FLOW,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 2G.
W77-10271

PHOSPHORUS SORPTION AND DESORPTION CHARACTERISTICS OF SOIL AS AFFECTED BY ORGANIC RESIDUES,
daho Univ., Moscow. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 2G.
W77-10275

IIGH-FREQUENCY IRRIGATION FOR WATER NUTRIENT MANAGEMENT IN IUMID REGIONS,
Agricultural Research Service, Florence, S.C. Coastal Plains Soil and Water Conservation esearch Center.
. J. Phene, and O. W. Beale.
oil Science Society of America Journal, Vol 40, lo 3, p 430-436, May-June 1976. 8 fig, 2 tab, 16 ef.

escriptors: Subsurface irrigation, *Irrigation ystems, Irrigation, *Irrigation effects, Nutrients, lumid climates, *Humid areas, Soil water, Fer- lization, Crop response, Corn(Field), Furrow ir- gation, Sprinkler irrigation, Leaching, Crop roduction.
lentifiers: Trickle irrigation, Drip irrigation.

water-nutrient management method was esigned to prevent plant-water and nutrient resses while maximizing the available soil water orage to accomodate rainfall. This method inimized the need for the soil as a storage reser- oir for water and nutrients by frequently irrigat- g a portion of the root zone with small amounts water and nutrients. The optimal range of soil atric potential, based on soil oxygen diffusion te, soil strength, water desorption charac- ristics, and unsaturated hydraulic conductivity as used to determine high-frequency irrigation iteria for sweet corn. Trickle-irrigated plots elded 12 and 14% more corn than did the furrow- d sprinkler-irrigated plots. When fertilizers were oadcast and banded, soil NO3-N profiles mea- red near the end of the growing season showed at, compared to furrow and sprinkler irrigation, ckle irrigation reduced NO3-N losses from the ot zone. (Skogerboe-Colorado State)
77-10278

TECHNIQUE TO DETERMINE IRON EFFI- ENCY IN PLANTS,
gricultural Research Service, Beltsville, Md. ant Physiology Inst.
r primary bibliographic entry see Field 2G.
77-10280

EVALUATION OF SULFUR-COATED UREA A PREPLANT TOTAL SEASON NITROGEN PPLY FOR TRELLISED TOMATOES,
rth Carolina State Univ., Raleigh. Dept. of Soil ence.
. Shelton.
l Science Society of America Journal, Vol. 40, . 1, p 126-129, January-February 1976. 2 fig, 2 , 5 ref.

scriptors: *Ureas, *Nitrogen, Nutrients, Fer- zation, *Tomatoes, Crop response, Sampling, op production.
ntifiers: *Sulfur-coated urea.

e use of a controlled release N source for the duction of trellised tomatoes which require quent topdressings would be desirable. Three sulfur-coated urea (SCU) materials having release rates of 11.4, 21.5, and 19.3% over a 7-day period were compared to NH4NO3 applied preplant or as multiple applications. Nitrogen rates were 392, 560, and 729 kg N/ha. Marketable yields from an application of SCU(11.4) at 392 or 560 kg N/ha were greater than with the same rate of N as NH4NO3 either as preplant or split applications. When SCU(21.5) or SCU(29.3) was used, the yields were comparable to a single application of NH4NO3. Differences in fruit number per plot were not significantly related to treatments. However, there was a significant difference in average fruit weight which was correlated with total yield. Tissue N content was highest at the first sampling from a single application of NH4NO3 and lowest from SCU(11.4). However, at later sampling periods the N content was maintained at a higher level with SCU(11.4). Although 729 kg N/ha as a single application of NH4NO3 detrimentally affected plant growth and production, this effect was not noted with the sulfur-coated urea materials. (Skogerboe-Colorado State)
W77-10283

INFLUENCE OF ROW SPACING AND STRAW MULCH ON FIRST STAGE DRYING,
Agricultural Research Service, Temple, Tex. Southern Region.
For primary bibliographic entry see Field 2D.
W77-10286

LAW OF PROBABILITY FOR TWO LOW WATER VARIABLES,
Direction des Eaux, Baja (Hungary).
For primary bibliographic entry see Field 2E.
W77-10297

HERE COMES THE SUN.
For primary bibliographic entry see Field 8C.
W77-10518

CAN IRRIGATION WITH MUNICIPAL WASTE WATER CONSERVE ENERGY,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 5E.
W77-10579

IRRIGATION TRIAL WITH MORRO BAY WASTEWATER,
California Univ., Davis. Cooperative Extension.
For primary bibliographic entry see Field 5D.
W77-10623

IRRIGATING WITH WASTEWATER IN SONOMA COUNTY,
California Univ., Davis. Cooperative Extension.
For primary bibliographic entry see Field 5D.
W77-10624

QUANTIFICATION OF BENEFICIAL EFFECTS OF SPRINKLER IRRIGATION APART FROM INCREASE IN CROP YIELD, (IN GERMAN),
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Muencheberg (East Germany). Forschungszentrum Bodenfruchtbarkeit.
Helmut Foerkel, and Fritz Schirach.
Arch Acker-Pflanzenbau Bodenkd 19(5), p 375-382, 1975.

Descriptors: *Benefits, *Sprinkler irrigation, *Livestock, *Forage palatability, *Irrigation systems, Efficiencies, Crop response, Slurries, Nutrient requirements.
Identifiers: Livestock production.

To estimate the efficiency of sprinkler irrigation systems it is necessary to take into account the beneficial effects of sprinkler irrigation apart from the increase in crop yield. The effect on the cropping structure and the advantages to livestock production that arise from the better forage quality are of major importance. Other cost reductions in crop production are usually of minor importance. Changes in the cost of drinking water if a large part of the irrigated land is used as pasture, and slurry application through the sprinkler system as against mobile slurrying may also have some effect.
W77-10726

NEW SOLUTIONS FOR WATER RESERVOIRS IN IRRIGATION SYSTEMS FED BY THE DANUBE AND INLAND RIVERS, (IN FRENCH),
S. Hancu, V. Jeler, Lucia Predescu, and I. Vasilescu.
Bull Acad Sci Agric For 3, p 43-56, 1973.

Descriptors: *Reservoirs, *Irrigation systems, *Water supply, *Water sources, Rivers, Hydraulic models, Laboratory tests, Dams, Dam design, Damsites.
Identifiers: Danube, Romania.

Water reservoirs are of fundamental importance to the proper functioning of irrigation systems; since they depend on the characteristics of the water source and the conditions imposed by their exploitation, the planning of reservoirs requires careful study and research on hydraulic models under laboratory conditions. Such studies made to date by the collectives of the Institute for the Study of Improved Water Sources (Romania) has led to the establishment of certain types of reservoirs in free communication with the Danube and inland rivers. The investments required for such reservoirs are more modest than those of other known types. The adaptation of such types of reservoirs under specific local conditions is not possible without laboratory trials. When dams are required, laboratory studies must be focused particularly on correct placement, the layout of the project and the dimensions of the compartment construction parts.
W77-10727

A BASIC STUDY ON APPLICATION OF SYSTEMIC INSECTICIDES: V. EFFECTS OF RAINFALL ON TOXICITY OF VAMIDOTHION AND MALATHION, (IN JAPANESE),
Shionogi Co. Ltd., Shiga (Japan). Aburahi Lab.
For primary bibliographic entry see Field 5C.
W77-10737

AN ECONOMIC ANALYSIS OF IRRIGATED FARMING WITH DIMINISHING GROUND WATER RESERVES,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 4B.
W77-10748

SURFACE ROUGHNESS OF CROPS AND POTENTIAL EVAPOTRANSPIRATION,
International Inst. for Land Reclamation and Improvement, Wageningen (Netherlands).
For primary bibliographic entry see Field 2D.
W77-10771

EFFECTS OF INCREASED FERTILIZER RATES ON NITROGEN CONTENT OF RUNOFF AND PERCOLATE FROM MONOLITH LYSIMETERS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W77-10773

HOW ACCURATE ARE SHOP-MADE ORIFICE PLATES,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
W. O. Ree.

Transactions of the American Society of Agricultural Engineers, Vol 20, No 2, p 298-300, March-April 1977. 3 fig, 2 tab.

Descriptors: *Irrigation, *Flow measurement, *Orifice flow, Orifices, Measurement, On-site data collections, Equipment, Gages, Flow, Irrigation ditches, Irrigation engineering, Water delivery, Irrigation efficiency.
Identifiers: *Orifice plates.

Efficient use of irrigation water may require field measurement of furrow flows. A plate with a circular orifice, together with a simple hook gage (both readily made in any sheet metal shop), can be used to measure the flows. However, the orifice may not be perfect, and its accuracy is doubtful. Tests of a sample lot of orifice plates showed that errors in flow measurement could be as large as 15% for a 2.54-cm diameter orifice. For a 8.89-cm diameter orifice, the maximum error would probably be about 2%. The errors are tolerable for rough flow measurements but not for a more accurate measurement. The head measuring technique was checked and found to be satisfactory. (Sims-ISWS)
W77-10782

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

SIMULATING OVERLAND FLOW IN BORDER IRRIGATION,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-10170

FIELD EVALUATION OF 102-MM (4-INCH) CORRUGATED POLYETHYLENE TUBING,
Soil Conservation Service, Broomal, Pa. Dept. of Water Management Engineering.
For primary bibliographic entry see Field 8G.
W77-10172

RURAL DOMESTIC WATER SYSTEM PEAK FLOWS AND DESIGN INNOVATIONS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 8B.
W77-10176

DYNAMICS OF URBAN DEVELOPMENT ON FLOOD PLAINS,
Kansas Water Resources Research Inst., Manhattan.
R. F. Wiseman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 617, Price codes: A04 in paper copy, A01 in microfiche. KWWRI Contribution No 189, April 1977. 57 p, 27 fig, 1 tab, 125 ref. OWRT A-072-KAN(1). 14-31-0001-5016.

Descriptors: *Flood plains, *Land use, *Kansas, Urbanization, Cities, Floods, Flood control, *Flood forecasting, Flood frequency.
Identifiers: *Urban development, *Flood risk, Urban morphology, *Flood probability level.

This study presents a descriptive analysis of urban land use development on flood plain areas within Wichita, Kansas. The principal data source is building permits and tax records which identify the number of square feet of floor space constructed, year of construction and land use type. Aggregated to the census block level, construction rates for five year periods from 1941 to 1970 are compared across flood probability levels. A discussion of the major theories of urban morphology is supported by examination of the data documenting Wichita's development during the period 1900 to 1970. Analysis of relationships between this development and the flood risk potential as measured by flood probability reveals the following. During periods when there is moderate pressure for urban growth, developers are reluctant to build on land which has a flood probability greater than one flood per ten years. This reluctance has diminished over the past several decades and is totally non-existent during periods of strong pressure for urban growth. In fact, the period of greatest growth pressure witnessed more construction in two year flood probability areas than in areas with lower flood risk. This situation and the spatial nature of urban development over time result in the development of all areas regardless of flood risk. A history of recent, significant floods does not impede urban construction. This is particularly true of industrial and residential land uses and less typical for commercial development.
W77-10179

EFFECT OF LAND USE MANAGEMENT ON FLOOD PREDICTIONS,
Central Shenandoah Planning District Commission, Staunton, Va.
For primary bibliographic entry see Field 4C.
W77-10181

OPTIMAL EXPANSION OF FLOOD CONTROL SYSTEMS, (FINAL REPORT: VOLUME I),
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 6F.
W77-10263

EVALUATION OF FRESHWATER WETLANDS DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2H.
W77-10267

CONTROL OF ALGAE IN LAKES, LAGOONS AND SMALL RESERVOIRS WITH BIOGROWTH PARTITIONS,
Missouri Univ.-Rolla. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-10268

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
For primary bibliographic entry see Field 2E.
W77-10296

THE USE OF MATHEMATICAL MODELS FOR FORECASTING IN HYDROLOGY AND METEOROLOGY,
Electricite de France, Grenoble. General Technical Div.
For primary bibliographic entry see Field 2A.
W77-10298

MODEL STUDIES OF DENVER WHITEWATER CHANNEL,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W77-10304

METHOD FOR ROUGHLY ESTIMATING THE WATER EXCHANGE OF A RESERVOIR WITH AN AQUIFER HYDRAULICALLY CONNECTED WITH IT,
For primary bibliographic entry see Field 4B.
W77-10321

EXPERIMENTAL DETERMINATION OF THE RADIO EMISSION OF THE UNDERLYING SURFACE ON LAMBDA = 2.1 CM,
For primary bibliographic entry see Field 7B.
W77-10322

REDUCTION OF 2, 4-D LOAD IN SURFACE RUNOFF DOWN A GRASSED WATERWAY,
Agricultural Research Service, Tifton, Ga. Southern Region.
For primary bibliographic entry see Field 5G.
W77-10323

HIERARCHICAL ANALYSES OF WATER RESOURCES SYSTEMS, MODELING AND OPTIMIZATION OF LARGE-SCALE SYSTEMS,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 6A.
W77-10418

APPLICATION OF MATHEMATICAL MODELS IN HYDROLOGY AND WATER RESOURCES SYSTEMS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2A.
W77-10419

APPLICATION OF SOME STATISTICAL METHODS FOR THE ESTIMATION OF MINIMUM FLOW,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2E.
W77-10420

A NEW METHOD FOR MODELLING MONTHLY DISCHARGE SERIES,
Research Inst. for Water Resources Development, Budapest (Hungary).
M. Kardos.
In: Application of Mathematical Models in Hydrology and Water Resources Systems (Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 121-129, 1975. 3 fig, 7 ref.

Descriptors: *Model studies, *Statistical methods, *Runoff, *Simulation analysis, Mathematical models, Discharge(Water), Watersheds(Basins), Synthetic hydrology, Analytical techniques, Markov processes, Stochastic processes, Monthly, Annual, Variability, Random number, Synthesis, Foreign research, Time series analysis.
Identifiers: *Hungary, *Danube River(Hungary), *Tisza River(Hungary).

The most widespread methods for generating long discharge series relating to several hundred years which are necessary for the efficient operation of simulation models generally used in modern water management systems, are mainly mathematical models based on the Monte Carlo method. The basic idea of the models is to take the time functions of discharges as stochastic processes about which we know one realization in the past. Assuming that some future statistical properties of the processes will remain unchanged, elements of arbitrary long series can be generated by the use of random numbers; that is to say, so-called generated series can be constructed. The series can be taken as one of the possible realizations of the future. The generation of the series in a single section of a water course was made in two steps: first the yearly and then the monthly series were generated. A new method was developed to avoid the disadvantages of the usual methods of generating discharge series. The basic idea of the new method is the assumption that the characteristics of the discharge distributions within a year of the future will be similar to those of the past. To facilitate the judgement of the reliabi-

f the new method, a comparison was made of the tatistical parameters of series generated by the raditional and by the new method. It was found hat statistical parameters of the series generated y the new method are much closer to the same arameters of observed series than are the arameters of a series generated by the traditional ethod. (See also W77-10419) (Humphreys-ISWS)
V77-10425

ERFORMANCE OF TWO DETERMINISTIC YDROLOGICAL MODELS,
epartment of the Environment, Ottawa Ontario). Water Resources Branch.
. W. Kite.
n: Application of Mathematical Models in ydrology and Water Resources Systems; roceedings of the Bratislava Symposium, Sepmber 1975: International Association of ydrological Sciences Publication No. 115, p 136-42, 1975. 2 fig, 1 tab, 4 ref.

escriptors: *Model studies, Watersheds(Basins), *Canada, *Runoff, *Flood orecasting, Hydrographs, Hydrology, ischarge(Water), Computer models, Evaluation, erformance.
dentifiers: *Ontario(Canada), *Magpie iver(Canada).

wo model studies were performed in the basin of e Magpie River in northern Ontario. The basin s an area of 1900 sq km and is situated in the anadian Shield of Pre-Cambrian rock. The river s a length of just over 90 km and falls approxiately 330 m before entering Lake Superior. The il cover is a mixture of productive forest and nproductive swamp forest. The results from a mple basin model, (Water Resources Branch) th a few parameters and an automatic optimizaon scheme were compared to the results of the ger and more complex 'Streamflow Synthesis d Reservoir Regulation (SSARR) model. While e small model obviously does not have the verility and range of application of the larger dels, it can be easily and quickly applied to sins without a large amount of data. Comrisons were carried out using 12 months daily ta for calibration of the models and 12 months ta for verification. The simpler WRB model ve results which were statistically at least equal those of the more complex SSARR model. The sults from the WRB model can be used to inate those components of the hydrological cycle portant in a study basin. The information then n be used to reduce the number of trial-and-or computer runs for models such as SSARR. e also W77-10419) (Humphreys-ISWS)
7-10426

ATISTICAL MODELLING OF RIVER FLOW THE MONTE CARLO METHOD AND ALUATION OF DISTRIBUTION PARAMERS AND QUANTITIES,
sudarstvennyi Gidrologicheskii Institut, Leningd (USSR).
primary bibliographic entry see Field 2E.
7-10433

MATHEMATICAL MODEL FOR URBAN RUFF,
effield Univ. (England). Dept. of Civil and uctural Engineering.
primary bibliographic entry see Field 2A.
7-10434

OCHASTIC PROPERTIES OF THE OCESSES TRANSFORMED IN LINEAR DROLOGICAL SYSTEMS,
sh Academy of Sciences, Warsaw. Inst. of physics.
primary bibliographic entry see Field 2A.
7-10436

APPLICATION OF CONCEPTUAL RAINFALL-RUNOFF MODELS IN A COMPLEX PROGRAM,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 2A.
W77-10437

A MATHEMATICAL MODEL OF FLOOD WAVES MOVING ALONG A CASCADE OF RESERVOIRS ON A LARGE RIVER,
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 2E.
W77-10438

STRUCTURE OF NATURAL HYDROLOGIC TIME PROCESSES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10440

LONG-RANGE CHANGES,
Department of the Environment, Ottawa (Ontario). Inland Water Directorate; Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2A.
W77-10443

DREDGE RIVER CHANNEL: NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT (FINAL SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT).
Naval Facilities Engineering Command, Philadelphia, Pa. Northern Div.
For primary bibliographic entry see Field 6G.
W77-10454

WATERS OF THE UNITED STATES: DOES FEDERAL CONTROL INUNDATE THE WETLAND (COMMENT ON US V HOLLAND),
For primary bibliographic entry see Field 6E.
W77-10463

FLORIDA'S LAND USE RESTRICTIONS: ARE THEY SERVING THE PUBLIC INTEREST,
For primary bibliographic entry see Field 6E.
W77-10465

COASTAL ZONE MANAGEMENT INVOLVING THE BOUNDARY WATERS OF NEW YORK AND ONTARIO,
For primary bibliographic entry see Field 6E.
W77-10469

FEDERAL AND STATE CONTROLS OVER LAND/WATER DEVELOPMENT IN NAVIGABLE AND NON-NAVIGABLE WATERS,
For primary bibliographic entry see Field 6E.
W77-10470

MODEL FOR EVALUATING THE EFFECTS OF DIKES ON THE WATER AND SALT BALANCE OF GREAT SALT LAKE, UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 2H.
W77-10563

THE PREDICTION OF THE RAINFALL-RUNOFF BEHAVIOR IN URBAN AREAS (ZUR PROGNOSE DES NIEDERSCHLAG-ABFLUSS-VERHALTENS IN URBANEN EINZUGSGEBIETEN),
W. Neumann.
Wasserwirtschaft, Vol. 67, No. 4, p 89-93, April, 1977. 9 fig, 10 ref.

Descriptors: *Rainfall-runoff relationships, *Model studies, *Urban areas, Flow, Surface runoff, Precipitation(Atmospheric), Urban runoff, Slopes, Overland flow, Physical properties.

A model for the prediction of urban rainfall-runoff relationships was presented. A division into surface and channel systems was necessary, and an overland flow model was especially important regarding the transfer of areal characteristics. A single linear reservoir model suffices if the parameter is based on specific area characteristic values. Variables considered included length of flow, roughness of area surface, and slope. Rainfall intensity influences were necessarily considered in the nonlinear rainfall-runoff process. The model provided practical solutions to this problem. (Collins-FIRL)
W77-10581

URBAN RUNOFF AND COMBINED SEWER OVERFLOW,
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
R. Field, R. Bowden, and K. Rozgonyi.
Journal Water Pollution Control Federation, Vol 49, No 6, p 1095-1104, June, 1977. 116 ref.

Descriptors: *Storm runoff, *Storm drains, *Combined sewers, *Urban runoff, *Infiltration, Mathematical models, Hydrologic studies, Overflow, Flow control, Flow measurement, Runoff, Urban runoff, Urban hydrology, Waste water treatment, Water Pollution Control Federation.

A literature review is presented of the various aspects related to the control and treatment of storm water discharges and combined waste water overflows from urban areas. Various methods for determining the quantity and quality of urban runoff are discussed, including descriptions of field and laboratory studies. Hydrologic studies and mathematical models for simulation of storm and combined sewer systems are considered for urban watershed management. The use of infiltration-flow analysis and flow meters is outlined for sewer system management and evaluation. Previous studies of construction costs for combined sewer overflow treatment plants and erosion control programs are described. (Schulz-FIRL)
W77-10600

STORM MANAGEMENT PROGRAM IS MODEL FOR OTHERS,
Georgia Inst. of Tech., Atlanta. Dept. of City Planning.
T. B. Debo, and B. O. Ulrich.
Public Works, Vol. 108, No. 7, p 60-62, July, 1977. 3 fig.

Descriptors: *Storm runoff, *Stream bank erosion, *Surface runoff, *Stream flow, *Flood routing, Sedimentation, Erosion control, Planning, Model studies, Hydrologic models, Storm water, Urbanization, Urban drainage.
Identifiers: Columbus(GA), Columbus Storm Water Management Program(CSWMP).

Urbanization and changes in land use have substantially altered the natural drainage and vegetation patterns in the area of Columbus, Georgia. Construction in previously undeveloped areas has led to increased surface runoff, sedimentation, stream-flow, and stream bank erosion. The Columbus Storm Water Management Program (CSWMP) was designed to establish guidelines and procedures to alleviate flooding, erosion, and sedimentation and to protect existing natural areas. New computer techniques are used to augment traditional methods. The first phase of the three phase program included a comprehensive soils inventory and analysis to supplement existing data. The goal of the second phase was to conduct

hydrologic studies and to develop a comprehensive erosion and sediment control program. Third phase of the program includes implementation of a two-part urban flood simulation model. The first component of the model generates flood hydrographs and frequency estimates, while the second component evaluates alternative flood mitigation measures using local physical characteristics and economic data. (Schulz-FIRL)
W77-10612

THE APPLICATION OF HYDROMETEOROLOGICAL DATA OBTAINED BY REMOTE SENSING TECHNIQUES FOR MULTIPURPOSE RESERVOIR OPERATIONS,
Salt River Project, Phoenix, Ariz.
W. L. Warskow, T. T. Wilson, Jr., and K. Kidar.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 29-37, 1975. 4 ref.

Descriptors: *Remote sensing, *Snow cover, *Reservoirs, *Arizona, Satellites(Artificial), Projects, Snowpacks, Snowmelt, Runoff, Watersheds(Basins), Rivers, Mapping, Water resources, Water management(Applied), Hydrology, Meteorology.

Watershed snowpack and streamflow data obtained and transmitted by (ERTS) satellite has been used in the operational and water management decisions in the Salt River Project. Located in central Arizona, the Project provides water and electric power for the more than 1.1 million residents of the Salt River Valley. The water supply source is a 33,670 sq km watershed and 250 deep well pumps. Six storage reservoirs, four of which have hydroelectric capability, located on two river systems have a storage capacity of over 246,600 hectare-metres (2,000,000 AF.). Information from the watershed during the normal runoff period of December to May and more especially during critical periods of high runoff and minimum reservoir storage capacity is necessary for the reservoir operation regimen. Extent of the snowpack, depth of snow, and the condition of the pack has been observed and reported by an observer in aerial flights over the watershed. Snow density, air temperature, accumulated precipitation, and streamflow quantities have been relayed by satellite data collection stations. The data, along with bi-weekly snow surveys, have been the bases for runoff volume forecasts and for the development of the reservoir operations plan. The application of snow mapping techniques from satellite imagery which can provide frequent definition of the areal extent of watershed snow cover holds good potential for improved accuracy of the volume forecasts as well as providing needed information for the day to day critical operational decisions. (See W77-10662) (Sims-ISWS)
W77-10664

INTERPRETATION OF SNOWCOVER FROM SATELLITE IMAGERY FOR USE IN WATER SUPPLY FORECASTS IN THE SIERRA NEVADA,
California State Dept. of Water Resources, Sacramento. Snow Surveys Branch.
A. J. Brown, and J. F. Hannaford.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 39-51, 1975. 3 fig.

Descriptors: *Remote sensing, *Snow cover, Water resources, *California, Satellites(Artificial), Watersheds(Basins), Snowpacks, Mountains, Snowmelt, Runoff, Rivers, Reservoirs, Water supply, Water management(Applied), Forecasting, Data processing, *Forecasting.
Identifiers: *LANDSAT data, *Sierra Nevada.

The California Applications Systems Verification Test (ASVT) test area is composed of two study areas; one in Northern California covering the Upper Sacramento and Feather River Basins, and the other covering the Southern Sierra Basins of the San Joaquin, Kings, Kaweah, Tule, and Kern Rivers. The paper described the experiences of reducing snowcover from satellite imagery, the accuracy of present water supply forecast schemes, and the potential operational advantages of introducing snowcover into the forecast procedures. (See also W77-10662) (Sims-ISWS)
W77-10665

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS IN RIO GRANDE DRAINAGE OF COLORADO,
Soil Conservation Service, Denver, Colo.
J. N. Washicheck, and T. Mikesell.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 53-69, 1975. 7 fig

Descriptors: *Remote sensing, *Snow cover, *Rio Grande River, *Colorado, Satellites(Artificial), Watersheds(Basins), Rivers, Streamflow, Forecasting, Snow, Snowpacks, Snowmelt, Runoff, Forests, Mountains, Clouds, Mapping, Data processing, Hydrology.
Identifiers: *LANDSAT data.

It is hoped that snowcover as determined from satellite pictures can be used in streamflow forecasting. An improvement in forecasting is an improvement in management. Various mapping techniques were tried and evaluated. There were many problems encountered such as distinguishing clouds from snow and snow under trees. A partial solution to some of the problems involves ground reconnaissance and low air flights. Some problems go unanswered. Snow areas, cloud cover, and total areas were planimetered after transferring imagery by use of zoom transfer scope. The determinations were then compared to areas determined by use of a density slicer. Considerable adjustment is required for the two values to compare. NOAA pictures also were utilized in the evaluation. Forest cover is one of the parameters used in the modeling process. The determination of the percentage is being explored. (See also W77-10662) (Sims-ISWS)
W77-10666

THE OPERATIONAL PROGRAM OF SATELLITE SNOWCOVER OBSERVATION AT NOAA/NESS.
National Environmental Satellite Service, Washington, D.C.
S. R. Schneider.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 87-101, 1975. 5 fig, 2 tab, 9 ref.

Descriptors: *Remote sensing, *Snow cover, *Watersheds(Basins), Satellites(Artificial), Rivers, Snowpacks, Snow, Snowmelt, Runoff, Mapping, Data processing, Quality control, Water resources, Hydrology, *River basins.
Identifiers: *GEOS data.

NOAA's National Environmental Satellite Service (NESS) has been producing satellite derived areal snow cover maps for selected river basins during the past three snow seasons. The project began in the Spring of 1973 with four basins originally targeted for study. The basins were selected so as to provide a variety of topographic, spatial, and climatological characteristics. The subject areas included the American River basin in California, the Williamette River basin in Oregon, the Red River of the North basin in North Dakota and Minnesota, and two sub-basins of the Genesee River in New York. An increase in manpower resources and the procurement of an electronic planimeter has enabled NESS to expand this successful program. Operational coverage is now being provided for 18 basins in the United States as well as several in Canada. The operational river basin snow mapping program at NESS was described, with emphasis on quality control techniques and results for the 1974-1975 snow season. (See also W77-10662) (Sims-ISWS)
W77-10668

USE OF AREAL SNOW COVER MEASUREMENTS FROM ERTS-1 IMAGERY IN SNOWMELT-RUNOFF RELATIONSHIPS IN ARIZONA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2C.
W77-10669

UTILIZATION OF LANDSAT MONITORING CAPABILITIES FOR SNOWCOVER DEPLETION ANALYSIS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W77-10670

OPERATIONAL APPLICATIONS OF NOAA-VHRR IMAGERY IN ALASKA,
Alaska Univ., Fairbanks. Inst. of Water Resources.
R. D. Seifert, R. F. Carlson, and D. L. Kane.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 143-155, 1975. 6 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Snow cover, *Floods, *Alaska, Satellites(Artificial), Runoff, Streamflow, Flood forecasting, Mapping, Snowpacks, Snow, Snowmelt, Ice, Ice jams, Water temperature, Watersheds(Basins), Hydrology.

A discussion of near-real time operational applications of NOAA satellite-enhanced thermal infrared imagery to snow monitoring for river forecasts, and a photographic overlay technique of imagery to enhance snowcover were presented. Ground truth comparisons show a thermal accuracy of approximately + or - 1C for detection of surface radiative temperatures. The application of NOAA imagery to flood mapping also was presented. (See also W77-10662) (Sims-ISWS)
W77-10672

EMPLOYMENT OF SATELLITE SNOWCOVER OBSERVATIONS FOR IMPROVING SEASONAL RUNOFF ESTIMATES,
National Aeronautics and Space Administration New York. Goddard Inst. for Space Studies.
A. Rango, V. V. Salomonson, and J. L. Foster.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 157-174, 1975. 6 fig, 2 tab, 11 ref. NOAA/NESS NA-776-74.

Descriptors: *Remote sensing, *Snow cover, *Wyoming, *Runoff, Satellites(Artificial), Watersheds(Basins), Rivers, Streamflow, Snowpacks, Snowmelt, Melt water, Seasonal, Mapping, Hydrology.
Identifiers: *Indus River(Pakistan), *Wind River(Wyo), *LANDSAT data.

Low resolution meteorological satellite and high resolution earth resources satellite data have been used to map snowcovered area over the upper Indus River and the Wind River Mountains in Wyoming, respectively. For the Indus River, early Spring snowcovered area was extracted and correlated to April through June streamflow from 1966-1971 using a regression equation (r sq = 0.91). For

ction of the April-June 1972 streamflow from the
tellite data was within three % of the actual total.
omposited results from 2 years of data over 7
Vind River Mountain watersheds indicated that
ANDSAT-1 snowcover observations, separated
n the basis of watershed elevation, also could be
lated to runoff in significant regression equa-
ons. It appears that earth resources satellite data
ill be useful in assisting in the prediction of
asonal streamflow for various water resources
plications, in non hazardous collection of snow
ta from restricted-access areas, and in hydrolog-
modeling of snowmelt runoff. (See also W77-
662) (Sims-ISWS)
77-10673

PPLICATIONS OF SATELLITE SNOW
OVER IN COMPUTERIZED SHORT-TERM
REAMFLOW FORECASTING,
F. Leaf.
: Operational Applications of Satellite Snow-
ver Observations; Report No NASA SP-391.
oceedings of workshop held August 18-20, 1975,
uth Lake Tahoe, California, p 175-186, 1975. 5
, 3 tab, 7 ref.

escriptors: *Remote sensing, *Snow cover,
olorado, *Runoff, Satellites(Artificial), Model
udies, Mathematical models, Computer models,
reamflow, Snowpacks, Snow, Snowmelt,
vers, Watersheds(Basins), Hydrology, Rio
ande River.
entifiers: *Conejos River(Colo), *Rio Grande
ver Basin.

procedure was described whereby the correla-
n between: (1) satellite derived snow-cover
pletion, and (2) residual snowpack water
uivalent, can be used to update computerized
idual flow forecasts for the Conejos River in
uthern Colorado. (See also W77-10662) (Sims-
WS)
7-10674

W SOLUTIONS FOR WATER RESERVOIRS
IRRIGATION SYSTEMS FED BY THE
NUBE AND INLAND RIVERS, (IN FRENCH),
primary bibliographic entry see Field 3F.
7-10727

AWDOWN ANALYSIS OF SLOPES BY NU-
RICAL METHOD,
ginia Polytechnic Inst. and State Univ.,
cksburg. Dept. of Civil Engineering.
primary bibliographic entry see Field 8D.
7-10776

ABILIZATION OF POTENTIALLY LIQUEFI-
LE SAND DEPOSITS USING GRAVEL
AINS,
fornia Univ., Berkeley. Dept. of Civil En-
ering.
primary bibliographic entry see Field 8D.
7-10777

UENT PEAK PROCEDURE: MINIMUM
ERVOIR CAPACITY SUBJECT TO CON-
AINT ON FINAL STORAGE,
nsylvania State Univ., University Park. Dept.
eosciences.
V. Potter.
er Resources Bulletin, Vol 13, No 3, p 521-
June 1977. 1 fig, 2 ref, append.

criptors: *Reservoirs, *Peak loads, *Peaking
city, Peak discharge, Reservoir design, Reser-
operation, Reservoir storage, Reservoir yield,
age, Cycles, Withdrawal, Equations.
tifiers: *Sequent peak procedure, Reservoir
city, Final storage, Cycles of inflow, Design
w, Design drafts.

When the sequent peak procedure is used to size a reservoir, two cycles of inflows and drafts are analyzed. The use of two cycles results in the identification of the minimum reservoir capacity which, when simulated with the design inflows and drafts, will not only meet demands, but also results in a final storage which equals or exceeds the initial storage. Demonstration of optimality follows from consideration of a method which is equivalent to the sequent peak procedure. It was shown that the use of two cycles in the sequent peak procedure results in the identification of the minimum reservoir capacity which, when simulated with the design inflows and drafts, not only meets demands but also results in a fatal storage greater or equal to the initial storage. To demonstrate that the use of two cycles constrains final storage, it was shown that the two cycle results can be obtained simply from one cycle only. (Roberts-ISWS)
W77-10781

HOW ACCURATE ARE SHOP-MADE ORIFICE PLATES,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
For primary bibliographic entry see Field 3F.
W77-10782

SOME REMARKS ON THE STATISTICAL THEORY OF EXTREME VALUES,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 2A.
W77-10786

HYDRAULIC MODELING OF MIXING IN STRATIFIED LAKES,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W77-10798

4B. Groundwater Management

EFFECTS OF ARTIFICIALLY INTRODUCED GROUND WATER ON THE CHEMICAL AND BIOCHEMICAL CHARACTERISTICS OF SIX HILLSBOROUGH COUNTY (FLORIDA) LAKES,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 2H.
W77-10139

IMPACT OF LEGAL CONSTRAINTS ON GROUND-WATER RESOURCE DEVELOPMENT IN IDAHO,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W77-10173

INFLUENCE OF ORGANIC CARBON AND MICROORGANISMS ON IRON AND SULFIDE CONCENTRATIONS IN GROUNDWATER,
Missouri Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-10183

TRITIUM IN THE MONITORING OF WATER SUPPLY.
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
For primary bibliographic entry see Field 2F.
W77-10196

RECOMMENDATIONS FOR THE ROUTINE RECORDING OF BOREHOLE DATA FOR HYDROGEOLOGICAL PURPOSES,
National Physical Research Lab., Pretoria (South Africa).
P. F. Worthington, and E. Martinelli.
South African Journal of Science, Vol. 72, No. 8, p 229-232, August 1976. 2 tab, 16 ref.

Descriptors: Groundwater resources, Evaluation, *Well data, *Water wells, Boreholes, Hydrologic data, *Hydrogeology.
Identifiers: South Africa.

The first stage of any detailed investigation of groundwater resources involves an appraisal of existing hydrogeological data. Unfortunately this procedure is often complicated by the incompleteness and lack of uniformity of the available information. Generalized standard recommendations are presented concerning the routine recording of hydrogeological data which are sufficiently comprehensive to form a useful basis for future detailed studies of groundwater resources. (So African Water Info Center)
W77-10224

EFFECT OF VISCOSITY RATIO ON THE RECOVERY OF FRESH WATER STORED IN SALINE AQUIFERS,
Louisiana Water Resources Research Inst., Baton Rouge.
O. K. Kimbler, and W. R. Whitehead.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 780, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, April 1977. 33 p, 5 fig, 6 tab, 6 ref, 3 append. OWRT A-037-LA(1), 14-34-0001-6019.

Descriptors: Groundwater recharge, *Water storage, *Injection wells, Recharge wells, Hydraulics, Artificial recharge, *Aquifers, *Viscosity.
Identifiers: *Saline aquifers.

Differences in viscosity between injected and displaced fluids will always result in a lower recovery efficiency during underground water storage in aquifers than would have been realized had the viscosities been equal. This result arises from (1) increased dispersion and (2) viscous fingering (gross frontal irregularities). Experimental studies involving injection and subsequent production from single wells in two physical flow systems (miniaquifers) suggest the following conclusions: (1) The recovery efficiency is a maximum where the fluid viscosities are equal; (2) from an engineering point of a view, the recovery efficiency is approximately the same for a fixed viscosity difference irrespective of whether injected or native water is the more viscous; (3) a computational procedure previously developed for a viscosity of unity is applicable for a non-unity viscosity ratio provided an effective dispersivity is used which has been obtained from an injection/production well test; and (4) dispersivity coefficients obtained from the production profile of an observation well rather than the injection well represent highly unrealistic values and if used in the computational procedure will yield false values of recovery efficiency.
W77-10264

METHOD FOR ROUGHLY ESTIMATING THE WATER EXCHANGE OF A RESERVOIR WITH AN AQUIFER HYDRAULICALLY CONNECTED WITH IT,
I. B. Vol'ftsun.
Soviet Hydrology, Selected Papers, Issue No. 4, p 213-215, 1975. 1 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No 226, p 104-110, 1975.

Descriptors: *Forecasting, *Groundwater movement, *Reservoirs, *Surface-groundwater relationships, Subsurface waters, Surface waters,

Groundwater, Hydrologic equations, Analytical techniques, Analysis, Foreign research, Foreign countries, Base flow.
Identifiers: *USSR.

An approximate analytical solution of the water exchange based on the following assumptions was presented: (1) the area where the aquifer is drained by the reservoir is underlain by a horizontal impervious bed, and the height of the water level in the reservoir above the aquifer is the same over the entire water area; (2) the recharge of the groundwaters by infiltration and their discharge into the zone of aeration are negligibly small during the reference time interval; (3) the thickness of the aquifer at the upper boundary of the zone of depression of the groundwater surface, produced by the reservoir, and the depression radius are constant in time; and (4) the drop in the water level of the reservoir during the selected reference time interval is linear. Under the mentioned conditions, the unit groundwater discharge into the reservoir was expressed by the Dupuit equation. Application of this solution agreed satisfactorily with a field investigation. The use of the results of determination of water exchange by the proposed method in computations of the hydrologic budget of reservoirs should reduce the discrepancies in the budget and correspondingly increase the accuracy of its computation. (Humphreys-ISWS)
W77-10321

MASS BALANCE MONITORING OF LAND APPLICATION SITES FOR WASTEWATER RESIDUALS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-10326

PROBLEMS OF HEAT STORAGE IN AQUIFERS,
Eidgenoessische Technische, Zurich (Switzerland). Institut fur Geophysik.
For primary bibliographic entry see Field 5B.
W77-10332

COAL AND COAL MINE DRAINAGE, (LITERATURE REVIEW),
Bituminous Coal Research Inc., Monroeville, Pa.
For primary bibliographic entry see Field 5G.
W77-10355

THE USE OF NATURAL TRITIUM FOR EVALUATING AQUIFER RECHARGE,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils.
For primary bibliographic entry see Field 2F.
W77-10372

HYDRAULIC DESIGN DATA FOR WATER WELLS IN UNCONSOLIDATED SEDIMENTS,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 8B.
W77-10377

EFFECTS OF SILTATION ON RATES OF RECHARGE,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia).
S. E. James, and J. L. Henry.
Australian Water Resources Council Technical Paper No. 23, 1977. 32 p, 11 tab, 22 fig, 4 ref.

Descriptors: *Artificial recharge, *Infiltration rates, *Suspended solids, *Australia, Groundwater recharge, Induced infiltration, Silting, Sediments.
Identifiers: *Burdekin - Haughton Delta(Qld).

The eastern part of the Burdekin-Haughton Delta on the coast of Queensland, Australia, is serviced by an artificial groundwater recharge scheme involving the diversion of flow from the Burdekin River through a system of channels, trenches and pits. The major operating problem of the scheme is a reduction in infiltration rates, thought to be associated with clogging of sediments by material suspended in the recharge water. A description of the region, its climate, geology, hydrology, water useage and recharge works is provided, together with an account of a data collection study of the composition of the recharge water and associated effects on infiltration rates. (CSIRO)
W77-10378

ANALYSIS OF THE MOVEMENT OF WATER FROM RECHARGE CHANNELS AND PITS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
S. N. Webb, and K. K. Watson.
Australian Water Resources Council Technical Paper No 24, 1977. 174 p, 14 ref.

Descriptors: *Artificial recharge, *Pit recharge, *Infiltration, *Australia, Induced infiltration, Groundwater recharge, Numerical analysis, Computer models.
Identifiers: *Burdekin - Haughton Delta(Qld).

As part of a series of studies of the operation and problems of the artificial groundwater recharge scheme on the Burdekin-Haughton Delta of Queensland, Australia, an analysis was undertaken to elucidate the patterns of movement of water from the recharge channels and pits. The results are presented in two parts: numerical analyses, with theoretical background and outlines of the computer programs; and field studies, with details of data collection and analysis. The numerical analyses included two dimensional unsteady flow and steady state studies, and a one dimensional simulation of surface clogging due to suspended material in the recharge water. Field studies investigated diurnal recharge variations, and pressure, water content, and temperature profile development patterns, for one of the pits. (CSIRO)
W77-10379

CONSEQUENCES OF GROUNDWATER EXTRACTION ON EVAPOTRANSPIRATION AND SATURATED-UNSATURATED FLOW,
International Courses in Hydraulic and Sanitary Engineering, Delft (Netherlands).
P. J. M. de Last, C. van den Akker, and Th. J. van de Nes.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 67-76, 1975. 3 fig, 1 tab, 2 ref.

Descriptors: *Evapotranspiration, *Model studies, *Groundwater movement, *Water balance, Saturated flow, Unsaturated flow, Mathematical models, Equations, Analytical techniques, Soil water movement, Saturated soils, Analysis, Foreign research, Foreign countries.
Identifiers: *The Netherlands.

A three-dimensional mathematical model was developed to solve field-size composite groundwater soil moisture systems in relation to actual evapotranspiration. The model comprises three subsystems: saturated flow, and evapotranspiration. The solution for saturated flow is approached with the finite element method, and the evapotranspiration is calculated by Penman's formula, which has been adapted to cropped surfaces. The uniqueness of the model lies in the treatment of the unsaturated flow, which has been approached with a pseudo steady-state solution. The second approach was found to be sufficiently accurate and extremely efficient. It allows for the numerical solution of the system in such a way that time increments in the order of magnitude of days can be used. The application to a field-size problem shows that in certain areas during the growing season considerable reductions in the actual evapotranspiration occur as a result of groundwater withdrawal. Input parameters include type of crop, rainfall rates, and standard meteorological data. Output of the hydraulic head, pressure head in the effective root zone, potential and actual evapotranspiration, open water runoff, saturation deficits, etc., can be in the form of plots or may be produced as printouts. Problems concerning (sub)surface runoff and hysteresis phenomena in the unsaturated zone are still to be solved. (See also W77-10419) (Humphreys-ISWS)
W77-10422

MATHEMATICAL MODELLING OF THE RETURN WATERS RUNOFF,
Laboratory of Mathematical Modelling of Hydrological Processes, Sarnignii, Tashken (USSR).
J. M. Denisov, F. E. Rubynova, and A. I. Sergeev.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 77-84, 1975. 2 fig, 1 tab, 4 ref.

Descriptors: *Irrigated land, *Return flow, *Model studies, *Mathematical models, Equations, Analytical techniques, Analysis, Runoff, Groundwater movement, Unsaturated flow, Discharge(Water), Water balance, Irrigation, Foreign research, Foreign countries.
Identifiers: *USSR.

A mathematical model of the return waters runoff from irrigated areas was constructed by means of simple differential equations. The model was designed to great majority of parameters as physical quantities (characteristics), easily determined experimentally; while for the remainder of the parameters, evaluations were given which may effectively be used for a first approximation. The model can be used for calculating the water regime of an irrigated area as well as for designing and reconstructing the collecting drainage net. Applications of the model to an irrigated area of 310,000 ha for an 11 year period showed that the irrigation regime stabilized by the tenth year of its implementation. (See also W77-10419) (Humphreys-ISWS)
W77-10423

APPLICATION OF DYNAMIC PROGRAMMING TO MODEL TRI-DIMENSIONAL FLOW IN POROUS MEDIA (APPLICATION DE LA PROGRAMATION DYNAMIQUE AUX MODELES TRIDEMENSIONNELS DE CALCUL DES ECOULEMENTS DANS LES MILIEUX POREUX),
Tehran Univ. (Iran), Dept. of Irrigation.
For primary bibliographic entry see Field 2F.
W77-10429

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS,
For primary bibliographic entry see Field 5G.
W77-10458

GROUND WATER ACT OF 1955 (REGULATION OF UNDERGROUND WATERS THRU A PERMIT SYSTEM).
For primary bibliographic entry see Field 6E.
W77-10495

MAN-MADE GEOTHERMAL ENERGY SOURCE USES OIL-FIELD KNOW-HOW.
For primary bibliographic entry see Field 8A.
W77-10515

WELL MAINTENANCE AND REHABILITATION,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 8B.
W77-10516

GROUNDWATER MONITORING WELLS,
Stearns and Wheeler, Cazenovia, N. Y.
For primary bibliographic entry see Field 5B.
W77-10517

DISPOSAL OF SALT WATER DURING WELL CONSTRUCTION, PROBLEMS AND SOLUTIONS,
Geological Survey, Miami, Fla. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-10519

PROTECTING GROUND WATER FROM DOMESTIC WASTEWATER EFFLUENT,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-10520

NEW INSTRUMENT EXPANDS WATER WELL TECHNOLOGY,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8G.
W77-10521

KANSAS TASK FORCE TO DEVELOP WATER USE PROGRAM TO RESOLVE SERIOUS PROBLEMS,
Johnson Drillers Journal, Vol 49, No. 3, p 7-12, May-June, 1977.

Descriptors: *Water law, *Groundwater, *Water conservation, Droughts, Water management(Applied), Water shortage, *Kansas, *Water utilization.

Governor Bennett of Kansas called on a 26-member task force headed by Lieut. Governor Shelby Smith to develop programs for water use in that state. The task force is expected to make recommendations for action by the 1978 and 1979 legislative sessions. Several communities in eastern Kansas are presently suffering from the effects of low water table conditions; long-range goals for the proposed legislation include the improvement of conservation and management of state water supply. Immediate concerns of the task force are identifying the options available to state and local government units for resolving water problems, and assessing the social, economic, and environmental impact of all alternatives. (Eberle-WWA)
W77-10522

MAKING WATER SUPPLY NITRATE REMOVAL PRACTICABLE,
Garden City Park Water District, N.Y.
For primary bibliographic entry see Field 5F.
W77-10525

SAMPLING TESTS PROVIDE USEFUL DATA, PART II,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8B.
W77-10530

CONSTRUCTION OF A LARGE DIAMETER WELL,
For primary bibliographic entry see Field 8B.
W77-10531

CURRENT TRENDS IN WATER RECLAMATION TECHNOLOGY,
Los Angeles County Sanitation Districts, Whittier, Calif.
For primary bibliographic entry see Field 5D.
W77-10649

A SIMPLE EFFECTIVE METHOD FOR THE COMPUTER SIMULATION OF GROUNDWATER STORAGE AND ITS APPLICATION IN THE DESIGN OF WATER RESOURCE SYSTEMS,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W77-10660

MODELING OF UNCONFINED GROUNDWATER SYSTEMS,
Lehigh Univ., Bethlehem, Pa. Dept. of Civil Engineering; and Lehigh Univ., Bethlehem, Pa. Fritz Engineering Lab.
For primary bibliographic entry see Field 2F.
W77-10661

AN ECONOMIC ANALYSIS OF IRRIGATED FARMING WITH DIMINISHING GROUND WATER RESERVES,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
A. K. Sanghi, and R. Klepper.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 433, Price codes: A04 in paper copy, A01 in microfiche. Report NSF-RA-760084 (CBNS/AE/8), May 1976. 57 p, 8 tab, 30 ref. NSF AER-75-19031.

Descriptors: *Economic impact, *Crop production, *Groundwater availability, Economic feasibility, Net profit, Methodology, Analysis, *Irrigation, Irrigation efficiency, Corn(Field), Crop response, Soil-water-plant relationships, Water requirements, Water table aquifers, Zone of saturation, Plant growth, Great Plains.

A method is developed for evaluating the economic aspects of groundwater irrigation for individual farms, focusing on the effect of a declining water table on crop yield and its consequent effect on net return. The key aspect of the method is a production function which incorporates the availability of water in a critical period of plant growth and differentiates between the effect of a water deficit on yield in the critical period and other stages of plant growth. The method is demonstrated using hypothetical examples of corn crops under center pivot irrigation with declining water tables. Results show that net farm income is more vulnerable to fluctuations in crop yield as the well is reduced due to the declining water table than it is to higher pumping costs due to increased lift. The limiting factor for irrigated farming from groundwater is the saturated thickness of the aquifer as the saturated thickness declines. In addition, there is a need for a better understanding of the relationships between water applications and crop yield, since the resulting net returns for individual farmers are the major input for their investment decisions, and for determining broader issues of the optimal drilling rate for groundwater resources and the associated problem of commonality in groundwater use. (Luedtke-Wisconsin)
W77-10748

PUMP TESTING IN HETEROGENEOUS AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2F.
W77-10764

STATISTICAL APPLICATIONS IN GROUNDWATER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-10789

4C. Effects On Water Of Man's Non-Water Activities

DYNAMICS OF URBAN DEVELOPMENT ON FLOOD PLAINS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 4A.
W77-10179

EFFECT OF LAND USE MANAGEMENT ON FLOOD PREDICTIONS,
Central Shenandoah Planning District Commission, Staunton, Va.
R. W. Smith, D. K. Jamison, and J. W. Knapp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 645, Price codes: A03 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg. Bulletin 103, June 1977. 39 p, 13 fig, 11 tab, 4 ref, append. OWRT A-062-VA(3).

Descriptors: *Flood forecasting, *Virginia, Methodology, Floods, Management, Cities, Evaluation, *Alternative planning, *Land use, Urbanization, Watersheds(Basins).
Identifiers: *South River watershed(Va), *Urban watersheds.

This study investigated the effects of changes in land-use practices and hydrologic parameters on flooding in an urbanizing area. It adapted modeling techniques developed by the Soil Conservation Service to local computing facilities and applied these models to flooding problems in the South River Watershed in and above Waynesboro, Virginia. (A related research project, (see W77-02078), developed methods to predict runoff from various soil conditions and land uses and, by use of a finite-element technique, to predict total downstream runoff.) This study provides comparative data and presents a methodology allowing evaluation of alternative courses of action needed to produce a least-cost flood-management program. In addition to developing computer analysis capability at the local level, the project produced findings that were instrumental in developing flood-management guidelines adopted by the South River Watershed Flood Control Commission and the Central Shenandoah Planning District Commission.
W77-10181

STREAM COMMUNITY RESPONSE TO ROAD CONSTRUCTION SEDIMENTS,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
J. R. Reed, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 659, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 97, June 1977. 61 p, 17 tab, 11 fig. OWRT A-056-VA(1).

Descriptors: Road construction, Streamflow, Sediments, *Benthos, Fish, Biological communities, Computer programs, Aquatic drift, Littoral drift, *Erosion control, Sediment control, Water pollution effects, *Virginia.
Identifiers: *Road construction effects, Siltation, Species diversity, Non-point pollution sources.

This study investigated how aquatic macrobenthic and fish communities responded to the effects of

siltation from highway construction. Community response was evaluated on the basis of community diversity and changes in the numbers of organisms and/or species. An innovative computer program calculated the diversity indices, using the sequential comparison technique. The primary response observed among the macrobenthic and fish communities was a reduction both in numbers of species and in organisms downstream from the construction. The diversity index also demonstrated a statistically significant long-term change in aquatic community structure, but was less meaningful for indicating initial effects or making single comparisons. Findings suggest that drift is a major physical response of macrobenthos to increased siltation, and may be a primary mechanism for repopulating stressed habitats. This is contrary to the commonly held hypothesis that smothering is a major effect, and should be tested in further investigations. Fishes apparently vacated areas of increased siltation, but were able to repopulate such areas within 12 months after construction activity stopped, depending upon the stream's cleansing ability. In this connection, stream flow rate and gradient are significant factors. In general, this study found that erosion-control measures as they commonly are applied in highway construction are of limited value in preventing damages to stream communities, especially in the early construction stages. This indicates a need for more comprehensive and particularly more timely application of appropriate erosion-control techniques.
W77-10182

OPTIMAL SYSTEMS OF STORM WATER DETENTION BASINS IN URBAN AREAS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 4D.
W77-10184

SHORT-TERM EFFECTS OF HIGHWAY CONSTRUCTION ON THE LIMNOLOGY OF A SMALL STREAM IN SOUTHERN ONTARIO,
Guelph Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10260

THE EFFECT OF FIRE ON THE CALIFORNIA CHAPARRAL VEGETATION,
Academia Sinica, Taipei (Taiwan). Inst. of Botany.
For primary bibliographic entry see Field 5C.
W77-10324

OFFSHORE MINERAL RESOURCE EXPLOITATION: THE STATE AND FEDERAL RESPONSE,
For primary bibliographic entry see Field 6E.
W77-10471

STORM MANAGEMENT PROGRAM IS MODEL FOR OTHERS,
Georgia Inst. of Tech., Atlanta. Dept. of City Planning.
For primary bibliographic entry see Field 4A.
W77-10612

A HYDROMETEOROLOGICAL RESEARCH PROGRAM,
Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
For primary bibliographic entry see Field 2B.
W77-10658

DRY DEPOSITION LOADING OF LAKE MICHIGAN BY AIRBORNE PARTICULARATE MATTER,
Governors State Univ., Park Forest South, Ill. College of Environmental and Applied Sciences.
For primary bibliographic entry see Field 5A.
W77-10758

4D. Watershed Protection

PROBLEMS AND POLICY ALTERNATIVES: CONSTRUCTION,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W77-10164

EFFECT OF ANTECEDENT CONDITIONS ON FROZEN GROUND FLOODS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2C.
W77-10175

STREAM COMMUNITY RESPONSE TO ROAD CONSTRUCTION SEDIMENTS,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
For primary bibliographic entry see Field 4C.
W77-10182

OPTIMAL SYSTEMS OF STORM WATER DETENTION BASINS IN URBAN AREAS,
Kentucky Water Resources Research Inst., Lexington.
D. K. Mynear, and C. T. Haan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 644, Price codes: A05 in paper copy, A01 in microfiche. Research Report No. 104, June 1977. 76 p, 11 fig, 4 tab, 35 ref. OWRT B-046-KY(2), 14-34-0001-6081.

Descriptors: *Detention reservoirs, Urban hydrology, *Storm water, Management, Cities, *Settling basins, Methodology, Computer programs, *Urbanization, Design, Watersheds(Basins), Optimization.
Identifiers: *Optimum (least cost) systems.

Flood retention basins are commonly used in urban areas to reduce the impact of urbanization on downstream flooding. When more than a few acres are developed, systems of retention basins are often required. A procedure has been developed whereby the optimum (least cost) system of basins can be determined to meet a given downstream flow requirement. The method considers several design options including basins on all sub-watersheds, basins on only some of the sub-watersheds, basins of various sizes and basins with various stage-discharge characteristics. The procedure has been developed in the form of a computer program to aid the designer in selecting the optimum system of stormwater retention basins. This report develops the methodology, presents the computer program and illustrates the use of the program. (Huffsey-Kentuckyk)
W77-10184

SIMULATION OF THE SEDIMENTOLOGY OF SEDIMENT DETENTION BASINS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5G.
W77-10185

SHORT-TERM EFFECTS OF HIGHWAY CONSTRUCTION ON THE LIMNOLOGY OF A SMALL STREAM IN SOUTHERN ONTARIO,
Guelph Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10260

REDUCTION OF 2, 4-D LOAD IN SURFACE RUNOFF DOWN A GRASSED WATERWAY,
Agricultural Research Service, Tifton, Ga. Southern Region.
For primary bibliographic entry see Field 5G.
W77-10323

A NEW CODE FOR REDUCING STREAM SILTATION,
Environment Protection Authority, Melbourne (Australia).
F. Balkau, and D. G. Thompson.
In: Environmental Engineering Conference, Canberra, Australia, 1977. The Institution of Engineers Australia, Preprints of Papers, p 108-111. (The Institution of Engineers Australia National Conference Publication No. 77/4).

Descriptors: *Streams, *Sediment control, *Regulation, *Australia, State governments, Land development, Soil conservation, Construction, Sediment load, Administrative agencies.
Identifiers: *Victoria, Codes of Practice, Land disturbance.

A Land Disturbance Working Party comprising members of state government agencies in Victoria, Australia, has been convened to recommend remedies for the problem of high sediment loads in streams. Its approach has been to concentrate on compiling the necessary technical information for the production of a Code of Practice, initially for the use of government agencies involved in land disturbance activities, though it is hoped that the guidelines will also be adopted by private companies and consultants. The origins and effects of stream sedimentation, and the approach of the Working Party in compiling the guidelines, are briefly reviewed. (CSIRO)
W77-10369

THE APPLICATION OF A DETERMINISTIC MODEL TO A SEMIARID BASIN (APPLICATION DU MODELE A DISCRETISATION SPATIALE A UN BASSIN VERSANT SEMI-DESERTIQUE),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
For primary bibliographic entry see Field 2A.
W77-10424

PERFORMANCE OF TWO DETERMINISTIC HYDROLOGICAL MODELS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 4A.
W77-10426

MATHEMATICAL SIMULATION MODELS OF HYDROLOGICAL PROCESSES IN TURKEY,
Aegean Univ., Bornova (Turkey). Faculty of Engineering Sciences.
For primary bibliographic entry see Field 2A.
W77-10430

A MODEL OF THE MELTING PROCESS OF THE SNOW COVER AS A PART OF CATCHMENT MODELS,
Meteorologischer Dienst der Deutschen Demokratischen Republik, Berlin. Forschungsinstitut fuer Hydrometeorologie.
For primary bibliographic entry see Field 2C.
W77-10432

FLOODPLAIN ZONING--AN ALTERNATIVE APPROACH TO LAND REGULATION IN FLOOD HAZARD AREAS,
For primary bibliographic entry see Field 6F.
W77-10451

STORM MANAGEMENT PROGRAM IS MODEL FOR OTHERS,
Georgia Inst. of Tech., Atlanta. Dept. of City Planning.
For primary bibliographic entry see Field 4A.
W77-10612

PREDICTION OF VELOCITY DISTRIBUTION IN A VORTEX TUBE SEDIMENT TRAP WITH TURBULENCE MODELS,
Nebraska Univ. Panhandle Station at Scottsbluff.
R. J. Edling, B. J. Barfield, and C. T. Haan.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 2, p 301-308, March-April 1977. 5 fig, 2 tab, 16 ref.

Descriptors: *Sediment control, *Sediments, *Vortices, *Model studies, Mathematical models, Velocity, Flow, Sediment transport, Fluid mechanics, Hydraulics, Open channels, Distribution patterns, Rotational flow, Turbulence.
Identifiers: *Vortex tube sediment traps, *Sediment traps, Turbulence models.

Meaningful investigation into the potential and limitations of the vortex tube sediment trap could be accomplished theoretically if prediction of velocity profiles were possible. Empirical and semi-empirical velocity prediction techniques were tested. In the empirical technique, constants combining values for mean flow velocity, wall velocity, and vortex perimeter velocity were applied; whereas in the semi-empirical technique, a two equation turbulence model containing equations for turbulence kinetic energy and dissipation was applied. Prediction models were tested experimentally. Results revealed a range in constants for the empirical technique which indicated that the method could only be used as a guide. The semi-empirical prediction values approximated measured velocity values. (Sims-ISWS)
W77-10657

GENETIC ANALYSIS OF THE SUSPENDED LOAD DISCHARGE OF MOUNTAIN RIVERS,
Tashkent Univ. (USSR).
For primary bibliographic entry see Field 2J.
W77-10778

WATERSHED SEDIMENT YIELD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
H. W. Shen, and R. M. Li.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 21, Colorado State University, Fort Collins, p 21-1 - 21-68, 1976. 19 fig, 2 tab, 50 ref.

Descriptors: *Watersheds(Basins), *Sediment yield, *Model studies, *Soil erosion, Theoretical analysis, Rainfall, Runoff, Stochastic processes, Mathematical models, Soil management, Erosion control, Analytical techniques, Numerical analysis, Statistical models, Equations, Hydrographs, Sediments, Regression analysis.

Much of the sediment transported by rivers and deposited in reservoirs is eroded from watersheds. Watershed sediment yield is a direct indication of the land erosion rate in watersheds. Soil loss by surface runoff from a watershed is due to any or a combination of the four following processes: (1) raindrop splash erosion; (2) sheet erosion by overland flow; (3) rill, gully and channel erosion; and (4) massive land sliding. The important governing factors are: (1) climate; (2) topography; (3) soil; and (4) vegetation or land management. The basic principles for determining watershed sediment yield by statistical regression models, unit sediment graph, parametric routing models and stochastic models are quite similar. Essentially they all contain the following steps: rainfall distribution, rainfall-runoff model, and runoff-sediment model. (See also W77-10439) (Humphreys-ISWS)
W77-10790

STOCHASTIC ASPECTS OF INCIPIENT GRAIN MOTION ON RIVERBEDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-10792

SEDIMENT TRANSPORT MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
For primary bibliographic entry see Field 2J.
W77-10793

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

DETERMINATION OF DIMETHYLNITROSAMINE IN AIR, WATER, AND SOIL BY THERMAL ENERGY ANALYSIS: MEASUREMENTS IN BALTIMORE, MD.,
Thermo Electron Research Center, Waltham, Mass.
D. H. Fine, D. P. Rounbehler, A. Rounbehler, A. Silvergleid, and E. Sawicki.
Environmental Science and Technology, Vol 11, No 6, p 581-584, June 1977. 2 fig, 4 tab, 16 ref. EPA 68-02-2312.

Descriptors: *Analytical techniques, *Air pollution, *Pollution abatement, *Maryland, *Testing procedures, Air environment, Pollutants, Analysis, Soil analysis, Water analysis, Chemical analysis, Chromatography, Mass spectrometry, Chemistry, Instrumentation.
Identifiers: *Curtis Bay(Md), *Baltimore(Md), *Stonehouse Cove(Md), *Dimethylnitrosamine, *Thermal energy analysis, *Dimethylhydrazine, Nitrosamines, Mobile laboratory, Airborne carcinogens.

Dimethylnitrosamine (DMN) was reported to be present as an air pollutant in Baltimore, Maryland. On the site of a chemical factory that is manufacturing unsymmetrical dimethylhydrazine for which DMN is an intermediate, average DMN levels are 11,600 ng/cu m. Average DMN levels in neighboring residential communities are 1070 ng/cu m, with DMN levels in downtown Baltimore being between 30 and 100 ng/cu m. Salt water from the Curtis Bay and Stonehouse cove area surrounding the chemical factory contains DMN at the 35-940 ng/L level. (Henley-ISWS)
W77-10129

TRANSFER TO FISH OF PETROLEUM PARAFFINS AND ORGANIC SULFUR COMPOUNDS,
Okayama Univ. (Japan). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5C.
W77-10144

EFFECT OF SURFACTANTS ON THE DETERMINATION OF ALUMINUM IN WATERS,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
P. Pakalns, and Y. J. Farrar.
Water Research, Vol. 11, No. 4, p. 387-392, 1977. 1 fig., 1 tab., 5 ref.

Descriptors: *Analytical techniques, *Aluminum, *Surfactants, Spectrophotometry, Detergents, Detergents, Nitrilotriacetic acid, Linear alkylate sulphonates, *Pollutant identification.

The ways in which 11 surface-active substances--mostly detergents--affected the determination of aluminum in waters by spectrophotometric methods is described. Cationic, anionic and nonionic detergents at concentrations up to 2,100 and 1000 mg/l did not interfere with such determinations, but sodium tripolyplosphate interfered badly above 1.0 mg/l. Concentrations of NTA, soap and sodium pyrophospate had to be below 0.5, 10 and 20 mg/l, respectively, to limit the error to 5%. The severe tripolyphosphate interference could be overcome by hydrolysis of the tripolyphosphate to phosphate, but even then 10 mg/l washing powder gave a recovery of 93%. The ferron-orthophenanthroline method can be used only after a correction for iron is made. This method can tolerate large concentrations of all surfactants tested and is recommended for determination of aluminum in polluted waters provided there is no iron interference. The three methods investigated can determine aluminum satisfactorily in natural waters because detergent concentrations seldom exceed 0.5 mg/1, and unless raw effluent is present, tripolyphosphate will be degraded by 90% during activated sludge treatment. The atomic absorption spectrophotometric methods which uses 8-quinolinol extraction into chloroform and ethyl propionate can extract aluminum in the presence of washing powder but its sensitivity for aluminum is low. (Auen-Wisconsin).
W77-10151

MERCURY IN WATERWAYS THAT DRAIN INTO THE WASH, IN EASTERN ENGLAND,
Institute of Terrestrial Ecology, Huntingdon (England). Monks Wood Experimental Station.
For primary bibliographic entry see Field 5B.
W77-10152

THE DETERMINATION OF DISSOLVED INORGANIC CARBON, A POSSIBLE SOURCE OF ERROR IN DETERMINING THE PRIMARY PRODUCTION OF LAKE WATER PHYTOPLANKTON,
Helsinki Univ., Lammi (Finland). Lammi Biological Station.
For primary bibliographic entry see Field 5C.
W77-10153

AN INVESTIGATION OF THE PARTICULATE PHASE OF ACID PRECIPITATION,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 2B.
W77-10178

AN IDENTIFICATION KEY TO THE WATER MITE FAMILIES OF THE ETHIOPIAN REGION,
University of Durban-Westville (South Africa). Dept. of Zoology.
C. A. Jansen van Rensburg.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1, p 11-20, 1976. 58 fig, 27 ref.

Descriptors: Morphology, Aquatic animals, *Africa, *Mites, Pollutant identification.
Identifiers: Arthropoda, Acari, *Ethiopia, South Africa.

A condensed reference is provided to the structure of and terminology used in the study of water mites, as well as a workable illustrated key for quick identification of families which are likely to be found in fresh waters on the African continent south of the Sahara. Definitions of the basic technical terms as applied to water mites are appended. (So. African Water Info. Center)
W77-10192

DIATOM INDICATOR GROUPS IN THE ASSESSMENT OF WATER QUALITY IN THE JUKSKEI-CROCODILE RIVER SYSTEM (TRANSVAAL, REPUBLIC OF SOUTH AFRICA),
National Inst. for Water Research, Pretoria (South Africa).
F. R. Schoeman.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1iver, Hennops River, Crocodile River, South Africa.

Descriptors: Ecological distribution, *Diatoms, Water quality, Evaluation, Algal growth, Eutrophication, Rivers, *Bioindicators, *Pollutant identification.
Identifiers: Jukskei River, Modderfontein River.

Based on the detailed study of Cholnoky on the ecology of diatoms, species with similar ecological requirements are arranged in groups. The use of these datom groups as reliable indicators of the water quality in the Jukskei-Crocodile river system (Transvaal) is examined. The predictions of the water quality based on the diatom groups are compared with the chemicaland algal growth potential data. The results indicate that the diatom groups employed can serve as reliable indicators of water quality. In the present study they further suggest that the Modderfontein and Jukskei rivers are considerably more eutrophied than the Hennops and Crocodile rivers. (So. African Water Info. Center)
W77-10193

CADMIUM CONCENTRATIONS IN THE TISSUES OF BULLIA DIGITALIS (PROSOBRANCHIATA) FROM THE SOUTH AFRICAN WEST COAST,
Cape Town Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10203

PHOTOSYNTHETIC BACTERIA IN RIETVLEI DAM,
National Inst. for Water Research, Pretoria (South Africa).
G. C. Coetzer, and D. F. Toerien.
South African Journal of Science, Vol. 72, No. 3, p 88, March 1976. 1 tab, 1 fig, 7 ref.

Descriptors: *Photosynthetic bacteria, Metabolism, Bacteria, Sampling, Eutrophication, Isotherms, Stratification, Aerobic conditions, Anaerobic bacteria, *Pollutant identification, Depth, Distribution.
Identifiers: *Rietvlei dam(South Africa), Rhodopseudomonas, Rhodomicrobium, Rhodospirillum.

An investigation of the occurrence of photosynthetic bacteria in Rietvlei dam near Pretoria, showed the presence of all three purple non-sulphur bacterial genera, i.e. Rhodopseudomonas, Rhodomicrobium and Rhodospirillum. No definite depth distribution of the bacteria was observed. Sampling techniques are described. (So African Water Info Center)
W77-10204

METALS IN ORGANISMS FROM SALDANHA BAY AND LANGEBAAN LAGOON PRIOR TO INDUSTRIALIZATION,
Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries.
For primary bibliographic entry see Field 5C.
W77-10205

OCCURRENCE AND POSSIBLE USE OF NON-SULPHUR PURPLE BACTERIA IN EFFLUENT TREATMENT PROCESSES,
National Inst. for Water Research, Pretoria (South Africa).
D. F. Toerien.
South African Journal of Science, Vol. 72, No. 5, p 148-149, May 1976. 4 tab, 3 ref.

Descriptors: *Sewage effluents, *Waste water treatment, *Anaerobic bacteria, Anaerobic digestion, Anaerobic treatment, Fatty acids, Activated sludge, *Methane bacteria, Methane production, *Photosynthetic bacteria, *Sewage treatment, Sewage bacteria, Management, *Pollutant identification.
Identifiers: Rhodospirillaceae, South Africa, Daspoort, Baviaanspoort.

To determine the presence of non-sulphur bacteria in different sewage treatment processes, a basal culture medium was variously supplemented with acetate, propionate, butyrate, valerate, citrate, benzoate, malate, methanol, ethanol and n-butanol. Photosynthetic bacteria were present at all sampling localities. The widespread distribution of these bacteria in sewage treatment plants and their ready growth on volatile fatty acids and alcohols suggest that it may be technically feasible to utilize such a system as part of sewage treatment processes or for the treatment of effluents rich in the lower fatty acids. (So African Water Info Center)
W77-10207

THE DESIGN OF A FULLY AUTOMATIC LIQUID INJECTION APPARATUS FOR USE ON A CARBON ANALYSER,
National Inst. for Water Research, Pretoria (South Africa).
R. A. Van Steenderen.
Water SA, Vol. 2, No. 3, p 125-130, July 1976. 3 fig, 3 tab, 5 ref.

Descriptors: *Pollutant identification, Design, Instrumentation, Liquids, Carbon, Analytical techniques, Equipment, Flow, Mode of operation, *Water analysis.
Identifiers: *Total organic carbon, *Carbon analysers.

A fully automatic liquid injection apparatus for use on a hitherto non-automated Beckman total organic carbon analyser Model IR915 is described. In the past the method of sample introduction into the carbon analyser has been a manual technique using a microsyringe. This was found tedious and time consuming for processing large numbers of samples on a routine basis. Technique is described that enables automatic sampling and analysis of twenty samples per hour. (So African Water Info Center)
W77-10209

APPARATUS FOR THE AUTOMATIC DETERMINATION OF OXYGEN CONSUMPTION IN FISH,
Port Elizabeth Univ. (South Africa). Dept. of Zoology.
J. F. Marais, A. F. Akers, and P. Van der Ryst.
Zoologica Africana, Vol. 11, No. 1, p 87-95, 1976. 5 ref, 2 fig.

Descriptors: Equipment, *Instrumentation, *Oxygen, Fish, *Respiration, Electrodes, Flow, Flow rates, *Bioassay, *Pollutant identification.
Identifiers: South Africa.

An apparatus is described which permits the automatic determination of the oxygen consumption of three fish and a control for 24 hours per day. This is made possible by an electrical control system operating four three-way valves which allow water from one of four respiration chambers at a time to flow past an oxygen electrode for quarter-hour periods. These values are registered successively on a recorder. (So African Water Info Center)
W77-10217

BROWN TROUT (SALMO TRUTTA L.) GROWTH AT REDUCED PH,
Oslo Univ. (Norway). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10227

INDICATORS OF HEAVY-METAL CONTAMINATION IN THE LOOE ESTUARY (CORNWALL) WITH PARTICULAR REGARD TO SILVER AND LEAD,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
G. W. Bryan, and L. G. Hummerstone.
Journal of the Marine Biological Association of the United Kingdom, Vol. 57, p 75-92, 1977. 4 tab, 4 fig, 26 ref.

Descriptors: *Lead, *Heavy metals, *Absorption, *Bioindicators, *Estuaries, *Algae, *Gastropods, *Mussels, *Mollusks, *Metals, *Copper, *Food chains, Cadmium, Iron, Cobalt, Manganese, Nickel, Zinc, Path of Pollutants, Invertebrates, Foodwebs, Sediments, Herbivores.
Identifiers: *Looe estuary(Cornwall), *Silver.

The two branches of the Looe Estuary in Cornwall receive metal contamination; one branch receiving lead and silver from old mines and the other receiving silver from a presumed industrial source. Analyses of these and eight other metals were made in seaweed (Fucus) as an indicator of levels the in water, in herbivorous gastropods (winkle, Littorina littorea; limpet, Patella vulgata), in filter feeders (mussel, Mytilus edulis; cockle, Cerastoderma edule) as indicators of contamination in suspended particles and in deposit feeders (bivalve molluscs Scrobicularia plana and Macoma balthica; Ragworm Nereis diversicolor) as indicators of available metals in sediments. Although the concentrations of particulate silver from the two sources were of the same order of magnitude, the influence of the non-mining source was much greater, a concentration of silver 425 times normal being observed in Scrobicularia at an upstream station. There was little evidence of contamination with dissolved silver in the estuary. Unlike silver, contamination with lead was consistent in the different species. Of the other metals (Cd, Co, Cr, Cu, Fe, Mn, Ni, Zn) copper was present at the most abnormal levels. (Katz)
W77-10228

A STUDY OF THE EFFECTS OF COPPER APPLIED CONTINUOUSLY AND DISCONTINUOUSLY TO SPECIMENS OF MYTILUS EDULIS (L.) EXPOSED TO STEADY AND FLUCTUATING SALINITY LEVELS,
Natural Environment Research Council, Bangor (Wales). Unit of Marine Invertebrate Biology
For primary bibliographic entry see Field 5C.
W77-10239

FISHERY WASTE EFFLUENTS: A SUGGESTED SYSTEM FOR DETERMINING AND CALCULATING POLLUTANT PARAMETERS,
National Marine Fisheries Service, Kodiak, Alaska. Northwest and Alaska Fisheries Center.
J. Collins, and R. D. Tenney.
Fishery Bulletin, Vol. 75, No. 2, p 253-260, 1977. 3 fig, 4 tab, 6 ref.

Descriptors: *Industrial waste, *Analytical techniques, *Shrimp, *Chemical oxygen demand, *Water quality, *Monitoring, *Statistical methods, *Pollutant identification, Indicators, Commercial shellfish, Water pollution sources.
Identifiers: *Fishery waste.

An improved and simplified system to test for pollutants in shrimp waste effluents is presented. In addition, two methods were developed to calculate both protein and oil and grease content. The first method is based on establishing empirical regressions of protein or oil and grease on total residue. The second and preferred method, a simultaneous equation, is independent of these correlations but dependent on the total residue and chemical oxygen demand (COD) of the waste effluent obtained through routine analyses. The COD value was found to depend upon the amount of potassium dichromate remaining at the completion of the 2-h reflux period. The dichromate can vary from 0 to 6.25 meq excess and between 2 and 5 meq, the COD will vary 4.2%. A table of factors is given to correct the COD to 3.5 meq excess. Coefficients of COD were determined on a number of preparations of protein and oil and grease from shrimp waste effluent and from fish and shellfish. These coefficients (1.338 mg COD/mg protein and 2.67 COD/mg oil and grease) were required for the simultaneous equation. The simple analytical test and mathematical treatment used in this system would be less expensive to the industry and would result in a more accurate and comprehensive evaluation of the waste load than currently ob

tainable by methods specified in the monitoring regulations. (Katz)
W77-10242

EFFECTS OF POLLUTING SUBSTANCES ON ENZYMES OF AQUATIC ORGANISMS,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10247

FATTY ACIDS AS ICHTHYOTOXIC CONSTITUENTS OF A GREEN ALGA CHEATOMORPHA MINIMA,
Tokyo Univ. (Japan). Lab. of Marine Biochemistry.
For primary bibliographic entry see Field 5C.
W77-10248

MERCURY IN AQUATIC ORGANISMS. II. MERCURY DISTRIBUTION IN MUSCLES OF TUNAS AND SWORDFISH, (IN JAPANESE),
S. Arima, and S. Umemoto.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 42, No 8, p 931-937, 1976. 2 tab, 4 fig, 24 ref.

Descriptors: *Mercury, *Fish physiology, Path of pollutants, *Absorption, *Proteins, Distribution, Public health, Commercial fish, Metals, *Marine fish, Biochemistry, Pollutant identification.
Identifiers: *Tissue analysis, *Tuna, *Thunnus, *Swordfish, *Muscle proteins.

Mercury distribution in fish muscle was determined using samples of ordinary muscle from the bigeye tuna, Thunnus obesus, bluefin tuna, T. thynnus, and swordfish, Xiphias gladius. Four components; myofibrillar protein (Mf), sarcoplasmic protein (Sp), extractives (nonprotein nitrogenous compounds) (Ex), and insoluble muscle residue (R) were separated from the muscle and mercury concentration in each was determined. The total mercury concentrations in the muscles ranged from 0.74 to 2.34 ppm. The mercury contents (Hg/N) were different among the four components being highest in Mf followed by Sp and R, and lowest in Ex. This resulted in an uneven distribution of mercury in muscle. The Mf and Sp fractions compose the major part of muscle protein and contained 71 to 89% of the muscle mercury. Similar patterns of mercury distribution were observed in the six muscles examined. Linear relations were found between the mercury content in muscle and that in Mf or Sp. At a low mercury level, mercury was preferentially incorporated into Mf, while at a higher level, mercury was incorporated into both Mf and Sp. (Katz)
W77-10253

STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-IX, ISOLATION AND IDENTIFICATION OF PENTACHLOROPHENYL-B-GLUCORONIDE ACCUMULATED IN BILE OF GOLDFISH,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
For primary bibliographic entry see Field 5C.
W77-10255

HEAVY METALS IN THE GASTROPOD MOLLUSC HALIOTIS TUBERCULATA (L.),
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W77-10256

CRITICAL THERMAL MAXIMA OF TWO SPECIES OF ESTUARINE FISH,
Environmental Research Lab., Narragansett, R.I.
For primary bibliographic entry see Field 5C.
W77-10258

COPPER TOXICITY EXPERIMENTS IN RELATION TO ABALONE DEATHS OBSERVED IN A POWER PLANT'S COOLING WATERS,
California State Dept. of Fish and Game, Monterey. Marine Bioassay Lab.
For primary bibliographic entry see Field 5C.
W77-10261

INFLUENCE OF SOIL PH ON THE AVAILABILITY OF ADDED BORON,
Wisconsin Univ., Madison. Dept. of Soil Science; and Wisconsin Univ., Madison. Dept. of Horticulture.
For primary bibliographic entry see Field 2G.
W77-10274

EXCHANGE AND HYDRATION PROPERTIES OF CU(2+) ON MIXED-ION NA(+) - CU(2+) SMECTITES,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-10276

POTASSIUM RELEASE FROM SAND, SILT, AND CLAY SOIL SEPARATES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-10277

TRIPOLYPHOSPHATE AND PYROPHOSPHATE HYDROLYSIS IN SEDIMENTS,
Monsanto Philippines Inc., Makati.
For primary bibliographic entry see Field 5B.
W77-10285

SOIL AERATION,
Edinburgh Univ. (Scotland). School of Agriculture.
For primary bibliographic entry see Field 2G.
W77-10325

DETERMINATION OF DIMETHYLNITROSAMINE IN AIR AND WATER BY THERMAL ENERGY ANALYSIS: VALIDATION OF ANALYTICAL PROCEDURES,
Thermo Electron Research Center, Waltham, Mass.
D. H. Fine, D. P. Rounbehler, E. Sawicki, and K. Krost.
Environmental Science and Technology, Vol. 11, No. 6, p 577-580, June 1977. 3 fig, 3 tab, 13 ref.

Descriptors: *Pollutant identification, Analytical techniques, *Air pollution, *Water pollution, *Water analysis, Pollutants, Chemical analysis, Chromatrography, Mass spectrometry, Chemistry, Instrumentation, Testing, Testing procedures, Analysis, Thermal power.
Identifiers: *Dimethylnitrosamine, *Validation of procedure, Airborne carcinogens, Nitrosamines, Cryogenic trapping, Air monitoring.

Analytical techniques for the analysis of dimethylnitrosamine (DMN), sensitive at the 1 ng/cu m level in air and at the 2 ng/L level in water, were described. For air analyses, DMN was scrubbed by one of three parallel procedures, cryogenic trapping, trapping in dilute alkali, or trapping on Tenax GC material. To ensure that the analytical procedures were valid and that there was no possibility of a positive or negative interference during scrubbing or subsequent work-up and chromatography, extensive control experiments were carried out on the site of two chemical factories. (Henley-ISWS)
W77-10329

USE OF A MODIFIED TENAX GC COLUMN PACKING FOR THE DIRECT GAS CHROMATOGRAPHIC ANALYSIS OF PHENOLS IN WATER AT THE PPM LEVEL,
Leeds Univ. (England). Dept. of Physical Chemistry.
K. D. Bartle, J. Elstub, M. Novotny, and R. J. Robinson.
Journal of Chromatography, Vol. 135, No. 2, p 351-358, May 21, 1977. 5 fig, 3 tab.

Descriptors: *Gas chromatography, *Analytical techniques, *Phenols, *Adsorption, Industrial wastes, Effluents, Organic compounds, Sewage treatment, *Waste water treatment, Waste treatment, *Pollutant identification.
Identifiers: Column packing, Tenax.

The use of gas chromatography with a Tenax (2,6-diphenyl-p-phenyl oxide polymer) column packing is examined as an effective means for the analysis of very dilute solutions (ppm levels) of phenols in water. Comparisons were made of the adsorption effects of three column packings: Tenax GC as received, and Tenas modified by the treatment with 2% and also 5% of its weight in polymetaphenyl ether. This modifying phase was chosen for its high temperature stability and similarity in molecular strucutre to that of Tenax in an attempt to deactivate the adsorption sites of Tenax, whose strong irreversible adsorption of polar compounds had been previously demonstrated and was reconfirmed in the experiment. A clear improvement in peak symmetry and in areas of the peaks was shown with the use of the modified Tenax. The improvement was greatest with the use of the concentrated solution of ether (5% of the weight of the Tenax) where early symmetrical peaks and and an efficient signal to noise ratio were observed. Retention times were shorter in the Tenax modified with 2% of its weight in ether than with the unmodified material but were increased in length by the use of the 5% modified Tenax, evidently showing a mixture of gas/liquid and liquid/gas chromatographic properties. Both quantitative and qualitative analyses were then made of aqueous solutions of phenols including the direct analysis of industrial effleunt samples. This column packing material was shown to provide for an efficient transmission and resolution of very small (ppm levels) quantities of organic compounds in the presence of tremendous excesses of water, thus meeting the requirement for a rapid method for the identification of individual phenols in industrial effluent. (Pfeifer-FIRL)
W77-10350

RAPID ANALYSIS OF ACID MINE DRAINAGE,
West Virginia Univ., Morgantown. Coal Research Bureau.
B. G. McMillan, D. J. Akers, and J. F. Colabrese.
Mining Congress Journal, Vol. 63, No. 5, p 28-33, May, 1977. 4 fig, 3 tab, 1 ref.

Descriptors: *Pollutant identification, *Mine drainage, *Acid streams, *Analytical techniques, *Colorimetry, *Mine acids, Mine water, Mining, Strip mine wastes, Acid mine water, Water pollution sources, Waste water treatment, Industrial wastes, Coal mines, Metals, Iron, Aluminum, Copper, Manganese, Nickel, Sulfates.

In light of increasing need for frequent monitoring and rapid treatment of industrial discharges and acid mine drainage, the feasibility of 'on-site' chemical analyses was evaluated. Results obtained by analyses for Al, Cu, Mn, Fe, Ni, and SO4 in acid mine drainage (AMD) using three analytical instruments (a portable field colorimeter, a laboratory model spectrophotometer, and an atomic absorption spectrophotometer) were compared for test accuracy and speed. It was found that ionic interference and pH may affect test accuracy. High iron concentrations must be eliminated by acidifying the AMD before concentrations of Al, Cu, Mn, Ni and SO4 can be determined. Using the percent mean error as a criterion for accuracy, use of the

spectrophotometer was preferred. Ni could be analyzed using either spectrophotometry or atomic absorption. (Schulz-FIRL)
W77-10356

GROWTH OF AN ESTUARINE PSEUDOMONAS SP. ON POLYCHLORINATED BIPHENYL,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-10362

A SYSTEM OF RADIATION MONITORING, AND METHODS AND EQUIPMENT FOR MEASURING WATER OF LOW SPECIFIC ACTIVITY,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow. Institut Atomnoi Energii.
For primary bibliographic entry see Field 5B.
W77-10414

GROUNDWATER MONITORING WELLS,
Stearns and Wheeler, Cazenovia, N. Y.
For primary bibliographic entry see Field 5B.
W77-10517

A RAPID METHOD FOR THE QUANTITATIVE ISOLATION OF VIRUSES FROM POLLUTED WATER,
Hadassah Medical School, Jerusalem (Israel).
E. Katzenelson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 117, Price codes: A02 in paper copy, A01 in microfiche. 1976. 16 p, 2 fig, 4 tab, 14 ref.

Descriptors: *Viruses, *Pollutant identification, Cultures, Analytical techniques, Water pollution control, Chemical reactions, Chemical analysis, Bioindicators, Pollutants, Bioassay, Waste water treatment.

A method was presented for the rapid identification and quantification of viruses in polluted water. The fluorescent antibody technique was employed to determine viruses in tissue cultures within hours of infection. Positive cells were seen after 6-8 hours, but results were not sufficiently quantitative. An interval of 18-24 hours would be adequate for most applications. Possible 'false positive' results were considered in high-speed determinations because of reagent impurities. The method was less susceptible to bacterial contamination than those currently used. Reliability should be improved by the use of reagents with higher quality. Potable water determinations, by this method, were considered. (Collins-FIRL)
W77-10538

HANDBOOK FOR SAMPLING AND SAMPLE PRESERVATION OF WATER AND WASTEWATER,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
K. R. Huibregtse, and J. H. Moser.
1976. 276 p, 79 fig, 47 tab, 161 ref. EPA Technical Report EPA-600/4-76-049.

Descriptors: *Water analysis, *Sampling, *Analytical techniques, Chemical analysis, Testing procedures, Measurement, Monitoring, Instrumentation, Industrial water, Municipal water, Agricultural runoff, Biological properties, Chemical properties, Laboratory tests, On-site tests, Analysis, Waste water treatment.
Identifiers: Sample preservation.

Sampling techniques and methods of sample protection were provided for water and waste water analysis. The information was collected from literature and a survey of field practices. General sampling and other guidelines were presented. There was a discussion of automatic samplers, flow measuring devices, and a statistical approach to sampling. The preservation of physical, chemical, biological, and radiological parameters was also considered. Sampling procedures for waters from municipal, industrial, and agricultural sources were reviewed. Information was presented concerning surface water and sludge sampling procedures. The report was not an official EPA manual. (Collins-FIRL)
W77-10539

THE PERSISTENCE OF POLIOVIRUS IN ACTIVATED SLUDGE TREATMENT,
Surrey Univ., Guildford (England).
For primary bibliographic entry see Field 5D.
W77-10583

DISTRIBUTION OF GAS FORMING BACTERIA IN SULFUR DEPOSITS OF THE PRECARPATHIANS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
For primary bibliographic entry see Field 5B.
W77-10640

RECOVERY AND SUSCEPTIBILITY PATTERN OF FAECAL STREPTOCOCCI BACTERIOPHAGES,
National Research Centre, Cairo (Egypt). Water Pollution Dept.
F. A. Saleh.
Water Research, Vol. 11, No. 4, p 403-409, 1977. 1 fig, 5 tab, 24 ref.

Descriptors: *Streptococcus, *Pollutant identification, Sewage bacteria, Biological properties, Chemical properties, Analytical techniques, Separation techniques, Laboratory tests, Cultures, Water water treatment.

The incidence of fecal streptococci and their phages in fresh sewage samples was determined. About 120 isolated strains were recovered. Nearly 18% were classified as Str. faecalis, Str. faecalis var. zymogenes, Str. facecalis var. liquefaciens, Str. durans, Str. faecium, and Str. equinus. Another 52% were designated as atypical faecalis, I, II, III, and IV. Thirty percent were unidentified. Phage sensitive cultures were 68% of the isolates, phage resistant strains 32%. For phage recovery, two primary enrichment media containing MgSO4 and L-tryptophan were used. Of 20 samples, 19 yielded at least one phage type for recovery rate of 95%. Nine phages could not be isolated in the absence of MgSO4 and L-tryptophan co-factors; three of these required L-tryptophan and one required MgSO4. Phage typing was favorable, simple, and definitive for identification of a majority of the isolated cultures. Phage sensitivity was found to correlate with characteristics such as tellurite resistance, TTC-reduction, and mannitol fermentation. Further study of phage typing was recommended. (Collins-FIRL)
W77-10641

SCREENING METHOD FOR DETERMINATION OF THE DEGRADABILITY OF ORGANIC COMPLEXING AGENTS (SCREENINGVERFAHREN ZUR FESTSTELLUNG DER ABBAUBARKEIT ORGANISCHER KOMPLEXBILDNER),
K. H. Robra.
Zeitschrift fuer Wasser- und Abwasser-Forschung, Vol. 10, No. 3, p 104-108, 1977. 3 fig, 3 tab, 22 ref.

Descriptors: *Biodegradation, *Organic compounds, Carbon, Analytical techniques, Microorganisms, Biochemical oxygen demand, Biological treatment, Analysis, Performance, Waste water treatment.
Identifiers: Closed bottle test(GF-test).

Experiments were conducted to study the degree and rate of biological degradation of organic complex-forming compounds. The trials were based on the closed-bottle test (GF-Test). The only source of carbon for the microorganisms in the inoculum was the organic substances supplied. Degradation rates were expressed as a percentage of BOD relative to the decrease of organic substances in terms of the theoretical BOD. (Collins-FIRL)
W77-10644

WATER ANALYSIS,
Geological Survey, Denver, Colo.
M. J. Fishman, and D. E. Erdmann.
Analytical Chemistry, Vol. 49, No. 5, p 139R-158R, April, 1977. 429 ref.

Descriptors: *Analytical techniques, *Pollutant identification, *Monitoring, *Measurement, Organic compounds, Inorganic compounds, Gases, Metals, Water quality, Waste water treatment.

A two-year review (October 1974 through September 1976) was presented on the application of analytical chemistry to water analysis. Continuous monitoring, automated analysis, and sampling procedures were discussed. Analyses involved included major and trace inorganics, organics, and water characteristics. Several spectrometric methods were described for determinations of alkali metals and alkaline earth metals. Techniques for analysis of copper, zinc, lead, and similar metals included several methods of simultaneous analysis. A spectrophotometric method presented for phosphate analysis in waste water involved ultrafiltration, humic acid precipitation, and its determination as the yellow vanadate-molybdate complex. Arsenic determinations by flameless atomic adsorption spectrometry and sulfate analysis by gravimetric and automated spectrophotometric methylthymol blue methods were successful. Simultaneous determinations of ammonium, sodium, and potassium ions in waste water were achieved by using ion-selective electrodes. Methods applied to oxygen, ozone, and chlorine analysis included spectrophotometric, chemiluminescence, and colorimetric procedures. Organic pollutants were measured by gas chromatography-mass spectrometry. Automated and portable techniques were presented for analysis and monitoring. Other methods for organic determinations included membrane techniques, solvent extraction, and fluorometric techniques. Methods of radiochemical and isotopic analysis were presented. (Collins-FIRL)
W77-10648

SAMPLE PRETREATMENT FOR DETERMINATION OF SOME ANIONS IN HIGHLY POLLUTED EFFLUENTS (UPRAVA VZORKU PRED STANOVENIM NEKTERYCH ANIONTU V SILNE ZNECISTENYCH ODPADNICH VODACH),
Technical Univ. of Brno (Czechoslovakia).
F. Kosina, J. Kupec, M. Mladek, and A. Fojtu.
Chemicky Prumysl, Vol 26, No 11, p 601-603, November, 1976. 1 fig, 5 ref, 1 tab.

Descriptors: *Waste identification, *Water analysis, *Anions, *Cation exchange, Ion exchange, Effluents, Organic compounds, Sulfides, Tannery wastes, Water pollution sources, Wastes, Industrial wastes, Chlorides, *Pollutant identification, Sulfur compounds.

The determination of some anions such as chlorides in highly contaminated effluents is often hindered by the presence of organic materials. Instead of clarification with aluminum hydroxide, a method was developed and successfully tested using highly acidic cation-exchange resin (Wofatit KBS) for the removal of undesirable dissolved organics. The use of a Samuelson column with a stirrer is recommended to avoid plugging. Some anions (such as sulfide, mercaptide, and thiosulfate) which interfere with the analysis can

e oxidized with 30% hydrogen peroxide solution. The described sample pretreatment using the cation-exchange resin and oxidation with peroxide vas successfully applied to tannery wastes prior to he volumetric determination of chlorides. Trubacek-IPC)
W77-10692

NALYSIS OF POLLUTANTS IN EFFLUENTS OF A PYROLYSIS FACTORY (ANALIZ AGRYAZNENII STOCHNYKH VOD PIROLIZOGO PREDPIYATIYA),
. A. Smirnova, A. I. Firsov, and Yu. V. odzinskii.
idroliznaya i Lesokhimicheskaya Promyshlenost, No 8, p 15, 1976. 5 ref, 1 tab.

escriptors: *Effluents, *Waste identification, Waste water treatment, Pollution abatement, astes, Water pollution sources, Industrial astes, Pollutants, Acids, Phenols, Carohydrates, Anions, Cations, Inorganic comunds, Organic compounds, Biological treatent, Water pollution treatment, Oxidation, Aeraon, Waste treatment, Effluents, Oxygen, Foreign untries, Treatment facilities.
lentifiers: *Wood pyrolysis, Wood products instry, Soviet Union(USSR).

connection with stricter standards for the purifiion of waste waters in the USSR, analyses were ade of effluents of the Syava wood pyrolysis ant. The untreated effluent contained, per liter, 00 mg of 1-5 carbon acids, 120 mg of 6-20 carbon ids, 40 mg of phenols, 80 mg of carbohydrates, mg of cations, and 4308 mg of anions, for a total 2580 mg organic and 4350 mg inorganic subances. Biological purification reduced this load 80-90%. The purified effluent had the same alitative composition as before purification but ntained only 110 mg/liter organic substances and 0 mg/liter inorganic substances. The treated efent was found to be contaminated with higher ids, phenols, alcohols, aldehydes, and salts of ganic and inorganic acids. It is suggested that the rification of the plant's effluents could be ineased up to 99.7% by prolonging the oxidation e and increasing the amount of oxygen fed into tanks, and also by conducting the biological rification in two stages, i.e., oxidation in ponds er the aeration tanks. (Stapinski-IPC)
77-10698

RGANIC COMPOUNDS IN RED PINE KRAFT EACHING SPENT LIQUOR (IN JAPANESE),
vernment Forest Experiment Station, Tokyo pan).
Shimada.
an Tappi, Vol 31, No 2, p 97-103, February, 7. 7 fig, 19 ref, 5 tab.

scriptors: *Bleaching wastes, *Organic comunds, *Waste identification, *Pollutant identifiion, Wastes, Industrial wastes, Pulp wastes, ter pollution sources, Pine trees, Lignins, romatography, Gas chromatography, Mass ctrometry, Chemical analysis, Water analysis, aration techniques.
ntifiers: Pinus densiflora(Japanese red pine), ft pulp, Kraft mills.

h- and low-molecular weight organic comnds were isolated from bleach plant effluents raft-pulped Pinus densiflora and examined for mical characteristics. Among the high-molecu- weight compounds, chlorinated oxylignin L) amounted to about 16% of total organic erials. Gel permeation and ultrafiltration inted COL to have higher molecular properties n milled wood lignin or thiolignin (kraft lignin), its chemical structure was seriously degraded ng bleaching to the extent that the p-hydroxenylpropane unit predominant in the original n almost disappeared. However, a small unt of chlorinated aromatic rings was still ent in the COL molecule, as evidenced by chlorinated vanillin derivatives among the alkaline cupric oxide oxidation products. Low-molecular weight compounds obtained by continuous extraction with n-hexane, ethyl ether, and ethyl acetate, isolated by column chromatography and identified by gas chromatography/mass spectrometry and chemical analyses, included palmitic acid, stearic acid, 2,4,6-trichlorophenol, 5-chlorovanillin, beta-sitosterol, p-hydroxbenzoic acid, vanillic acid, 5- and 6-chlorovanillic acids, syringic acid, and ferulic acid. (Brown-IPC)
W77-10699

ON THE PROPERTIES OF WASTE WATER PRODUCED IN OZONE BLEACHING OF KRAFT PULP (IN JAPANESE),
Government Industrial Research Inst., Takamatsu (Japan).
T. Kubo, J. Hosokawa, T. Kobayashi, and Y. Kimura.
Japan Tappi, Vol. 31, No. 2, p 104-109, February, 1977. 8 fig, 12 ref, 4 tab.

Descriptors: *Bleaching wastes, *Ozone, Wastes, Industrial wastes, Pulp wastes, Carbohydrates, Acids, Lignins, Organic compounds, Effluents, Pulp and paper industry, Effluents, *Waste identification, *Pollutant identification.
Identifiers: Kraft pulp, Kraft mills.

Effluents from the ozone stage of kraft pulp bleach plants were compared with those of CEHDED bleaching. In the ozone effluent, carbohydrate and weak acid contents increased with bleaching levels, while lignin content first increased (during the initiation period) and then decreased. Gel filtration chromatograms, infrared, and nuclear magnetic resonance spectra indicated decomposition of macromolecular lignin to lower-molecular weight organic compounds with no absorption at 280 nm. Carbohydrate and TOC components in the ozone effluent (compared at 85% pulp brightness) were higher than in the chlorination effluent, despite the former's lower lignin content, owing to a greater amount of low-molecular weight organic compounds. (Brown-IPC)
W77-10700

DETERMINATION OF CONTAMINANTS IN KRAFT MILL CONDENSATES USING GAS CHROMATOGRAPHY (STANOVENI KONTAMINUJICICH LATEK V KONDENZATECH ZE SULFATOVE CELULOZKY POMOCI PLYNOVE CHROMATOGRAFIE),
IRAPA, Prague (Czechoslovakia). Vyvojovy a Racionalizacni.
L. Ruzickova.
Papir a Celuloza, Vol. 31, No. 12, p 277-278, 1976. 1 fig, 3 ref, 1 tab.

Descriptors: *Waste identification, *Gas chromatography, *Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Hydrogen ion concentration, Water analysis, Analytical techniques, Chromatography, Evaporators, Sulfides, Alcohols, Organic compounds.
Identifiers: *Kraft mills, Methyl mercaptan, Dimethyl sulfide, Dimethyl disulfide, Methanol, Ethanol, Acetone.

The gas-chromatographic analysis of kraft mill condensates was carried out using a 2-m-long stainless steel column with Chromosorb AW-HMCS wetted with 20% Triton X-305. The column was heated to 100 C, and the flow of nitrogen, hydrogen, and air was kept at 40, 50, and 750 ml/min, respectively. The chromatograph had a flame ionization detector. A total of seven samples were analyzed, obtained from digester relief and multiple-effect evaporators in various kraft mills. Tabulated results show the pH and the concentrations of methyl mercaptan, dimethyl sulfide and disulfide, methyl and ethyl alcohols, and acetone in the samples. Also shown are examples of chromatograms obtained. (Trubacek-IPC)
W77-10712

DAPHNIA PULEX PULLS ITS WEIGHT IN PULP MILL TOXICITY TESTS,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
E. W. Tunstall, and M. Solinas.
Pulp and Paper Canada, Vol. 78, No. 4, p 84-85, 87-90 (T93-T98), April, 1977. 3 fig, 1 illus, 14 ref, 2 tab.

Descriptors: *Pulp wastes, *Toxicity, *Bioassay, *Daphnia, Wastes, Industrial wastes, Effluents, Aquatic animals, Costs, Operating costs, Crustaceans, Insects, Fish, Water pollution sources, Testing, Testing procedures, Biological treatment, Pulp and paper industry, Aquatic microorganisms, *Pollutant identification.

A method for testing the toxicity of pulp mill effluents to an aquatic microorganism, Daphnia pulex, has been developed. The bioassay gave reproducible and self-consistent results which showed good correlation with those of a fish bioassay. The simplicity of rearing daphnids and using them for testing toxicity makes the test suitable for use at the mill site. The small effluent volumes required for administering the test make it ideal for research. Cost of the 24-hr test is a fraction of the 96-hr fish bioassay. (Brown-IPC)
W77-10718

A LONG-RANGE PROGRAM FOR MEETING THE PAPER INDUSTRY'S ENVIRONMENTAL PROTECTION TECHNICAL INFORMATION NEEDS,
National Council of the Paper Inustry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-10720

CHARACTERIZATION OF SPENT BLEACHING LIQUORS. PART 2. DIFFERENT SEQUENCES FROM PREBLEACHING OF PINE AND BIRCH KRAFT PULP,
Swedish Forest Products Research Lab. Stockholm.
H. L. Hardell, and F. de. Sousa.
Svensk Papperstidning, Vol. 80, No. 7, p 201-209, April 25, 1977. 6 fig, 8 ref, 12 tab.

Descriptors: *Bleaching wastes, *Waste identification, *Water analysis, Chlorine, Organic compounds, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Waste water(Pollution), Water pollution, Pine trees, Effluents, Pulp wastes, Color, Hardwood, Softwood.
Identifiers: Chlorine dioxide, Chlorine compounds, Kraft pulp, Birch trees(Betula).

The previously outlined method of characterizing bleach plant effluents has been used to compare different prebleaching sequences for soft- and hardwood kraft pulps based on C1, chlorine dioxide, and their mixtures. When chlorine dioxide was used, relatively more organic material was dissolved in the first stage, probably because of the greater oxidizing power of chlorine dioxide than of C1. For the same reason probably, the proportion of high-molecular weight organic materials in the spent liquor increased with increasing amounts of chlorine dioxide used in bleaching. The color of pine pulp bleaching effluent, using chlorine dioxide alone, was about one-half that of the spent C1 bleach liquor. For birch kraft pulp, the corresponding color reduction was only about 20%. (See also W77-09731) (Brown-IPC)
W77-10723

A PRESENTATION OF THE NORWEGIAN EFFECT 'ACID PRECIPITATION-EFFECTS ON FOREST AND FISH',
Royal Norwegian for Scientific and Industrial Research, Kjeller.
For primary bibliographic entry see Field 5C.
W77-10724

USE OF LABORATORY EXTRACTION DATA TO PREDICT LOSSES OF DISSOLVED INORGANIC PHOSPHATE IN SURFACE RUNOFF AND TILE DRAINAGE,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
A. N. Sharpley, R. W. Tillman, and J. K. Syers.
Journal of Environmental Quality, Vol 6, No 1, p 33-36, 1977. 4 fig, 2 tab, 14 ref.

Descriptors: *Phosphorus, Surface runoff, *Subsurface runoff, *Measurement, *Laboratory tests, Analytical techniques, Pastures, Tile drainage, Fertilization, Foreign research, *Pollutant identification, *Phosphates, *Dissolved solids.
Identifiers: New Zealand, Non-point phosphorus sources.

A laboratory procedure is described which measures extractable soil inorganic phosphorus to predict losses of dissolved inorganic phosphorus (DIP) in surface runoff and subsurface tile drainage from a soil under permanent pasture in both fertilized and unfertilized conditions. The mean DIP concentration in each of several surface runoff periods was closely correlated with the amounts of inorganic phosphorus extracted by 0.1M sodium chloride from the top 5 cm of soil prior to the period. For three of the four combinations of treatments evaluated (undrained, unfertilized; drained, unfertilized; and drained, fertilized) the linear relationships obtained were similar despite large variations in the phosphorus concentrations observed. Mean DIP concentrations in surface runoff from the drained plots were consistently lower than those from the undrained plots. The relationship between the mean DIP concentrations of surface runoff and the amounts of extractable inorganic phosphorus for the undrained, fertilized plot was also linear but a greatly different gradient was obtained. Soil extraction data appear to be useful in predicting mean DIP concentrations in surface runoff from reasonably homogeneous soils under pasture. Total DIP loading correlated best with the amounts of inorganic phosphorus extracted from soil at 40-50 cm, a depth which corresponds to that of mole channels. (Auen-Wisconsin)
W77-10734

A BASIC STUDY ON APPLICATION OF SYSTEMIC INSECTICIDES: V. EFFECTS OF RAINFALL ON TOXICITY OF VAMIDOTHION AND MALATHION, (IN JAPANESE),
Shionogi Co. Ltd., Shiga (Japan). Aburahi Lab.
For primary bibliographic entry see Field 5C.
W77-10737

HEAVY METAL CONCENTRATIONS IN ORGANISMS FROM AN ACTIVELY DREDGED TEXAS BAY,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-10739

CHEMISTRY AND VEGETATION OF HIGHLY ACIDIC STREAMS,
Durham Univ. (England). Dept. of Botany.
J. W. Hargreaves, E. J. H. Lloyd, and B. A. Whitton.
Freshwater Biology, Vol. 5, No. 6, p 563-576, 1975. 2 fig, 7 tab, 23 ref.

Descriptors: *Acid streams, *Surveys, *Water chemistry, *Acid mine water, *Acidic water, Hydrogen ion concentration, Industrial wastes, Algae, Aquatic plants, Mosses, Heavy metals, Nitrogen, Phosphates, Silicates, Streams, Ponds, Varieties.
Identifiers: *England.

Highly acidic freshwater streams (pH of 3.0 or less) in England were surveyed and their water chemistry and flora reported. Fifteen sites were located, 13 of which were associated with coal mining, one with a barytes mine, and one with an industrial effluent. All sites included flowing waters, though in a number of cases stagnant pools came in direct contact with these streams. Each body of water contained high levels of heavy metals and silicate and most carried moderately high levels of phosphate and combined inorganic nitrogen. Total flora consisted of 24 algae, two mosses, and two flowering plants. Of these, three algae and one flowering plant were only found in polls. The most widespread species, Euglena mutabilis, was also often the most abundant, forming up to an 80% cover. Species in both pools and streams showed a positive correlation with pH during late summer, but revealed a negative correlation with total acidity in winter. These algal observations were also compared with similar studies of U.S. waters. Only four algal species were common to both countries. (Luedtke-Wisconsin)
W77-10744

ORTHOPHOSPHATE TURNOVER IN EAST AFRICAN LAKES,
Munich Univ. (West Germany). Zoologisches Institut.
For primary bibliographic entry see Field 5C.
W77-10752

DRY DEPOSITION LOADING OF LAKE MICHIGAN BY AIRBORNE PARTICULARATE MATTER,
Governors State Univ., Park Forest South, Ill. College of Environmental and Applied Sciences.
H. Sievering.
Water, Air, and Soil Pollution, Vol. 5, p. 309-318, 1976. 3 fig, 3 tab, 22 ref.

Descriptors: *Mass transfer, *Aerosols, *Model studies, Diffusion, Dispersion, Fallout, Trace elements, Metals, Particle size, *Lake Michigan, Air pollution.
Identifiers: *Dry deposition, Wet deposition, Chicago(Illinois).

A model which treats transport of airborne particulate as a function of particle size couples Chicago area meterorological data through the mixed layer with laboratory and field data on water surface dry depostion. Dispersion over Lake Michigan is characterized by a diffusion equation which includes the gravitational field corrected for surface depletion, and deposition onto a smooth surface is characterized by a previously-developed equation. The model is used: (1) to estimate a minimum mass transfer efficiency by dry deposition from the Chicago area to Lake Michigan; (2) to compare this minimum with the likely maximum wet deposition; and (3) to estimate the transfer efficiency of trace metals. Results indicate that fry deposition causes 15% or more mass transfer efficiency of aerosols to the total mass transfer may be equal to or greater than wet deposition by precipitation scavenging. However, because of the function of particle size, trace metal transfer is probably dominated by wet deposition. Most trace metals had a transfer efficiency of 1 to 2% by dry deposition. It is concluded that dry deposition appeared to be a more important mechanism for mass transport than wet deposition and that particle size should always be considered in any mass transport calculations. (Luedtke-Wisconsin)
W77-10758

DETERMINATION OF INORGANIC PHOSPHORUS IN OXALATE EXTRACTS OF SOILS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
L. B. Owens, D. W. Nelson, and L. E. Sommers.
Soil Science Society of America Journal, Vol 41, No 1, p 148-149, January-February 1977. 3 tab, 8 ref. OWRT B-075-IND(1).

Descriptors: *Pollutant identification, *Phosphorus, *Analytical techniques, *Soil analysis, *Phosphorus compounds, *Chemical analysis, Phosphates, Inorganic compounds, Colorimetry, Analysis, Soil chemistry, Color reactions, Instrumentation, Testing procedures, Separation techniques, Fertilizers.
Identifiers: *Inorganic phosphorus, *Phosphorus sorption, Oxalate extracts, Extractable iron, Oxalate interference, Ascorbic acid procedure.

A simple and rapid procedure for the determination of inorganic phosphorus in acid ammonium oxalate extracts of soils was developed by modifying the ascorbic acid-molybdenum blue colorimetric method. The oxalate interference in the determination of P was overcome by addition of excess ammonium molybdate. A molar ratio of molybdate to oxalate of 2.51:1 in the final solution was required in order to eliminate the oxalate interference. (Henley-ISWS)
W77-10797

5B. Sources Of Pollution

OXYGEN-SAG IN A TIDAL RIVER,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
G. J. Macdonald, and R. N. Weisman.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 103, No. EE3, Proceedings Paper 13023, p 473-488, June 1977. 5 fig, 1 tab, 24 ref, 2 append.

Descriptors: *Dissolved oxygen, *Biochemical oxygen demand, *Tidal streams, *Oxygen sag, Estuaries, Water quality, Dispersion, Analysis, Equations, Reaeration, Mathematical models, *Path of pollutants, Water pollution sources.
Identifiers: Tidal flow.

Freshwater flow in a tidal river was incorporated in a dimensionless solution of the derived equations for BOD and DOD, and a comparison was made between the profiles obtained with both a constant and a time variable dispersion coefficient, E. The time variation of E was expressed as the ratio of the absolute value of the oscillating velocity to a reference velocity. Flow data from the Potomac River, Washington, were used in the computer programs, and illustrative BOD and DOD profiles were presented. Increases in the river discharge decrease and translate downstream the points of maximum BOD and DOD. Time variation of the dispersion coefficient smooths both BOD and DOD profiles, as opposed to a constant value of E, and reduces their peak values. Decisions on the maximum DOD associated with a specific effluent outfall, which are based on a solution with a constant E, appear, therefore, to be conservative. (Adams-ISWS)
W77-10114

PLUTONIUM AND AMERICIUM ACTIVITIES IN THE NORTH SEA AND GERMAN COASTAL REGIONS,
Deutches Hydrographisches Institut, Hamburg (West Germany).
C. N. Murray, and H. Kantsky.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 319-328, May 1977. 4 fig, 4 tab, 17 ref.

Descriptors: *Radioactive waste, *Radioisotopes, *Oceans, *Coasts, Sampling, Surveys, Chemical analysis, Laboratory tests, Measurements, Sediments, Sea water, Pollutants, Water pollution, *Path of pollutants, Oceanography.
Identifiers: *Plutonium, *Americium, *North Sea.

Artificial radionuclides are discharged into the North Sea from three nuclear fuel reprocessing plants, namely La Hague in Northern France, Windscale in the north west of England, and Dounreay in Northern Scotland, as well as from

fallout from nuclear weapons testing. Data were presented on the distributions of 239 + 240 Pu, 238 Pu and 241 Am in seawater from the German Bight and German Baltic coastlines as well as from other parts of the North Sea up to latitude 60 deg N. Results from the Pentland Firth in the north of Scotland and the English Channel show 239 + 240 Pu activities in seawater 5-15 times higher than North Atlantic fallout levels. The ratio 238 Pu/239 240 Pu is significantly higher in the Pentland Firth area (0.21 plus or minus 0.01) than in the Channel (0.15 plus or minus 0.02), and the difference may well be a reflection of different input sources of plutonium in these waters. German coastal seawater and sediment plutonium activities appear to be due only to fallout, the isotope ratio being about 0.06 plus or minus 0.02, a value in good agreement with accepted North Atlantic values. (Sims-ISWS)
W77-10122

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
D. G. Shaw, L. M. Cheek, and A. J. Paul.
Estuarine and Coastal Marine Science, Vol 5, No 1, p 429-436, May 1977. 2 fig, 1 tab, 18 ref. EPA R800944.

Descriptors: *Oil pollution, *Sediments, *Alaska, In-site investigations, Sampling, Coasts, Water pollution, Oil, Oil spills, Harbors, Estuaries, Bays, Sands, Silts, Tides, Tidal effects, Analytical techniques, Chromatography, Gas Chromatography, Pollution.
Identifiers: *Port Valdez(Alaska).

The uptake and release of Prudhoe Bay crude oil by intertidal sediments at Port Valdez, Alaska, were studied. In two experiments designed to simulate the stranding of a light oil slick, oil was spread on sediments daily for 5 days. Hydrocarbon content of the top 1.0 cm of the sediments was monitored for 60 days from the first oiling. The two experimental rates of oil application were 1.2 microliters/cm and 5.0 microliters/cm. In both experiments the added oil was no longer detectable by the sixtieth day. Polsible reasons for this rapid loss of petroleum by sediments were discussed. (Sims-ISWS)
W77-10123

RELATIONSHIP BETWEEN NITROGEN FIXATION (ACETYLENE REDUCTION) AND THE C:N RATIO IN A POLLUTED CORAL REEF ECOSYSTEM, KANEOHE BAY, HAWAII,
Hawaii Univ., Honolulu. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-10124

EFFECTS OF ACID PRECIPITATION ON A SMALL ACID LAKE IN SOUTHERN NORWAY,
Norsk Institutt for Vannforskning, Blindern.
S. Henriksen, and R. F. Wright.
Nordic Hydrology, Vol 8, No 1, p 1-10, 1977. 2 fig, 1 tab, 12 ref.

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Acidic water, Lakes, Acidity, Acids, Salt, Water sampling, Granites, Forests, Coniferous forests.
Identifiers: *Acid precipitation, *Acid lake, *Acid rainfall, *Norway, Water research, Boitite gneisses, Peaty area.

Evidence suggests that the acidity of lakes and rivers in southern Scandinavia has increased over the past several decades. Chemical data collected in 1930-40, compared with data collected in the 70's, indicate that the pH in soft-water lakes has increased over 1 pH unit; the acidity is increasing 5% per year. Statistical analysis of pH-data in 7 lakes or rivers in southernmost Norway indicated a doubling in acidity over the 1965-75 period. In the northernmost part of Norway, the majority of lakes and rivers are so acid that the natural fish populations are unable to survive. The cause of the acidification of the freshwaters probably is due to deposition of acid precipitation which primarily originates from the emission, oxidation, and long-range transport of sulfur and nitrogen oxides released from the burning of fossil fuels. An intensive project in research on hydrology and hydrochemistry is underway at 10 gaged watersheds and lake basins in southern Norway. Results from studies at one of the watersheds, a small acid lake called Langtjern situated in south-central Norway about 100 km northwest of Oslow, were presented. (Roberts-ISWS)
W77-10127

DETERMINATION OF DIMETHYLNITROSAMINE IN AIR, WATER, AND SOIL BY THERMAL ENERGY ANALYSIS: MEASUREMENTS IN BALTIMORE, MD.,
Thermo Electron Research Center, Waltham, Mass.
For primary bibliographic entry see Field 5A.
W77-10129

VARIATION IN CHEMICAL COMPOSITION OF THE RIVER FROME, ENGLAND, FROM 1965 TO 1972,
Freshwater Biological Association, East Stoke (England).
For primary bibliographic entry see Field 5C.
W77-10138

CHEMICAL INPUTS BY A COLONY OF FRANKLIN'S GULLS NESTING IN CATTAILS,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
For primary bibliographic entry see Field 5C.
W77-10142

MERCURY IN WATERWAYS THAT DRAIN INTO THE WASH, IN EASTERN ENGLAND,
Institute of Terrestrial Ecology, Huntingdon (England). Monks Wood Experimental Station.
F. Moriarty, and M. C. French.
Water Research, Vol. 11, No. 4, p. 367-372, 1977. 3 fig., 8 tab., 10 ref.

Descriptors: *Path of pollutants, *Mercury, *Water pollution sources, *Fluvial sediments, Rivers, Ditches, Analytical techniques, Fungicides.
Identifiers: *The Wash(England).

Mercury contamination levels in The Wash (eastern England) were determined by examining superficial sediments in the Rivers Nene, Welland and Witham and sediments from their principal drainage channels. Ditches adjacent to bulb-dipping with mercurial fungicides were also sampled as was the mercury content of freshwater mollusks in the area. No large-scale contamination was found but appreciable amounts of mercury were found in ditches from two out of five bulb-dipping sites tested. The highest residue in a sediment sample was 223 microgram/l (wet weight), compared to average mercury contents of soils of 0.1 microgram/l. It was found that the rate of flow affects diffusion of mercury from a discrete source. Aquatic gastropods proved to be useful monitors for deterring intermittent mercury releases. Sediment samples indicated a good relationship between depth and the amount of mercury. Sediments with several microgram/l mercury lost little or no mercury when air-dried at room temperature. The indication was that mercury is retained very firmly in the sediments. (Auen-Wisconsin).
W77-10152

COMPARATIVE LIMNOLOGY OF DIFFERENTIALLY REGULATED SECTIONS OF A COLORADO MOUNTAIN RIVER,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 6G.
W77-10155

CHEMICAL QUALITY OF IRRIGATION WATER POLLUTED WITH NITROGEN COMPOUNDS, (IN JAPANESE),
National Agricultural Experiment Station, Hokkaido (Japan).
Y. Tokunaga, J. Asano, and Y. Honjho.
Bull Tokai-Kinki Natl Agric Exp Stn. 24, p 132-150, 1972.

Descriptors: *Water quality, *Irrigation water, *Nitrogen compounds, Water pollution sources, Path of pollutants, Nitrates, Nitrites, Chemical wastes, Industrial wastes, Sewage, Chemical oxygen demand.
Identifiers: *Japan(Aichi-Nara-Osaka).

A study of the chemical quality of irrigation water polluted with nitrogen compounds was carried out in paddy field regions of Aichi, Nara and Osaka Prefectures (Japan), respectively, in 1969, 1970 and 1971. The origins of pollutants were wastes of starch manufacture, dye and textile works and urban sewage. The measured values of EC (electrical conductivity), total solids, NH4-N, T-N(total N), COD (chemical oxygen demand) and Cl of poluted water were higher than non-polluted water. The concentration ratios of polluted water to non-polluted water were significant among EC<COD,Cl<T-N, NHR-N. Positive simple correlations were significant among EC, total solids, NH4-N, T-N, COD and Cl of polluted and non-polluted water. The values of correlation coefficients between T-N and other items were higher than the others; measurement of T-N may be important as an index for polluted water with N compounds. Chemical quality of polluted water reflected the origins of pollutants. The concentrations of NH4-N, T-N and COD tended to decrease and NO3-N (nitrate N) and pH tended to increase as the stream flowed away from the contaminating point. This is probably a qualitative part of self purification of foul water. The pH value of polluted water changed remarkably with time by stirring or standing undisturbed at room temperature; the change in CO2 concentration in water directly caused the variation in pH value. With the progress of pollution by N compounds, the concentration of NO3-N was reduced, occurring in reductive conditions. Most of the simple correlations were shown to be the observed relations by calculating the coefficients of partial correlation for each analytical item.--Copyright (c) 1974, Biological Abstracts, Inc.
W77-10156

MODELING THE PERFORMANCE OF FEEDLOT-RUNOFF-CONTROL FACILITIES,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
J. K. Kowlliker, H. L. Manges, and R. I. Lipper.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 6, Nov-Dec 1975, p. 1118-1121. 2 fig, 3 tab, 9 ref.

Descriptors: *Feed lots, *Runoff forecasting, *Surface runoff, *Model studies, Watershed management, Land management, *Kansas, Estimating, Runoff, Rainfall runoff relationships, Precipitation(Atmospheric), Management, *Path of pollutants, Water pollution.
Identifiers: *Runoff control facilities.

A watershed predictive model using daily precipitation and temperature was developed to evaluate expected performance of feedlot-runoff-control facilities under Kansas conditions. As a tool to estimate expected performances of various

designs and operational criteria, the model considers feedlot surface, runoff control structure, disposal capacity, soil conditions and operational criteria for disposing of the runoff onto agricultural land. Use of the model shows that in Kansas, a runoff control structure large enough to contain the volume of a 10-year 24-hour rainstorm from a feedlot and dispose of 10 percent of the volume per disposal day would control 91.3-99.4 percent of the runoff from an unsurfaced feedlot; one large enough to contain the volume of a 25-year 24-hour precipitation event would control 93.0-100 percent of the runoff. A further expectation to run off an unsurface feedlot while about 44 percent is expected to run off a surfaced lot. Based on these results, evaporation pond sizes in Kansas--it they are to provide control as good or better than land disposal systems--should be 6 ft deep for a surface area 120 percent of the minimum and 4 ft deep for a surface area 150 percent of the minimum. (Harris-Wisconsin).
W77-10157

INDICATOR VALUE OF BIOSESTON AND PERIPHYTON FOR EVALUATION OF POLLUTION DEGREE OF FLOWING WATERS, (IN POLISH),
Water Economics Research Inst., Wroclaw (Poland). Water Protection Research Section.
S. Golowin.
Pol Arch Hydrobiol. 18(4), p 367-379, 1971.

Descriptors: *Periphyton, *Seston, *Bioindicators, Water pollution, Indicators, Rivers, Path of pollutants.
Identifiers: *Bioseston, *Poland, Odra River, Sleza River, Olawa River, *Vector analysis, *Saprobity.

Investigations of bioseston and periphyton of 3 rivers, the Odra, Sleza and Olawa (Poland), were interpreted saprobiologically by vector analysis. The results are presented as longitudinal saprobiological profiles, illustrating the changes in saprobity along the river's streams at different testing seasons. Extensive differences in the indications of each of the analyzed sets of organisms were found. The curves of bioseston saprobity of the Odra River were different in different seasons and thus extensive oscillations of saprobity in individual sampling stations were observed during the yearly cycle. The ranges of periphyton saprobity in individual stations oscillated within a relatively narrow range of values approaching the averages from extreme bioseston indications. At the stations situated below the outlets of sugar mill effluents, bioseston saprobity in the Sleza and Olawa gradually increased during the sugar season, bioseston saprobity at these stations fell to its pre-season level. Periphyton, on the other hand, reached its maximum saprobity below pollution sources very quickly during the season and kept its maximum saprobity for several months. Comparative analyses show that in evaluating a present state of water purity, indications of bioseston can and should be used, while indications of periphyton saprobity refer to an indefinite past period and to the conditions in near-to-bottom or littoral fluvial zones.--Copyright (c) 1974, Biological Abstracts, Inc.
W77-10158

PROCEEDINGS: WORKSHOP ON NON-POINT SOURCES OF WATER POLLUTION.
Illinois Univ. at Urbana-Champaign. Coll. of Agriculture; and Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5G.
W77-10159

PROBLEMS AND POLICY ALTERNATIVES: AGRICULTURE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-10161

THE TECHNICAL PERSPECTIVE (WHAT IS QUALITY WATER),
Texas Univ., Austin. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W77-10162

PROBLEMS AND POLICY ALTERNATIVES: MINING,
Environmental Protection Agency, Springfield, Ill.
For primary bibliographic entry see Field 5G.
W77-10163

PROBLEMS AND POLICY ALTERNATIVES: CONSTRUCTION,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W77-10164

HEAVY METALS IN CHESAPEAKE BAY SEDIMENTS,
Maryland Univ., College Park. Water Resources Research Center
S. E. Sommer, G. Diachenko, A. Pyzik, and H. Siegrist
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 655, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 41, 37 p, 12 fig, 5 tab, 38 ref. OWRT A-026-MD(1). 14-31-001-5020.

Descriptors: Interstitial waters, *Sediments, *Bottom sediments, Rivers, *Heavy metals, *Chesapeake Bay, *Trace elements, Copper, Sediment-water interfaces, *Distribution, *Path of pollutants, Nickel, Lead, Carbon, Cobalt, Chromium.
Identifiers: Magothy River, Patuxent River, Potomac River, Severn River.

The sediments and interstitial waters of four rivers of the Chesapeake Bay the Potomac, Patuxent, Severn and Magothy, were analyzed for trace metals (Cu, Ni and Pb in the waters, Cu, Ni, Pb, Co, Cr, V and C in the sediments) to determine their distribution as a function of natural and man induced processes. Cu and Pb increase in the sediments as a function of proximity to pollution sources, but interstitial water composition does not always reflect this association. Rather, the degradation of organic matter and organic solubilization appears to control interstitial water metal content. When organic matter is removed by man's influence, metal content of interstitial waters is markedly reduced. Analyses for copper, zinc, nickel and lead in sediments of the Patuxent River Estuary, Md., show marked depletions at sites near the Chalk Point Power Plant outfall. The depletion of copper and lead in the sediments, and reduction of organic carbon, dissolved oxygen and pore fluid metal levels indicate that chlorine used to clean the Plant's cooling apparatus is oxidizing the sediment and solubilizing the metals. The reaction between goethite, -FeOOH, and aqueous bisulfide ion HS(-), was studied under conditions representative of estuarine sediments to determine the effects on the concentration and distribution of trace metals. The concentration-time curves of the following species were determined by spectrophotometric methods: total sulfide, dissolved sulfide, acid soluble sulfide, thiosulfate, sulfite, elemental sulfur, and dissolved (< 0.1 micro) iron. Polysulfides (S4(=) and S5(=)) were determined from ultraviolet absorbance measurements, while the hydrogen ion activity was measured with a pH electrode. Elemental sulfur, both as free and polysulfide sulfur was the major sulfide oxidation product. Thiosulfate comprised about 14 plus or minus 8% of the oxidation products on the basis of electron balance.
W77-10174

INFLUENCE OF ORGANIC CARBON AND MICROORGANISMS ON IRON AND SULFIDE CONCENTRATIONS IN GROUNDWATER,
Missouri Univ., Columbia. Dept. of Geology.
A. B. Carpenter, and R. N. Stoufer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 640, Price codes: A05 in paper copy, A01 in microfiche. Completion Report June 22, 1977; 85 p, 18 fig, 10 cat, 55 ref, append. OWRT B-077-MO(4), 14-31-0001-3608.

Descriptors: *Carbon, *Microorganisms, *Iron, Sulfides, *Groundwater, Water supply, Water wells, *Missouri, Dissolved solids, Water pollution sources, Oxidation-reduction potential, Landfills, Leaching, Nitrogen, Phosphorus, Percolation, *Leachate, Absorption.
Identifiers: *Organic carbon.

Twenty water supply wells in northern Missouri were sampled to determine the relationships between dissolved organic carbon, microorganisms, iron, and sulfide in unpolluted water. The data suggest a poor correlation between redox potential and the organic carbon content of the water. The data for nitrate-ammonia and sulfate-sulfide indicate that most of the samples were not in internal equilibrium with respect to oxidation-reduction reactions. Considerable data were obtained on groundwater systems with high concentrations of organic carbon. Most of these areas were affected by leachate from sanitary landfill operations. Landfill leachates have very different inorganic nitrogen to total phosphorus ratios than sewage lagoon or septic tank effluent. This ratio is an effective method for distinguishing between these two sources of pollutants in ground water. Percolation experiments were conducted to evaluate the capacity of the kaolinitic soils to remove organic carbon from leachate. Less than 5 percent of the organic carbon is removed from leachate by absorption or entrapment by this kind of treatment.
W77-10183

RELATION OF CLIMATE TO LEACHING OF SOLUTES AND POLLUTANTS THROUGH SOILS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
C. B. Tanner.
Final Report to NOAA, Environmental Data Service, May 20, 1977. 39 p, 9 fig, 9 tab, append. Grant NG-34-72.

Descriptors: Soil physics, *Soil water movement, *Pollutants, *Climates, *Nitrates, *Leaching, Groundwater, Evapotranspiration, Irrigation, *Path of pollutants, Water pollution sources, Soil contamination.

The original study had two objectives: (1) to test whether a simple soil physics model of nitrate leaching could be combined with analysis of weather records to model nitrate movement to the water table. This embraces both the concentration distributions in the soil and the total flux. Leaching is greatest when heavily fertilized and irrigated crops are grown on sandy soils. (2) the second objective was to determine whether the leaching information could be used to improve irrigation and fertilizer management to minimze leaching and improve management efficiency of crops where nitrogen and irrigation are used intensively. (NOAA)
W77-10187

TRITIUM IN THE MONITORING OF WATER SUPPLY.
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
For primary bibliographic entry see Field 2F.
W77-10196

THE ROLE OF EFFLUENTS IN THE SPREAD OF SALMONELLAE, (IN DUTCH),
For primary bibliographic entry see Field 5C.
W77-10231

ISHERY WASTE EFFLUENTS: A SUGGESTED SYSTEM FOR DETERMINING AND CALCULATING POLLUTANT PARAMETERS,
National Marine Fisheries Service, Kodiak, Alaska. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5A.
W77-10242

IEALTH AND ECOLOGICAL ASPECTS OF COBALT-60 TRANSFER IN SEAWATER FOOD CHAIN TYPICAL OF AN INTERTIDAL MUDFLAT,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Section de Radioecologie.
For primary bibliographic entry see Field 5C.
W77-10257

ITRIFICATION POTENTIAL OF RIVER ENIRONMENTS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W77-10265

HE RELEASE OF NITROGEN FROM SULUR-COATED UREA AS AFFECTED BY SOIL OISTURE, COATING WEIGHT, AND ETHOD OF PLACEMENT,
Woods (M. J.) and Associates, Dublin (Ireland).
For primary bibliographic entry see Field 2G.
W77-10270

IOSPHORUS SORPTION AND DESORPTION HARACTERISTICS OF SOIL AS AFFECTED Y ORGANIC RESIDUES,
Idaho Univ., Moscow. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 2G.
W77-10275

RIPOLYPHOSPHATE AND ROPHOSPHATE HYDROLYSIS IN SEDIENTS,
Monsanto Philippines Inc., Makati.
W. Blanchar, and D. C. Riego.
Soil Science Society of America Journal, Vol. 40, No. 2, p 225-229, March-April 1976. 3 fig, 2 tab, 22 ref. OWRT, A-059-MO(2).

Descriptors: *Sediments, Sedimentation, Hydrolysis, *Phosphates, Phosphorus, Nutrients, Lake sediments, Missouri, Pollutant Identification, Rivers, Streams.
Identifiers: *Tripolyphosphates, Pyrophosphates.

The rate of hydrolysis of tripolyphosphate (TPP) and pyrophosphate (PP) in river, creek, and lake sediments was determined. Half-lives for the hydrolysis of TPP and PP ranged from 1.6 to 2.6 days and 6.7 to 27.4 days, respectively. The influence of temperature, biological activity, and pH on the rate of TPP and PP hydrolysis was investigated using Flat Branch Creek sediment. The rate of TPP and PP hydrolysis increased with increasing temperature. The activation energy was 5.415 kcal/mole for TPP and 10,412 cal/mole for PP. TPP and PP hydrolyzed slower in sediment which had been autoclaved than in non-sterilized sediment. The half-life for TPP hydrolysis was 1.76 day at pH 5, 1.61 day at pH 7, and 2.16 day at pH 9. The rate of PP hydrolysis was increased as pH increased from 5 to 7 to 9 as indicated by half-lives of 8.7, 10.0 and 7.3 days, respectively. When TPP was added to the sediment as a Ca5-(P3010)2 precipitate, the rate of hydrolysis was slower than when TPP was added as a solution. (Skogerboe-Colorado State)
W77-10285

GASEOUS LOSS OF AMMONIA FROM SULFUR-COATED UREA, AMMONIUM SULFATE, AND UREA APPLIED TO CALCAREOUS SOIL (PH 7.3),
Woods (M. J.) and Associates, Dublin (Ireland).
For primary bibliographic entry see Field 2G.
W77-10287

A GENERAL PURPOSE UNIVARIATE PROBABILITY MODEL FOR ENVIRONMENTAL DATA ANALYSIS,
Environmental Protection Agency, Washington, D. C., Office of Research and Development.
For primary bibliographic entry see Field 6G.
W77-10291

OPTIMAL DESIGN OF MECHANICAL AERATION SYSTEMS FOR THERMALLY AND ORGANICALLY POLLUTED STREAMS,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W77-10293

MODELLING, SIMULATION AND CONTROL OF STOCHASTIC SYSTEMS WITH APPLICATIONS IN WASTEWATER TREATMENT,
Oxford Univ. (England). Dept. of Engineering Science.
For primary bibliographic entry see Field 5D.
W77-10294

A STOCHASTIC MODEL FOR THE SIMULATION OF THE TEMPERATURE OF A WATERCOURSE,
Electricite de France, Chatou. Div. Exchanges Atmospheriques.
For primary bibliographic entry see Field 2A.
W77-10300

ANALYTICAL MODEL OF DISPERSION IN TIDAL FJORDS,
Nova Scotia Technical Coll., Halifax. Dept. of Chemical Engineering.
S. T. Wang, A. F. McMillan, and B. H. Chen.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY7, Proceedings Paper 13073, p 737-751, July 1977. 8 fig, 19 ref, 2 append.

Descriptors: *Dispersion, *Fjords, *Tidal effects, *Model studies, Mathematical studies, Sewage disposal, Waste disposal, Industrial wastes, Pollutants, *Path of pollutants, Water pollution, Tides, Coasts, Hydrodynamics.

Using the integral transforms technique, the unsteady three-dimensional advective-diffusion equation was solved analytically for the dispersion of pollutants from an instantaneous point source in open channels of finite width. The flow velocity through the channel was the mean current velocity, which was assumed to vary sinusoidally with time but linearly with water depth. The effect of first-order reactions is to reduce the concentration level throughout the channel. The spread of pollutants in the direction of mean flow is accelerated as a result of the existance of a vertical shear. The width of the channel is important, as is the boundary in the y direction that profoundly affects the horizontal dispersion when the source is close to the bank, but the effect diminishes as the source is moving farther away from the bank. These findings, as well as others, were examined and illustrated graphically. (Sims-ISWS)
W77-10303

ANOXIC, HYPERSALINE BASIN IN THE NORTHERN GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-10319

MASS BALANCE MONITORING OF LAND APPLICATION SITES FOR WASTEWATER RESIDUALS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
J. L. Smith, D. B. McWhorter, and T. J. Trout.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 2, Paper No. 76-2065, p 309-312, March-April 1977. 4 fig, 2 tab, 8 ref.

Descriptors: *Waste water disposal, *Sludge disposal, *Soils, Groundwater, Leachates, Leaching, Heavy metals, Groundwater movement, Soil amendments, Wastes, Sewage sludge, Water table, Water levels, On-site investigations, Soil contamination, Water pollution, Pollutants, Monitoring.

The soil can serve as a receiving medium and a final form of treatment by removing and decomposing various constituents in the sludge. Land application, when properly controlled, incorporates ultimate disposal with resource recovery. This paper proposed use of the mass balance concept for predicting groundwater quality and buildup of heavy metals in soils due to application of wastewater sludges. The concept is based on the principle of continuity of mass and an idealization of the flow system. Data from the Boulder, Colorado municipal sludge applications site were used to illustrate practical application of the concept. Mass balance reduces the lag time between application and measurement and uses measurement made prior to dilution of potential contaminants. A major deficiency in the concept is that, while it predicts a buildup of heavy metals in the soil, it does not indicate their availability to plants. However, other research has indicated that there is no cumulative effect of heavy metals and that plant uptake is not normally a problem in soils having near neutral pH. (Sims-ISWS)
W77-10326

TRANSPORT PHASES OF TRANSITION METALS IN THE AMAZON AND YUKON RIVERS,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 2J.
W77-10328

PROBLEMS OF HEAT STORAGE IN AQUIFERS,
Eidgenoessische Technische, Zurich (Switzerland). Institut fur Geophysik.
D. Werner, and W. Kley.
Journal of Hydrology, Vol. 34, No. 1/2, p 35-43, July 1977. 3 fig, 7 ref.

Descriptors: *Thermal pollution, *Storage, *Heated water, *Aquifers, On-site investigations, Model studies, Mathematical models, Underground storage, Heat transfer, Diffusion, Convection, Temperature, Groundwater, Powerplants, Nuclear powerplants, Wells, Injection wells.

A hydrothermic field experiment near Krefeld (Federal Republic of Germany) was used to study the propagation of heat in groundwater. For two months, water at a temperature of 45 C was fed through a well pipe to the water-bearing strata, the distribution of temperature in the surrounding space was measured, and its variation with time was observed. A theoretical model was developed to simulate the field experiment. The model consisted of a time-spaced differential method with the help of which good conformity between theory and experiment was obtained. The aim of the study was to ascertain the physical bases for the storage of heat in groundwater. The techno-economic and environmental problem was posed because of the enormous quantities of cooling water necessary in the operation of atomic power stations. A functional theoretical model can help to decide how far the idea of storing heat in an aquifer is technically feasible. (Sims-ISWS)
W77-10332

COAL AND COAL MINE DRAINAGE, (LITERATURE REVIEW),
Bituminous Coal Research Inc., Monroeville, Pa.
For primary bibliographic entry see Field 5G.
W77-10355

HERBICIDE TRANSPORT IN SOIL UNDER CENTER PIVOT IRRIGATION SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
T. L. Lavy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 777, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, June 1977. 90 p, 8 fig, 3 tab, 61 ref. OWRT B-030-NEB(1), 14-31-0001-5087.

Descriptors: *Herbicides, Irrigation, Leaching, *Percolation, Irrigation practices, Irrigation systems, *Path of pollutants, Water pollution sources, Soils, Soil moisture, Soil profiles.
Identifiers: Center pivot irrigation.

A series of plant competition studies has shown that plants effectively compete for the available herbicide in soil solution. Extrapolating this finding to field situations illustrates the role that plants play in (1) preventing water from percolating through the soil profile and (2) removing phytotoxic materials from the water. Development of a centrifugal technique to remove low levels of moisture from soil allow the researcher to observe the concentration of herbicide present in the soil solution available to the growing plant. Rapid dissipation of atrazine under sandy irrigated conditions was primarily due to non-biological degradation. Although leaching of atrazine through 90 cm of a loamy sand in an irrigated field was shown, the percentage of the amount supplied was less than 2%. Mobility studies of labeled 35SO4 and 32PO4 was not shown. Comparisons between SO4, atrazine and picloram showed the SO4 to be most mobile. The fraction of atrazine free to move in a moist soil environment can be increased by increasing the soil moisture content or by decreasing the salt content of the soil solution.
W77-10366

IMPACTS OF NUCLEAR RELEASES INTO THE AQUATIC ENVIRONMENT.
International Atomic Energy Agency Vienna (Austria).
For primary bibliographic entry see Field 5C.
W77-10384

RADIOLOGICAL IMPACTS OF RELEASES FROM NUCLEAR FACILITIES INTO AQUATIC ENVIRONMENTS-USA VIEWS,
Energy Research and Development Administration, Washington, D.C. Div. of Biomedical and Environmental Research.
C. L. Osterberg.
In: Impacts of Nuclear Releases in to the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 25-35, 6 tab, 5 ref. IAEA-SM-198/58.

Descriptors: *Environmental effects, *Water pollution, Nuclear wastes, Nuclear reactors, Fallout, Radioisotopes, Radioactive wastes, Radioactivity effects, Columbia River, Pacific Ocean, *United States.

The paper reviews the history of radionuclide releases of the past three decades by taking a particular look at two major events which led to large-scale releases: the release of approximately 1000 curies a day to the Columbia River and the Pacific Ocean by Hanford Laboratories and releases through fallout. No harmful effects have been observed from the Hanford Laboratories release and releases from fallout are dying. (See also W77-10384) (Chilton-ORNL)
W77-10386

ETUDE DE L'INFLUENCE DU CADMIUM STABLE SUR LE TRANSFERT DU ZINX-65 EN ECOSYSTEME IRRIGUE PAR SUBMERSION (RIZIERE IRRIGUEE), (STUDY OF THE INFLUENCE OF STABLE CADMIUM ON THE TRANSFER OF ZINC-65 IN AN ECOSYSTEM IRRIGATED BY SUBMERSION (IRRIGATED RICE FIELD),
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
For primary bibliographic entry see Field 5C.
W77-10387

STUDIES ON RARE EARTH ELEMENTS IN SEAWATER AND UPTAKE BY MARINE ORGANISMS,
National Inst. of Radiological Sciences, Chiba (Japan).
For primary bibliographic entry see Field 5C.
W77-10390

LE TRANSFERT DU ZINC-65 DE SEDIMENTS A DES LARVES DE CHIRONOMIDES ET A UN POISSON D'EAU DOUCE ET L'EFFET DU CADMIUM SUR CE TRANSFERT, (TRANSFER OF ZINC-65 FROM SEDIMENTS TO CHIRONOMID LARVAE AND TO A FRESHWATER FISH AND THE EFFECT OF CADMIUM ON TRANSFER),
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
For primary bibliographic entry see Field 5C.
W77-10393

THE BEHAVIOUR OF SR90 AND CS137 IN THE WATERS OF THE BALTIC SEA,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow.
A. G. Trusov, L. M. Ivanova, V. S. Zolotukhina, and L. I. Gedeonov.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 133-144, 3 fig, 3 tab, 13 ref. IAEA-SM-198/54.

Descriptors: *Environmental effects, *Water pollution, Radioisotopes, *Strontium, *Cesium.
Identifiers: *Baltic Sea.

Changes in average values of Sr90 and Cs137 in the Baltic Sea over the past several years are estimated. Sr90 concentrations appear to generally follow changes in the rate of global fall-out with a considerable delay. Cs137 distributions were much smaller than those of Sr90. It is reasoned that the decrease of Sr90 is due to the shallowness and the isolation of the Baltic Sea. Low concentration of Cs137 is explained by the sorption processes in fresh water and by the flow of Cs depleted water from rivers. (See also W77-10384) (Chilton-ORNL)
W77-10394

EXPERIMENTAL STUDIES ON PLUTONIUM KINETICS IN MARINE BIOTA,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
S. Fowler, M. Heyraud, and T. M. Beasley.
In:Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 157-177, 4 tab, 9 fig, 31 ref. IAEA-SM-198/23.

Descriptors: *Environmental effects, *Water pollution, *Path of pollutants, Radioisotopes, Plutonium, Aquatic environment, Shrimp, Mussels, Worms, Sea water, *Biota.

Pu 237 was used to make measurements with standard NaI(T1) scintillation techniques on mussels, shrimp and worms from the marine environment. Results showed that plutonium was accumulated to a much greater degree in shell than in soft parts of molluscs and crustacea. Moulting strongly influenced the degree of uptake in shrimp, with cast moults containing large fractions of the shrimps Pu content. More than 80% of the mussels plutonium accumulation was found in the shell. Concentration factors in worms reached approximately 200. It was indicated that if the different plutonium isotopes found in nature are present in the same physico-chemical form, aquatic organisms may well be unable to discriminate between them during either accumulation or subsequent excretion phases. (See also W77-10384) (Chilton-ORNL)
W77-10396

ADSORPTION-DESORPTION CHARACTERISTICS OF PLUTONIUM AND AMERICIUM WITH SEDIMENT PARTICLES IN THE ESTUARINE ENVIRONMENT, STUDIES USING PLUTONIUM-237 AND AMERICIUM-241,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
C. N. Murray, and R. Fukai.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 179-192, 8 fig, 2 tab, 17 ref. IAEA-SM-198/25.

Descriptors: *Environmental effects, *Water pollution, Sorption, *Adsorption, *Plutonium, Fresh water, Sea water, Sediments.
Identifiers: *Desorption, *Americium.

Data demonstrated that the particles of Pu (IV) in river water and sea water are relatively homogeneous and not dependent on filter pore size used for the initial filtration nor on the salinity of the medium. However, particle formation of Am(III) in river water and sea water appeared to be influenced by colloidal substance in the medium and there was an appreciable size distribution of the particles formed. Particle formation of Pu(IV) was lower than Am, suggesting possible complex formations with carbonate and biocarbonate. Under natural conditions, the major fractions of Pu (III, IV) and Am (III) are likely to become particles larger than 0.45 microm, while a greater part of Pu (VI) may stay in solution. The desorption of Pu and Am from fresh water sediment in normal sea water was 5-15%. Lowering of the pH of sea water to 7, could double the desorption of Am while the Pu desorption would remain more or less unchanged. Addition of sewage effluent resulted in small but measurable effects on the adsorption-desorption characteristics of Pu. (See also W77-10384) (Chilton-ORNL)
W77-10397

PLUTONIUM IN THE AQUATIC ENVIRONMENT AROUND THE ROCKY FLATS FACILITY,
Dow Chemical Co, Golden, Colo. Rocky Flats Div.
M. A. Thompson.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 213-227, 7 tab, 4 fig, 3 ref. IAEA-SM-198/38. AT(29-2)-1106.

Descriptors: *Environmental effects, *Water pollution, *Plutonium, Waste water(Pollution), Sediments, Public health, Water quality, *Colorado.
Identifiers: *Rocky Flats Plant(Colo).

An estimate has been made of the location of plutonium releases with waste water over a period of 22 years of operation of the Rocky Flats Plant. Even considering the very conservative assumption that the plutonium concentration in water due to Rocky Flats operations is 0.01 pCi/1, only a small fraction of this released plutonium concentrates in biological systems or in man. The majority of the plutonium released through surface waters has been contained in the sediments of the plant holding ponds with small amounts being found in the sediments of the draining creek and in the sediments of the receiving reservoir. No evidence

been found to suggest that exposure to such low levels of plutonium present any health hazard to man or cause any damage to biological systems. (See also W77-10384) (Chilton-ORNL)
W77-10399

THE BEHAVIOUR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, I. BIOLOGICAL TRANSPORT, SEASONAL CYCLING, AND RESIDENCE TIMES IN THE WATER COLUMN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
M. A. Wahlgren, and J. S. Marshall.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 227-243, 3 tab, 4 fig, 23 ref. IAEA-SM-198/39.

Descriptors: *Environmental effects, *Water pollution, Radioisotopes, *Plutonium, Cesium, Strontium, Absorption, Turnovers, Path of pollutants, Lake Michigan, Seasonal, *Lake sediments.
Identifiers: Biogeochemical properties, Cycling, Residence time.

Pu 239, 240 and Cs 137 show similar biogeochemical properties such as turnover times and associations with seston fractions. There was a strong inverse relationship between concentration factors for Pu 239, 240 in organisms surveyed and their trophical level. The opposite behavior was noted for Cs 137. The concentration of Pu in plankton was strongly correlated with ash content. Sorption of plutonium by phytoplankton, and subsequent setting of phytodetritus, and zooplankton fecal pellets was postulated to account for the rapid removal of plutonium from the epilimnion during July and August. Pu 239, 240, Cs 137, and Sr 90 showed comparable biogeochemical behavior in the five Great Lakes, based on a set of comparison samples. The fraction of Pu 239, 240 and Cs 137 present in the water after a number of years can be related to the mean depth of the lake. (See also W77-10384) (Chilton-ORNL)
W77-10400

THE BEHAVIOR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, II. PATTERNS OF DEPOSITION IN THE SEDIMENTS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
J. N. Edgington, and J. A. Robbins.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 245-260, 2 fig, 2 tab, 20 ref. IAEA-SM-198/40.

Descriptors: *Environmental effects, *Water pollution, Radioisotopes, *Plutonium, Cesium, *Lake Michigan, Limnology, Sediments, Deposition(Sediments), *Lake sediments.

Pu 239, 240 and Cs 137 from stratospheric fallout were measured to predict depositional patterns. 95% of Pu 239, 240 and 95% of Cs 137 entering Lake Michigan from fallout was found in the sediments. Data indicated the scavenging of Pu 239, 240 and Cs 137 appears to occur at the same overall rate but that it is controlled by different processes in the water column. Sedimentation rates varied by more than an order of magnitude. Total content of Pu 239, 240 and Cs 137 was strongly correlated with mass-sedimentation rate resulting in large areas of the lake where there is virtually no deposition and other areas where the total content of the radionuclides per unit area is greater than would be expected. The shape of profiles in areas of high and low sedimentation rates a redistribution of the radioactivity which has already been deposited in the sediments. Any monitoring schemes to determine the long-term effects of effluents from nuclear power reactors must take accout of the limnological properties of the receiving body of water. (See also W77-10384) (Chilton-ORNL)
W77-10401

CONSEQUENCES DU DEPLACEMENT DES SEDIMENTS SUR LA DISPERSION DES RADIONUCLEIDES, (THE EFFECT OF SEDIMENT DISPLACEMENT ON THE DISPERSAL OF RADIONUCLIDES),
Electricite de France, Chatou.
R. Schaeffer.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 263-276, 4 fig, 2 tab, 1 append, 7 ref. IAEA-SM-198/16

Descriptors: *Environmental effects, *Water pollution, Sedimentation, Deposition(Sediments), Radioisotopes, Sediment transport, *Dispersion, *Path of pollutants.

Since the bulk of discharged radionuclides are adsorbed by sediments in water courses, it might be assumed that the volumetric activity of the water decreases with distance from the disposal point in an approximately expontential manner. It is reported that the bottom transport of the sediments reverses direction so that their activity increases progressively in a downstream direction and may reach a maximum a great distance away from the disposal point after a period of time. Based on this variation of sediment activity in time and in space, it was concluded that a limited number of measurements repeated at a single point is not representative. (See also W77-10384) (Chilton-ORNL)
W77-10402

CONCENTRATION OF RADIOACTIVE COBALT BY SEAWEEDS IN THE FOOD CHAIN,
National Inst. of Radiological Sciences, Chiba (Japan).
M. Nakahara, T. Koyanagi, and M. Saiki.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 301-312, 4 fig, 3 tab, 15 ref. IAEA-SM-198/20

Descriptors: Environmental effects, *Water pollution, *Radioisotopes, Cobalt, Path of pollutants, Absorption, Algae, Marine algae, Mollusks, Food chains.

Radioisotope tracer techniques were used to study the uptake, distribution and excretion of Co60 in various kinds of seaweeds under laboratory condition. Rapid uptake was seen in the initial stage, followed by slow increase of the concentration factor. Higher concentration factors were obtained in Sargassum thunbergii than in Laminaria japonica and Eisenia bicyclis. Transfer was studied by feeding abalones with Co60 labelled seaweed. Absorption rate calculated two days after feeding showed that abalones obtained 47% through Laminaria japonica and Ulva pertusa, 31% through Undaria pinnatifida and 26% through Laminaria bicyclis. It was concluded that the accumulation of radioactive cobalt by mollusca is affected by the species of seaweeds as food. Autoradiography of abalone samples showed a high concentration of ingested radioactive cobalt in the midgut gland. (See also W77-10384) (Chilton-ORNL)
W77-10404

TRANSPORT AND ACCUMULATION OF RADIOCOBALT IN THE MARINE SEDIMENT OF URAZOKO BAY,
National Inst. of Radiological Sciences, Chiba (Japan).
Y. Nagaya, and K. Nakimura.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 313-329, 6 fig, 7 tab, 15 ref. IAEA-SM-198/21.

Descriptors: Environmental effects, *Water pollution, *Radioisotopes, Nuclear wastes, Cobalt, Cesium, Sediments, Sorption.

The concentration of fallout Cs 137 in sediments was used as a measure of sorption capability. The transport and accumulation of Co60 released from a nuclear power plant were investigated by comparing the ratio of Co60 and Cs137 concentrations in the sediment. No seasonal variations were observed in the distribution pattern of the Co60/Cs137 ratio. Contamination was found to vary as a function of distance from the discharge outlet. Contamination appears to be spreading gradually from the bay to outer regions. An apparent equilibrium has been established among the factors affecting the increase and decrease of Co60 in the sediments. As long as the release of radionuclides remains at the present rate, or even if the discharge rate is decreased, approximately the same level of Co60 will be maintained in the sediment for a considerably long time. (See also W77-10384) (Chilton-ORNL)
W77-10405

HEALTH CRITERIA FOR ESTIMATING ACCEPTABLE CONTAMINATION OF COASTAL WATERS BY RADIONUCLIDES,
Ministerstvo Zdravookhraneniya SSR, Moscow. Institut Biofiziki.
D. I. Gusev.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 363-373, 4 tab, 8 ref. IAEA-SM-198/56.

Descriptors: *Environmental effects, *Water pollution, Public health, Radioisotopes, *Radioactivity, Coasts, Sea water.

Permissible levels of seawater contamination near beaches which are periodically washed by radioactive water are discussed. Attention is given to working limits on radionuclide concentrations in seawater, standardized for coastal water where fishing takes place and where edible seaweeds and bottom invertebrates are collected. Standard coefficients expressing radiation dose to critical organs of man in the uptake of radionuclides by the digestive tract can be used to estimate individual and collective doses to the population. (See also W77-10384) (Chilton-ORNL)
W77-10408

CONVENTIONAL AND RADIOACTIVE POLLUTANTS OF INLAND WATERS IN AUSTRIA,
Federal Inst. for Water Control, Vienna (Austria).
L. J. Ottendorfer.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 395-403, 4 fig, 5 ref. IAEA-SM-198/36.

Descriptors: Environmental effects, *Water pollution, Radioactivity, *Monitoring, Nuclear powerplants, International commissions.
Identifiers: Guidelines, *Austria.

Following large-scale nuclear tests since 1961, Austrian surface water bodies and the atmosphere have been monitored for radioactive contamination. The Federal Institute for Water Quality collects and analyzes samples from 6 selected points on a monthly basis. The data collected from these stations serves as the guidelines for the issue of licenses for nuclear power plants and the limits for radiological releases. The influence of already existing and planned nuclear power stations in neighboring countries is also considered. Some international organizations have expressed interest in multinational surveying and monitoring programs and these are mentioned. (See also W77-10384) (Chilton-ORNL)
W77-10410

ASSESSMENT OF DOSES IN THE ENVIRONMENT FOR LIQUID RELEASES FROM NUCLEAR POWER REACTORS,
Nuclear Regulatory Commission, Washington, D. C. Div. of Technical Review.
For primary bibliographic entry see Field 5C.
W77-10411

A SYSTEM OF RADIATION MONITORING, AND METHODS AND EQUIPMENT FOR MEASURING WATER OF LOW SPECIFIC ACTIVITY,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow. Institut Atomnoi Energii.
Yu. V. Sivintsev, and I. V. Kurchatov.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 441-458, 5 fig, 14 ref. IAEA-SM-198/53.

Descriptors: *Environmental effects, *Water pollution, Nuclear powerplants, *Radioactive wastes, *Monitoring, Analytical techniques, Pollutant identification.
Identifiers: Low specific activity.

Procedures are discussed for monitoring waters of low specific activity in relation to criteria for protection of populations and the environment near nuclear power plants. A discussion of background, efficiency, and sensitivity of laboratory equipment for gamma spectrometric analysis is included. (See also W77-10384) (Chilton-ORNL)
W77-10414

RADIOLOGICAL EFFECTS OF A NUCLEAR POWER PLANT ON A RIVER SYSTEM, AS DEMONSTRATED BY THE GUNDREMMINGEN BWR ON THE DANUBE,
Bayerische Biologische Veruchsanstalt, Munich (West Germany).
For primary bibliographic entry see Field 5C.
W77-10415

THE FISH/WATER ACCUMULATION FACTOR-AN IMPORTANT PARAMETER FOR DETERMINING THE ENVIRONMENTAL CAPACITY OF SURFACE WATERS,
Board of Nuclear Safety and Radiation Protection, Berlin (East Germany).
E. Ettenhuber, and W. Rohnsch.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 473-482, 4 fig, 2 tab, 6 ref. IAEA-SM-198/15.

Descriptors: *Environmental effects, *Water pollution, Surface waters, Fish, Radioactivity, Radioactive wastes, Fish farming, Food chain.
Identifiers: *Accumulation factors, Germany.

Cs137 accumulation factors were determined in fish from five bodies of water (Greifswalder Bodden, Stechlinsee, Oder, Elbe, and Muggelsee). The investigations showed that an average Cs137 accumulation factor of 1000 should be applied when evaluating the body burden of man through the ecological chain water-fish-man and the receiving capacity of surface water for Cs137. On the basis of experimentally determined accumulation factors, it was concluded that further use of contaminated cooling waters for fish production is possible. (See also W77-10384) (Chilton-ORNL)
W77-10416

RELEASE PATHWAYS FOR DEEP SEABED DISPOSAL OF RADIOACTIVE WASTES,
Sandia Labs-1, Albuquerque, N. Mex.
D. R. Anderson, W. P. Bishop, V. T. Bowen, J. P. Brannen, and W. N. Caudle.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 483-504, 9 fig, 2 tab, 10 ref. IAEA-SM-198/34.

Descriptors: *Water pollution, *Radioactive wastes disposal, Path of pollutant, Oceans, Bottom sediments, *Radioisotopes.
Identifiers: Seabed disposal, Basement rock.

Mid-plate/mid-gyre regions of the oceans are identified as areas for possible disposal of radioactive wastes. Possible dispersion of radioisotopes through a set of barriers (by cask corrosion, leaching, upward transport with upward moving pore water, biological transport, slow throughput of currents, advection and diffusion through the water column, thermally driven transport) is discussed. A mathematical model of the barriers has been prepared and one part of the model, which confirms estimates of the length of time for movement of the nuclides through the sediment column (more than a million years) has been tried. To date no serious technical reasons have been found to doubt the possibility of successful seabed disposal of high-level nuclear wastes. (See also W77-10384) (Chilton-ORNL)
W77-10417

OFFSHORE MINERAL RESOURCE EXPLOITATION: THE STATE AND FEDERAL RESPONSE,
For primary bibliographic entry see Field 6E.
W77-10471

LIVING WITH THE LAKE. A GUIDE TO ILLINOIS LAKESHORE MANAGEMENT.
Illinois State Dept. of Transportation, Chicago Div. of Water Resources.
For primary bibliographic entry see Field 5G.
W77-10504

GROUNDWATER MONITORING WELLS,
Stearns and Wheeler, Cazenovia, N. Y.
A. F. Diefendorf, and R. Ausburn.
Public Works, Vol. 108, No. 7, p 48-51, July, 1977. 2 fig.

Descriptors: *Observation wells, *Monitoring, *Waste disposal, *Groundwater movement, Landfills, Leaching, Water pollution sources, Sampling, Well screens.
Identifiers: Cluster wells.

Current environmental regulations in many cases require ground water monitoring of areas near waste disposal projects. Proper layout and design of observation wells are absolutely essential to insure reliability of the water samples taken. Detailed site investigations involving a variety of geologic and geophysical methods are a necessary first step in determining a proposed well field's characteristics; placement of individual wells or well clusters should be tailored to adequately intercept the expected paths of contaminants as predicted by the preliminary surveys. Well construction must be undertaken with the possible effects of the installation process itself in mind. Certain types of well screens and casings, for example, can react with high strength or corrosive contaminants and cause sampling anomalies. Migration of fines or sediment entering the well due to faulty construction could also result in erroneous analyses. Observation well projects are best accomplished by drillers who are familiar with monitoring well procedures. High-quality sampling can only be carried out by personnel who have been trained to use approved procedures for obtaining and handling samples. (Eberle-NWWA)
W77-10517

ENVIRONMENTAL IMPACTS OF ADVANCED WASTEWATER TREATMENT AT ELY, MINNESOTA,
Corvallis Environmental Research Lab., Oreg.
For primary bibliographic entry see Field 5D.
W77-10536

HANDBOOK FOR SAMPLING AND SAMPLE PRESERVATION OF WATER AND WASTEWATER,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
For primary bibliographic entry see Field 5A.
W77-10539

AUTOMATIC NETWORK ANALYSIS BY MICROCOMPUTER.
Water and Sewage Works, Vol 120, No 3, p 65, March, 1973.

Descriptors: *Computers, *Analytical techniques, Pipes, Flow, Public utilities, Water supply, Costs.
Identifiers: Network analysis system, Flow distribution, Microcomputer, Flow distribution balancing.

The Olivetti P 602/MLU Network Analysis System, a self-contained printing computer capable of storing both numerical data and programs, is currently solving problems for the Bureau of Environmental Engineering in Arkansas. Application for this computer is found in determining correct flow and head loss for pipes in a water network by performing the Hardy-Cross flow distribution balancing process. The system permits municipal water departments to evaluate the adequacy of a public water system prior to its construction and locate deficiencies in pipe networks which are already constructed. The balancing process of the flow distribution is completely automatic. The P 602/MLU system processes all data unattended. Upon convergence of the process to a pre-determined constant, the corrected flow and head loss are printed for every pipe in every loop. The balancing process will continue automatically without the need to re-enter any data. The network analysis system costs $6675 or it can be leased for less than $160 per month. (Sandoski-FIRL)
W77-10544

PROGRAM HOPES TO REDUCE POLLUTION FROM SEWER OVERFLOW.
Water and Wastes Engineering, Vol. 14, No. 5, 32, May, 1977.

Descriptors: *Stormflow, *Combined sewer, *Overflow, *Drainage systems, *Sewerage, Municipal wastes, Sewage disposal, Effluents, Storm drains, Storm water, Water pollution sources, Urban drainage, Urban runoff, Waste water treatment.
Identifiers: Syracuse(NY), Onondaga Lake(NY), O'Brien and Gere Engineers.

A study being conducted by the Onondaga County Department of Drainage and Sanitation was originated to develop an abatement program for overflow discharges into Onondaga Lake by the city of Syracuse, New York. An examination of quantity/quality relationships, measurements, projections, and assessment of the impact of overflows on receiving waters led to the development of a four-step plan of action. This plan includes the definition of major drainage areas, studies of selected overflow sites using automatic sampling and flow monitoring equipment, and verification of a model to be used for overflow and pollutant loading prediction. During an overflow, samples are automatically activated by a relay system on the flow monitoring equipment and samples are taken at predetermined intervals. Following the overflow, samples are collected for laboratory analysis, as these overflow discharges may contain a heavy load of oxygen-demanding matter, suspended solids, bacteria, and viral organisms. (Schulz-FIRL)
W77-10547

THE PRESENT STATE AND PROBLEMS OF THE RED TIDE RESEARCH IN JAPAN, (JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
Bull Plankton Soc Jap, 19(2), p 115-124, 1973.

Descriptors: *Red tide, *Nutrients, *Phosphorus, Water pollution sources, Plant growth, Pulp wastes, Industrial wastes, *Gymnodinium, Foreign research, *Benthos, Mud.
Identifiers: *Eutreptiella-sp, Heterosigma-inlandica, *Heterosigma-sp, Prorocentrum-triestrium, *Japan.

The design of research efforts directed elucidating the cause of red tides in Japan is outlined. Organisms identified as involved, and whose growth characteristics have been studied are: Eutreptiella sp., Heterosigma inlandica, Heterosigma sp., Gymnodinium-sp. Type-65 and Prorocentrum triestinum. Nutrients from bottom mud and discharges from pulp mills have been implicated in promoting growth of these organisms. Phosphorus concentration was limiting in some studies. The best approach for completion of the study is outlined.--Copyright 1974, Biological Abstracts, Inc.
W77-10551

WATER-QUALITY DATA FOR THE EAGLE RIVER VALLEY IN THE VICINITY OF EAGLE AND VAIL, WEST-CENTRAL COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
T. F. Giles, and R. E. Brogden.
Open-file report 76-812, November 1976. 1 sheet, 2 tab, 5 ref.

Descriptors: *Water quality, *Groundwater, Streams, *Chemical analysis, *Water quality standards, Recreation facilities, Colorado, Data collections, Sampling, *Eagle River valley.

Water-quality data were collected by the U.S. Geological Survey in the Eagle River valley, Colo., during 1976. Forty-nine ground-water samples from wells and springs were collected and analyzed during the study. Eight surface-water samples were analyzed. All the water samples were analyzed for major cations and anions, selenium, and arsenic. Seven of the surface-water samples also were analyzed for trace elements. The potability of ground and surface waters in the Eagle River valley can be determined by comparing the chemical data in tables with the recommended drinking-water-quality standards of the U.S. Public Health Service (1962) presented at the top of the tables. Most of the analyses indicate that only a few chemical constituents (dissolved solids, iron, manganese, and sulfate) occur in excess of these standards. The occurrence of selenium in excess of the recommended limits was detected in two samples. (Woodard-USGS)
W77-10555

DISSOLVED SOLIDS, HARDNESS, AND ORTHOPHOSPHATE OF SURFACE-WATER RUNOFF IN THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
S. Earle.
Water Resources Investigation 76-15 (open-file report), 1976. 6 p, 3 maps, 4 ref.

Descriptors: *Surface runoff, *Hardness(Water), Phosphates, *Dissolved solids, *Florida, Regional analysis, Water quality, Maps, Chemical analysis, *Suwannee River basin(Fla), Orthophosphates.

Historical water-quality data collected from January 1965 to September 1970 were used to prepare maps showing the generalized distribution of dissolved solids, hardness, and orthophosphate in streams and lakes in the Suwannee River Water Management District. The regional concentration patterns shown on the maps are generalized and local variations may be expected. The dissolved-solids concentrations generally range from 15 to 1,000 milligrams per liter. Higher concentrations are found in the coastal area on tide affected streams. The concentrations of hardness as CaCO3 generally range from 10 to 200 milligrams per liter. The concentrations of dissolved orthophosphate generally range from 0 to 3 milligrams per liter. These maps provide information to those concerned with water resources management and establish a basis for comparing future quality data. (Woodard-USGS)
W77-10556

DISTRIBUTION OF NITRATE IN GROUND WATER, REDLANDS, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
L. A. Eccles, and W. L. Bradford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 573/AS, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-117, March 1977. 38 p, 10 fig, 4 tab, 25 ref.

Descriptors: *Water pollution sources, *Groundwater, *Nitrates, *Path of pollutants, *Fertilizers, California, Groundwater movement, Water wells, Water level fluctuations, Pumping, Aquifer characteristics, Urbanization, Leaching, Redlands(Calif).

Wells producing water with nitrate as nitrogen concentrations in excess of 10 milligrams per liter are common throughout the Redlands, Calif., area. Nitrite as nitrogen concentrations in water from the saturated part of the aquifer ranged from much greater than 20 milligrams per liter at the water table to less than 5 milligrams per liter at depths of 300 feet below the water table. This depth dependence suggests that the major source of nitrate is a generalized area-wide infiltration of high-nitrate water downward from the surface through the unsaturated zone. The nitrate concentration in water from individual wells is dependent primarily upon depth and well construction--particularly aquifer seal and aquifer penetration--and secondarily upon well location. Nitrate concentrations of water in wells are increased by heavy pumping which causes high-nitrate water near the water table to be pulled deeper. (Woodard-USGS)
W77-10558

WATER-QUALITY DATA FOR THE SOUTHERN UTE INDIAN RESERVATION, SOUTHWESTERN COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
E. C. Hutchinson, and R. E. Brogden.
Open-file report 76-16, December 1976. 36 p, 2 fig, 2 plates, 2 tab, 7 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Indian reservations, *Colorado, Data collections, Sampling, Water analysis, Chemical analysis, Anions, Cations, *Southern Ute Indian Reservation(Colo), Selenium, Arsenic.

Water-quality data from a study by the U.S. Geological Survey on the Southern Ute Indian Reservation in southwestern Colorado are presented in two tables. The data were collected during 1973-76 from 338 ground-water and surface-water samples. All samples were analyzed for major catons and anions, and selenium and arsenic. Data in the tables are keyed by numbers to maps showing the locations of sampling sites. Many of the samples contained arsenic, chloride, dissolved solids, fluoride, iron, magnesium, manganese, nitrate, nitrite-plus-nitrate as nitrogen, selenium, and sulfate in concentrations exceeding recommended or mandatory standards for drinking water established by the Colorado Department of Health and U.S. Public Health Service. (Woodard-USGS)
W77-10562

ELECTROBIOCHEMICAL NEUTRALIZATION OF ACID MINE WATER,
Geological Survey, Reston, Va. Geologic Div.; and Geological Survey, Reston, Va. Conservation Div.
F. D. Sisler, F. E. Senftle, and J. Skinner.
Journal of the Water Pollution Control Federation, Vol 49, No 3, p 369-374, March 1977. 3 fig, 16 ref.

Descriptors: *Water pollution control, *Mine acids, *Electrophoresis, *Analytical techniques, Electrodes, Hydrogen ion concentration, Chemical properties, Water chemistry, Electrochemistry, *Acid mine water.

When iron sulfides in a coal mine are exposed to water containing oxygen and sulfur-oxidizing bacteria, oxidation takes place, which results in the formation of sulfuric acid. The acid mine water formed constitutes a formidable water pollution problem that seriously affects thousands of kilometers of streams and surface acreage in the U.S. In 1972, more than 3.5 billion kilograms (4 million tons) per year of sulfur acids were estimated to have drained from active and abandoned coal mines. The additional strip mining for coal brought about by the energy crisis could result in even more serious pollution problems. In this paper the basic water-treatment technique of Decker and King (1973) is combined with the biochemical fuel-cell principle. By adding electrodes and a simple external circuit to the system, one can increase the rate of acid neutralization. In addition, it may be possible to obtain a modest amount of electric power for plant operation, a practical means of disposal of sludge, and the recovery of some free sulfur. (Woodard-USGS)
W77-10569

NUMERICAL MODELING OF SUBSURFACE RADIOACTIVE SOLUTE TRANSPORT FROM WASTE-SEEPAGE PONDS AT THE IDAHO NATIONAL ENGINEERING LABORATORY,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. B. Robertson.
Available from the National Technical Information Service, Springfield, VA 22161 as IDO-22057, Price codes: A05 in paper copy, A01 in microfiche. Open-file report 76-717, January 1977. 68 p, 23 fig, 3 tab, 35 ref.

Descriptors: *Model studies, *Groundwater movement, *Path of pollutants, *Radioactive wastes, *Numerical analysis, Seepage, Ponds, Waste disposal, Analytical techniques, Snake River.

Aqueous chemical and low-level radioactive effluents have been disposed to seepage ponds since 1952 at the Idaho National Engineering Laboratory. The solutions percolate toward the Snake River Plain aquifer (135 m below) through interlayered basalts and unconsolidated sediments and an extensive zone of ground water perched on a sedimentary layer about 40 m beneath the ponds. A three-segment numerical model was developed to simulate the system, including effects of convection, hydrodynamic dispersion, radioactive decay, and adsorption. Simulated hydraulics and solute migration patterns for all segments agree adequately with the available field data. The model can be used to project subsurface distributions of waste solutes under a variety of assumed conditions for the future. Although chloride and tritium reached the aquifer several years ago, the model analysis suggests that the more easily sorbed solutes, such as cesium-137 and strontium-90, would not reach the aquifer in detectable concentrations within 150 years for the conditions assumed. (Woodard-USGS)
W77-10570

PRELIMINARY REPORT ON THE QUALITY OF WATER IN ABANDONED ZINC MINES IN

NORTHEASTERN OKLAHOMA AND SOUTHEASTERN KANSAS,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
S. J. Playton, and R. E. Davis.
Open-file report 77-163, March 1977. 36 p, 4 fig, 15 tab, 3 ref.

Descriptors: *Water quality, *Mine water, *Zinc, *Underground storage, *Chemical analysis, Oklahoma, Hydrogen ion concentration, Specific conductivity, Dissolved solids, Heavy metals, Water temperature, Chemical stratification, Water chemistry, *Acid mine water.

On-site measurements of pH, specific conductance, and water temperature show that water in seven mine shafts in northeastern Oklahoma and southwestern Kansas is stratified, with pH decreasing and specific conductance and water temperature increasing as sampling depth increases. Concentrations of chemical constitutents in mine-shaft water, such as dissolved solids, total and dissolved metals, and dissolved sulfate also increase as sampling depth increases. (Woodard-USGS)
W77-10571

SOLVING STREAM POLLUTION CONTROL PROBLEMS WITH DIGITAL COMPUTER AND MODELLING TECHNIQUES,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
L. K. Wang, M. H. Wang, and J. F. Bergenthal.
Proceedings of the Institute of Environmental Sciences, 23rd Annual Technical Meeting, April 25-27, 1977, Los Angeles, California, p 29-31. 1 fig, 1 tab, 7 ref.

Descriptors: *Dissolved oxygen, *Biochemical oxygen demand, *Mathematical models, Water pollution control, Temperature, Streamflow, Loads(Forces), Model studies, Computers, Waste water treatment, Analytical techniques.
Identifiers: DO-drop.

Procedures were described for modelling and controlling stream pollution. A mathematical model was developed by means of the multiple linear correlation method. This model calculated dissolved oxygen (DO) concentrations in fresh water at various temperatures. The DO-drop was determined to be a function of combined BOD loads of upstream, the temperature of stream water, and the stream flow. The model was used to calculate allowable BOD discharges in the upstream. A different DO-drop model should be developed for different streams or different sections in the same stream. (Collins-FIRL)
W77-10596

URBAN RUNOFF AND COMBINED SEWER OVERFLOW,
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
For primary bibliographic entry see Field 4A.
W77-10600

CLEANSING THE RIVER TYNE,
Northumbrian Water Authority, Gosforth (England).
For primary bibliographic entry see Field 5D.
W77-10613

DISTRIBUTION OF GAS FORMING BACTERIA IN SULFUR DEPOSITS OF THE PRECARPATHIANS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
S. S. Belyaev, and M. V. Ivanov.
Prikl Biokhim Mikrobiol. 9(1), p 67-72, 1973.

Descriptors: *Distribution, *Bacteria, Pollutant identification, *Sulfur, Gases, Microorganisms, Water pollution sources.
Identifiers: *Poland(Precarpathians), *Ukraine(Precarpathians), *Dissolved gases, Gas-forming bacteria.

Analysis of the gas dissolved in H2S-containing underground waters of sulfur deposits in the Ukraine and Poland showed that the main components were methane, N2 and CO2 with levels varying over a wide range. Study of the occurrence of microorganisms in underground water samples and the qualitative composition of the gas formed during the development of anaerobes suggests that these gases are formed as a result of recent microbiological processes.--Copyright 1974, Biological Abstracts, Inc.
W77-10640

RECOVERY AND SUSCEPTIBILITY PATTERN OF FAECAL STREPTOCOCCI BACTERIOPHAGES,
National Research Centre, Cairo (Egypt). Water Pollution Dept.
For primary bibliographic entry see Field 5A.
W77-10641

ORGANIC COMPOUNDS IN RED PINE KRAFT BLEACHING SPENT LIQUOR (IN JAPANESE),
Government Forest Experiment Station, Tokyo (Japan).
For primary bibliographic entry see Field 5A.
W77-10699

STUDY OF DILUTION OF SULFITE MILL EFFLUENTS IN LARGE RIVERS AND EVALUATION OF DETERMINING FACTORS (ISSLEDOVANIE PROTSESSA RAZBAVLENIYA STOKOV SUL'FIT-TSELLYULOZNOGO PROIZVODSTVA V USLOVIAKH BOLSHIKH REK I OTSENKA OPREDELYASHCHIKH FAKTOROV),
Leningradskii Tekhnologicheskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti (USSR).
A. I. Shishkin, T. N. Yurovskaya, B. I. Gurbashkov, and Z. M. Gulyakova.
Materialy Vsesoyuznogo Nauchnogo Simpoziuma po Sovremennym Problemam Samoochishcheniya Regulirovaniya Kachestva Vody, 5th, No. 1, p 183-189, 1975. 6 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste dilution, Rivers, Wastes, *Industrial wastes, *Water pollution sources, Pulp and paper industry, Water quality, Lignins, Sulfates, Chlorides, Color, Discharge(Water), Diffusion, Mathematical models, Self-purification, Water pollution, *Path of pollutants.
Identifiers: Lignosulfonic acids.

A hydro chemical study of a large river receiving sulfite mill effluents allowed evaluating the water quality before and after the discharge during the summer-fall period. The contents of lignosulfonic acids, sulfates, and chlorides, and the water color served as quality critiera. The data were used to obtain distribution diagrams of pollutants in the vertical and horizontal directions and the extent of effluent dilution at various distances from the point of discharge. In a large river, where the ratio of effluent to river water is about 1:600, complete mixing took place at a distance of 250-300 m from the discharge point. A mathematical model was developed for the determination of the optimum conditions of effluent discharge, based on a three-directional diffusion equation and experimental determination of the equation parameters. The self-purification of the river can be determined from calculated dilution of the effluent and the mathematical mode for given values of the diffusion coefficients. (Stapinski-IPC)
W77-10704

A SUMMARY OF RECEIVING WATER DISSOLVED OXYGEN CONDITIONS BELOW PULP AND PAPER MILL LOCATIONS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
M. Iacoboni, and R. O. Blosser.
NCASI Special Report No. 76-03, March, 1976. 9 p, 1 tab.

Descriptors: *Dissolved oxygen, *Water pollution effects, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Water quality, Effluents, Monitoring.

An analysis was made of dissolved oxygen data for 77 monitoring stations below 80 pulp and paper mills during the low-flow months in the years 1954, 1964, 1969, and 1974. There was a significant increase in dissolved oxygen levels between 1969 and 1974. In 82% of the cases the dissolved oxygen met or exceeded the water quality standards in 1974. In the cases where the levels were significantly less than the standard, the mill effluent comprised all of the bulk of the stream flow. (Buchanan-IPC)
W77-10705

USE OF LABORATORY EXTRACTION DATA TO PREDICT LOSSES OF DISSOLVED INORGANIC PHOSPHATE IN SURFACE RUNOFF AND TILE DRAINAGE,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 5A.
W77-10734

CONTAMINATION OF DRINKING WATER BY CORROSION OF COPPER TUBES,
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
G. G. Page.
N Z J Sci. 16(2), p 349-388, 1973.

Descriptors: *Potable water, *Corrosion, Copper, Water pollution, Pipes, Tubes.
Identifiers: *New Zealand, *Copper corrosion(Pipes).

Cu pipe normally gives excellent service in New Zealand and does not cause significant contamination of potable waters. However, under unfavorable conditions, the water drawn from taps in Auckland and some other New Zealand towns is persistently contaminated with suspended blue or green Cu corrosion products. These waters are very soft and unbuffered, and are treated by conventional techniques of alum flocculation and rapid sand filtration, with post-filtration pH adjustment, chlorination and fluoridation. Service showing this contamination are subject to excessive surface erosion due to velocity or turbulence. Coloration complaints also occur during the commissioning of buildings and from little-used small-bore branch services. In these cases the retention time of the water in the Cu services is excessive. Cu contamination builds up, and when used the water is liable to be colored. The level of copper tamination may be high when the corrosion rate is significant, the surface/volume ratio is high, or the flow rates low (or nil). In other instances, the corrosion deposits that form adhere to the bores of the Cu tubes and resist the scour that occurs when the service is in normal use. However, they may be displaced when unusual conditions prevail (e.g. increased velocities, water hammer, draining of the service). The volumes of contaminated water that can be purged from the systems are related to the amounts of water retained in the service, and the conditions that cause the dislodgement of the corrosion products. Other factors which influence the occurrence of Cu contamination in water drawn from small-bore Cu services include those that influence the stability of the adhesion of the corrosion products (including variations in the pH of the incoming water) and galvanic effects, including the relative anode area. (See also W77-06111). Copyright 1974, Biological Abstracts, Inc.

W77-10735

TOXICITY OF ALKYLDINITROPHENOLS TO SOME AQUATIC ORGANISMS,
Fisheries and Marine Service, St. Andrews (New Brunswick).
For primary bibliographic entry see Field 5C.
W77-10738

CONVERSION OF 1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE (DDT) TO WATER-SOLUBLE PRODUCTS BY MICROORGANISMS,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5C.
W77-10742

INFLUENCE OF SEDIMENT INFLOW IN PHYTOPLANKTON PRIMARY PRODUCTIVITY IN LAKE TAHOE (CALIFORNIA-NEVADA),
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10743

SURVEY OF INDUSTRIAL PROCESSING DATA. TASK II--POLLUTION POTENTIAL OF POLYBROMINATED BIPHENYLS,
Midwest Research Inst., Kansas City, Mo.
J. E. Mumma, and D. D. Wallace.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 690, Price codes: A04 in paper copy, A01 in microfiche. Report EPA 560/3/-75-004, June 1975. 56 p. 4 fig, 5 tab, 55 ref. EPA 68-01-2105.

Descriptors: *Water pollution sources, *Toxicity, Chemical industry, Industrial production, Industrial waters, Effluents, Bromides, Phenols, Bromine, Organic compounds.
Identifiers: *Polybrominated biphenyls, Hydrocarbons.

The potential for environmental contamination by brominated biphenyls is evaluated. Included are the identification and evaluation of production ties and volumes, manufacturing processes and waste disposal practices, commercial uses and substitutes, and environmental and health aspects. It is concluded that: (1) since 1974, no domestic commercial manufacturer has produced PBBs or is likely to do so in the near future, (2) some identified chemical production processes not related to direct production of PBBs can generate measurable quantities of PBBs appears to be related primarily to production and formulation processes rather than to usage and disposal of products containing PBBs, (4) domestic manufacturing sites where PBBs are used as raw materials are potential pollution sources, (5) the principal uses of PBBs in the U.S. has been as a fire-retardant additive in thermoplastic products and as such does not come into contact with human food or clothing, (6) use of PBBs is being phased out by the largest domestic consumer in favor of less toxic but more expensive fire-retardant substitutes, and (7) biological studies indicate that PBBs have a low acure toxicity, can bioaccumulate in fatty tissues, and can cause adverse effects on animal organs, especially the liver. (Luedtke-Wisconsin).
W77-10750

NITROGEN UPTAKE AND RELEASE IN A FORESTED WATERSHED, LAKE TAHOE BASIN, CALIFORNIA,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10753

SUMMER ZOOPLANKTON DISTRIBUTION IN A GEORGIA ESTUARY,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-10756

DRY DEPOSITION LOADING OF LAKE MICHIGAN BY AIRBORNE PARTICULARATE MATTER,
Governors State Univ., Park Forest South, Ill. College of Environmental and Applied Sciences.
For primary bibliographic entry see Field 5A.
W77-10758

COMPARISON OF BACTERIAL AND ALGAL UTILIZATION OF ORTHOPHOSPHATE IN AN ESTUARINE ENVIRONMENT,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10760

INVESTIGATION OF THE HYDROLOGICAL BALANCE IN A PEAT SWAMP,
Brussels Univ. (Belgium).
For primary bibliographic entry see Field 2F.
W77-10768

LEAD DISTRIBUTION IN THE CAPE FEAR RIVER ESTUARY,
Duke Univ., Beaufort, N.C. Marine Lab. and Duke Univ., Beaufort, N.C. Dept. of Chemistry.
R. W. Baier.
Journal of Environmental Quality, Vol. 6, No. 2, p 205-210, April-June 1977. 5 fig, 3 tab, 19 ref. DES74-12831, CG00005, GD32560.

Descriptors: *North Carolina, *Lead, *Water pollution, *Estuarine environment, *Fluvial sediments, *Pollutants, Analytical techniques, Heavy metals, Gasoline, Toxicity, Estuaries, Streams, Tides, Sediment transport, Flumes, Chemical analysis, Bottom sediments.
Identifiers: *Lead distribution, *Cape Fear River Estuary(NC), *Lead complexes, *Estuarine transport, *Lead pollution, Anodic stripping voltammetry, Protolysis, Trace metals, Antiknock compounds, Atomic absorption spectrophotometry, Polarographic analyzer, Complex formation.

Water and mud samples collected during 1973 and 1974 from the Cape Fear River, the region of its plume, and adjacent slope waters were analyzed for lead (Pb) by anodic stripping voltammetry and atomic absorption spectroscopy. Partitioning among adsorbed, strongly conplexed, and electroactive states of Pb in seawater was estimated by filtration and voltammetric analyses at two pH levels. A significant fraction of the Pb present was found to be compelexed in river water, but was dissociated upon mixing with shelf water. The concentration of Pb in offshore sediment with increasing grain size. All concentrations of Pb found in the Cape Fear River estuary wee well below recognized lethal values for aquatic life. (Henley-ISWS)
W77-10772

EFFECTS OF INCREASED FERTILIZER RATES ON NITROGEN CONTENT OF RUNOFF AND PERCOLATE FROM MONOLITH LYSIMETERS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W77-10773

DETERMINISTIC AND STOCHASTIC APPROACHES FOR MODELLING OF LONGITUDINAL DISPERSION IN A TURBULENT OPEN CHANNEL FLOW,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
P. Todorovic, D. B. Simons, and R. M. Li.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 27, Colorado State University, Fort Collins, p 27-1 - 27-17, 1976. 6 fig, 2 tab, 5 ref.

Descriptors: *Dispersion, *Open channel flow, *Model studies, *Stochastic processes, Mathematical models, Mathematical studies, Transfer, Statistical methods, Probability, Flow, Turbulent flow, Uniform flow, Theoretical analysis, Particles, Movement, Analytical techniques, Laboratory tests, Tracers, Path of pollutants.

A mathematical model of longitudinal dispersion for the case of stationary and homogeneous turbulence in steady fluid flow was derived using two approaches. One method was stochastic, based upon stochastic process of nondecreasing sample functions, and a one-dimensional probability distribution represented the longitudinal concentration function of the dispersant in the flow. The other approach was deterministic, involving the use of the principle of conservation of mass to derive a partial differential equation, the solution to which, under appropriate boundary conditions, gives the identical concentration function obtained using the probabilistic approach. To verify the developed theory, dispersion experiments were conducted in a two-ft wide circulating flume. Rodamin WT dye was injected into the flow from an instantaneous plane source for two different, but steady, flow conditions. The theoretical analysis showed that the mode of probability density function of the travel time of tagged particles is asymptotically a linear function of the distance, x. The theoretical result was verified by the experimental data. It was found that the two termed theoretical probability density functions compared favorably with the observed experimental results. (See also W77-10439) (Humphreys-ISWS)
W77-10794

DISPERSION OF SEDIMENT PARTICLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-10795

DETERMINATION OF INORGANIC PHOSPHORUS IN OXALATE EXTRACTS OF SOILS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W77-10797

SORPTION AND HYDROLYSIS OF ADDED ORGANIC PHOSPHORUS COMPOUNDS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
M. G. Rodel, D. E. Armstrong, and R. F. Harris.
Limnology and Oceanography, Vol 22, No 3, p 415-422, May 1977. 3 fig, 3 tab, 16 ref. OWRT B-002 WIS(15). 14-01-0001-1969.

Descriptors: *Sorption, *Hydrolysis, *Organic compounds, *Phosphorus compounds, Lakes, *Lake sediments, Laboratory tests, Phosphorus, Nutrients, Chemicals, Chemical reactions, Sediments, Microorganisms, Biology, Biological communities, Biological properties, Limnology.

The sorption and hydrolysis of three types of organic phosphate compounds in a lake sediment-water system were investigated. An intact, non-sterilized sediment was used to allow evaluation of chemical and biological effects. Sorption was attributed mainly to chemical interactions and hydrolysis to sediment microorganisms. The extent of sorption varied with the type of compound and was partly related to the number of phosphate groups per molecule. Hydrolysis rates were decreased by organic P sorption and by incubat at 4C rather than at room temperature. (Sim- ISWS)
W77-10799

RELATIONSHIP BETWEEN NITROGEN FIXATION (ACETYLENE REDUCTION) AND THE C:N RATIO IN A POLLUTED CORAL REEF. ECOSYSTEM, KANEOHE BAY, HAWAII,
Hawaii Univ., Honolulu. Dept. of Microbiology.
R. B. Hanson, and K. Gundersen.
Estuarine and Coastal Marine Science, Vol 5, No. 3, p 437-444, May 1977. 5 fig, 33 ref.

Descriptors: *Nitrogen fixation, *Algae, *Nitrogen fixing bacteria, *Hawaii, Bays, Water pollution, Nutrients, Sewage effluents, Sediments, Coral, Sampling, On-site investigations, On-site data collections, Carbon, Nitrogen, Path of pollutants.
Identifiers: *Kaneohe Bay(Hawaii).

Biological nitrogen fixation was investigated in Kaneohe Bay, Oahu, Hawaii, which receives secondary sewage from two treatment plants. In an attempt to determine the controlling environmental factors of nitrogen fixation in the Bay, dead coral heads, sediments, and suspended matter were analyzed for carbon and nitrogen and their concentrations related to nitrogen fixation. The high blue-green algal fixation on dead coral structures in the middle sector is ascribed in part to the efficient flushing by oceanic water as indicated by the relatively high C:N ratio (15:1) of the suspended matter. It is calculated that 760 and 6 Kg N2/ha is fixed annually by blue-green algae on dead coral and bacteria in the sediment, respectively, in Kaneohe Bay. These rates would supply 2.3% of the annual nitrogen requirement for phytoplankton growth. (Sims-ISWS)
W77-10124

SOME EFFECTS OF AGRICULTURAL DEVELOPMENT AND FLUCTUATIONS IN WATER LEVEL ON THE PHYTOPLANKTON PRODUCTIVITY AND ZOOPLANKTON OF A NEW ZEALAND RESERVOIR,
Otago Univ., Dunedin (New Zealand). Dept. of Zoology.
S. F. Mitchell.
Freshwater Biology, Vol. 5, No. 6, p. 547-562, 1975. 10 fig., 4 tab., 42 ref.

Descriptors: *Primary productivity, *Reservoirs, *Water level fluctuations, *Agricultural runoff, *Eutrophication, Zooplankton, Foreign countries, Phosphates, Phytoplankton, Lakes.
Identifiers: *Lake Mahinerangi(New Zealand).

The comparative influences of higher water levels and agricultural development in the periphery of Lake Mahinerangi, a New Zealand reservoir, on phytoplankton productivity and the zooplankton communities are discussed. An increase in primary productivity to an annual average of 210 mg C/sq m per day in 1968-1970 from 76 mg C/sq m per day in 1964-66 is attributed partly to higher water levels. Introduction of agriculture to about 3% of the reservoir drainage basin also contributed to productivity, with influent streams from the agricultural areas contributing more than 60% of the reactive phosphate while representing only 24% of the water which enters the lake. Inorganic nitrogen compounds are very low in the reservoir but the agricultural development may also have increased nitrate income. Bicarbonate alkalinity was slightly higher than in the earlier investigation, with a concurrent increase in pH, possibly due to lime leached from agricultural land. Secchi disc transparency also increase, in contrast to the usual symptoms of increased productivity. None of the three dominant Zooplankton species increased but there were substantial increases in two less abundant taxa, Daphnia carinata and Cyclopoida. The various factors involved in the biological responses due to the elevated water levels and nutrient inputs are evaluated. (Auen-Wisconsin).
W77-10137

VARIATION IN CHEMICAL COMPOSITION OF THE RIVER FROME, ENGLAND, FROM 1965 TO 1972,
Freshwater Biological Association, East Stoke (England).
H. Casey.
Freshwater Biology, Vol. 5, No. 6, p 507-514, 1975. 6 tab., 21 ref.

Descriptors: *Rivers, *Nutrients, *River flow, *Variability, Runoff, Foreign countries, Nitrates, Phosphates, Chemical properties, Water chemistry, Potassium, Agricultural runoff, Sewage effluents, Drainage basins.
Identifiers: *River Frome(England), *Nutrient sources, Chalk streams.

Amounts and chemical nutrients, their variations in relation to river flow and their sources were calculated in a 1965-1972 study of the River Frome, England. Mean flow ranged between 4.48 cu m/sec to 8.38 during the study period. Alkalinity, calcium, sodium and potassium values were almost constant. Silica showed large annual variations but the chalk springs, which are the major water source to the river, also showed large variations. Nitrate concentrations had increased from a mean value of 2.05 mg/l in 1965 to 3.06 in 1972. Most of this increase was due to the increasing use of nitrogen fertilizers. The percentage of nitrate derived from sewage effluents was fairly constant in around 7%. Phosphate concentrations had increased from 108 microgram/l in 1965 to 134.7 in 1972, over 70% of which are attributed to sewage effluents. Sewage effluents increased by 29% from 1965 to 1972 and are calculated to increase by 14% by 1980. The 1972 input, in tons, of phosphorus from sewage was 17.6; for 1980 the input would be 33.6 tons. When divided by the mean 1972 river flow the result would be 186 microgram/l phosphorus entirely due to sewage. The increase in sewage would also rise the nitrate 21% over the 1972 values. (Auen-Wisconsin)
W77-10138

EFFECTS OF ARTIFICIALLY INTRODUCED GROUND WATER ON THE CHEMICAL AND BIOCHEMICAL CHARACTERISTICS OF SIX HILLSBOROUGH COUNTY (FLORIDA) LAKES,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 2H.
W77-10139

PRIMARY PRODUCTION STUDIES IN PORTO NOVO WATERS, S. INDIA,
Centre of Advanced Study in Marine Biology, Porto Novo (India).
A. Purushothaman, and G. P. Bhatnagar.
Archiv fur Hydrobiologie, Vol. 77, No. 1, p 27-50, 1976. 10 fig, 14 ref.

Descriptors: *Primary productivity, *Estuaries, *Salinity, *Light penetration, Asia, Phosphates, Nitrates, Silica, Chlorophyll.
Identifiers: Porto Novo(India), *Villar Estuary(India).

Primary productivity and its contributing factors in the Vellar estuary of Porto Novo, South India, are described. Maximum primary production occurred at the mouth of the estuary where the water was most clear. The estuary is turbid but nevertheless light penetrates to the bottom because of its shallow depth and is available to production even at the bottom. Peak production values recorded at all seven study stations coincided with the rise in temperature and salinity in April, possible due to the influence of neritic waters and neritic phytoplankton. The N:P ratio ranged from 1:1 in April to 12:1 in February, with the minimum N:P ratio observed when production was maximum in April. Nitrates increased at the upper estuary and silicate contents were also very high. The ratio of photosynthesis to chlorophyll-a varied between 8.1 and 20.9. The carbon assimilation to chlorophyll-a ratio also varied. Chlorophyll-a and net photosynthesis correlated highly and were uniformly high in all stations. Production increased gradually beginning with the post-monsoon season and attained a peak value in April, when the temperature, salinity and light were high and the estuary was inundated by neritic water. However, nutrient levels dropped, possibly due to utilization by algae. (Auen-Wisconsin)
W77-10140

LIMNOLOGICAL STUDIES IN A LARGE, DEEP, OLIGOTROPHIC LAKE (LAKE OHRID, YUGOSLAVIA). EVALUATION OF NUTRIENT AVAILABILITY AND CONTROL OF PHYTOPLANKTON PRODUCTION THROUGH IN SITU RADIOBIOASSAY PROCEDURES,
Dartmouth Coll., Hanover, N.H. Dept. of Biological Sciences.
H. L. Allen, and B. T. Ocevski.
Archiv fur Hydrobiologie, Vol. 77, No. 1, p 1-21, 1976. 1 fig, 8 tab, 20 ref. SFG-2-8264.

Descriptors: *Primary productivity, *Limiting factors, *Oligotrophy, *Hardness(Water), Inorganic compounds, Foreign countries, Organic compounds, Silica, Iron, Nitrilotriacetic acid, Chelation, Trace elements, Vitamins, Marl, Lakes.
Identifiers: *Lake Ohrid(Yugoslavia).

Control of pelagial phytoplankton photosynthetic productivity rates by actual and physiological availability of inorganic and organic nutrients was investigated in Lake Ohrid, Yugoslavia, by carbon-14 bioassays. Results indicated that phytoplankton populations from 10-20 m depth were significantly limited by the availability of various inorganic nutrients. Phytoplankton populations, predominately centric diatonms, at depth near the light--compensation point and in upper hypolimnetic waters during summer stratification were significantly limited during much of spring and early summer. There were frequently additives as well as synergistic stimulatory responses of productivity induced by addition of 1-40 microgram/l silica, iron and phosphate, when added c simultaneously. Nitrate failed to produce any persistent stimulation. Simultaneous additions of iro and NTA frequently resulted in synergistic stimulation. Glucose, acetate, glycine and NT produced marked stimulatory responses. Chelate trace elements added separately or mixed inhibite phytoplankton production. Vitamins failed stimulate productivity, with the exception marked stimulation by microadditions of B12. T low productivity of this lake is attributed to the mal stratification characteristics, including the mal optima required for maximum growth, lig penetration characteristics and the qualitative n ture of the light at depth; availability of organ compounds that function as chelating or comple ing agents, and availability of inorganic iron, s ica, phosphorus, and possibly vitamins. (Auc Wisconsin)
W77-10141

CHEMICAL INPUTS BY A COLONY FRANKLIN'S GULLS NESTING IN CATTAILS
Minnesota Univ., St. Paul. Dept. of Ecology a Behavioral Biology
J. G. McColl, and J. Burger
American Midland Naturalist, Vol. 96, No. 2 270-280, 1976. 2 fig, 4 tab, 21 ref.

Descriptors: *Eutrophication, *Migratory bir *Freshwater marshes, *Cattails, *Minneso Gulls, Nitrogen, Phosphorus, Bottom sedimen Nesting, Calcium, Magnesium, Potassium, So um, Conductivity, Electrolytes
Identifiers: Agassiz National Wild Refuge(Minn), Franklin's gulls, Nutrient sinks.

To study the effects of nesting by a colony Franklin's gulls in the freshwater marsh of Agassiz National Wildlife refuge in northern M

esota, comparisons were made of water and sedi-ent samples from two shallow pools in the arsh; one pool was colonized by about 30,000 lls nesting among the cattails and the other pool ntained cattails but no gull colony. The migrato- birds arrive in late April and leave in mid-July, e young are fed entirely in the nesting colony for days post-hatching, defecate within the colony, d a large number of young, and some adults, die d sink into the water. Nitrogen and phosphorus ncentrations greatly increased in the water in e immediate vicinity of the gull colony; peak ncentrations coincided with the peak of gull st-building and feeding (mid-May to mid-July). out 36% of the annual phosphorus input is at-butable to the gulls within the nesting area pool. owever, there were no net changes in nitrogen d phosphorus concentrations in the water due to trient absorption by the pool sediments. The gull lony had little effect on the concentrations of dium, potassium, calcium and magnesium in the ter. Outlet waters of both the test and control ols had higher potassium concentrations than in-ts due to release of potassium by the sediment water, or by nutrient uptake and subsequent ching from the cattails. The marsh also acts as a nk' for nutrients from the surrounding agricul-al land. (Auen-Wisconsin)
W77-10142

FECT OF HERBICIDES ON OTOSYNTHETIC ELECTRON TRANSPORT D ON THE GROWTH OF THE ALGA ENEDESMUS QUADRICAUDA,
oclaw Univ. (Poland). Inst. of Botany and chemistry.
Hendrich, Z. Kubiak, K. Jurajda, and M. vlaczyk-Szpilowa.
a Societatis Botanicorum Poloniae, Vol. 45, 1, p 101-110, 1976. 4 tab, 22 ref.

scriptors: *Herbicides, *Mode of action, gae, Growth rates, Photosynthesis, nedesmus, 2,4-D, Water pollution effects.
ntifiers: *Hill reaction, Gramoxone, Afalon, samone, Simazine, CIPC.

growth-inhibiting effects of 2,4-D, Afalon, C (isopropyl ester of 3-chlorocarbanilic acid), moxone-paraquat, Afalon, Kresamone and azine on algae and on photosynthesis was in-igated with Scenedesmus quadricauda. Four-days of testing showed that Afalon is the most ngly toxic of these herbicides and that it ices dry weight cell number as well as packed volume. The inhibitory action of Kresamone CIPC is weak and 2,4-D, particularly in lower centrations, has a stimulating effect on algal vth. While Afalon does not cause any deforma- Simazine, CIPC and Gramoxone induce nu-ous deformed cells. Kresamone and CIPC ipt the formation of swollen and light cells, uently lacking cytoplasm, whereas Simazine rs development of large, round, well filled, heavy cells; Gramoxone induces very small . Afalon inhibits growth 50% at a concentra-of 0.000,001 M, an indication that the only site action is the chain of electron transport in the ity of Photosystem II. Simazine inhibits th and the Hill reaction in isolated roplasts, with 50% inhibition at a concentra-of about 0.000,006 M. This herbicide also es marked morphological changes, indicating side effects on the metabolism and cell divi-processes. The effect of CIPC, Kresamone ,4-D is not connected with electron transport Photosystem II. Only CIPC slightly inhibits Hill reaction, whereas both CIPC and 2,4-D nce cell production. (Auen-Wisconsin)
10143

NSFER TO FISH OF PETROLEUM PARAF-AND ORGANIC SULFUR COMPOUNDS,
ama Univ. (Japan). Dept. of Public Hygiene.
gata, Y. Miyake, S. Kira, K. Matsunaga, and anaka.
Water Research, Vol. 11, No. 4, p 333-338, 1977. 4 fig, 1 tab, 12 ref.

Descriptors: *Oil pollution, *Marine fish, *Absorption, Eels, Aromatic compounds, Sulfur compounds, Laboratory tests, Foreign research, Odor, Bioindicators, Oily water, Oil spills.
Identifiers: *Bioaccumulation, Hydrocarbons, Petroleum paraffins, Arabian Light Crude oil.

In a study of the uptake of petroleum products by fish, laboratory tests followed by gas chromatography demonstrated absorption of paraffins, organic sulfur compounds and hydrocarbons by eels after exposure to Arabian Light Crude oil. Analysis of eel flesh indicated straight and branched chain paraffins in the C13, C14 and C15 groups but no chromatographic peaks indicating n-alkanes. Paraffin C13-C15 groups increased with duration of rearing time in eel flesh. The results indicated that organic sulfur compounds having relatively low boiling points in oil-contaminated water can transfer to eel flesh and will increase with length of exposure. Aromatic hydrocarbons were also present in oil treated eels, the concentration ratios descending in the order of toluene m-oip-xylene, o-xylene and benzene. An obnoxious odor was detected in eels exposed to petroleum for 1, 3, 7 and 15 days. This experiment demonstrated that crude oil organic sulfur compounds transfer from water to fish and therefore organic sulfur compounds in fish may be used as an indicator of oil pollution. (Auen-Wisconsin)
W77-10144

ULTRA-VIOLET ABSORPTION CHARACTERISTICS OF WATERS IN AN INDUSTRIALIZED ESTUARY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, and G. M. Foster.
Water Research, Vol. 11, No. 4, p 351-354, 1977. 5 fig, 2 tab, 9 ref.

Descriptors: *Ultraviolet radiation, *Absorption, *Organic loading, *Estuaries, Foreign countries, *Industrial wastes, Organic wastes.
Identifiers: *Milford Haven estuary(Wales).

The impact of industrial organic loading on the ultraviolet (uv) absorption spectra in the Milford Haven estuary, Wales, (United Kingdom) is detailed. The magnitude of integrated absorption between 250 and 350 nm varied from 1767 units at low water in the Daugleddau to 268 units in deep waters at the estuary mouth. At all tidal stages a general trend of decreasing UV absorption was clearly evident downstream demonstrating that the major source of dissolved UV absorbing organic material to the estuary originated from the river and the distribution pattern of UV absorption was predominantly dependent upon the efficiency of physical mixing between the source and sea water with low absorption entering the mouth of the estuary. The relative contributions from industrial and/or biological sources to the total organic material present progressively increased to the center of the estuary; however, the increasing contribution of low absorbing sea water downstream more than compensated for this, with the net result that the magnitude of the UV absorption and hence organic concentrations decreased seawards. The conclusion is that the impact of industrial organic loadings on the UV absorbing organic matter has been minimal and has less significance than the in situ biological activity. (Auen-Wisconsin)
W77-10145

THE INFLUENCE OF SALINITY ON THE GROWTH OF SOME PLANKTON DIATOMS FROM BRACKISH WATER,
Oslo Univ. (Norway). Section of Marine Botany.
E. Paasche.
Norwegian Journal of Botany, Vol. 22, No. 3, 1975. p. 209-215. 4 fig, 33 ref.

Descriptors: *Diatoms, *Brackish water, *Estuarine environment, *Salinity, Plankton, Growth rates, Growth stages.
Identifiers: *Stenohalinity, Thalassiosira baltical (Grunow) Ostenfeld, Microsiphona potamos Weber, Skeletonema subsalsum (A. Cleve) Bethge, S. costatum (Greville) Cleve.

In experimental work conducted to verify the stenohaline character of plankton diatoms indigenous to brackish waters, it was shown by means of culture experiments that the plankton diatoms Thalassiorsira baltica (Grunow) Ostenfeld and Skeletonema subsalsum (A. Cleve) Bethge grow best in the salinity range of 2-20 percent. The results are in agreement with the known preference of these diatoms for brackish waters in nature. Similar results were obtained with Microsiphona potamos Wever, a diatom occurring in river plankton. Two clones of the marine plankton species Skecostatum (Greville) Cleve, one from the Oslofjord and the other from the Baltic Sea, grew well at salinities between 8-40 percent; both failed to grow at a salinity of 2 percent or less. The experiments confirm that the natural distribution of brackish-water diatoms is largely governed by a physiological intolerance to high and low salt concentrations in the growth mediums. Since other studies have shown that the influence of salinity on diatom growth is not greatly modified by variations in other environmental factors, such as temperature and light, it is concluded that the salinity tolerance patterns that can be inferred from the distribution of phytoplankton species in nature generally agree with the results obtained in growth experiments. (Harris-Wisconsin)
W77-10146

THE EFFECT OF ENVIRONMENTAL FACTORS ON ESTIMATED VIABLE AND TOTAL POPULATIONS OF PLANKTONIC BACTERIA IN LAKES AND EXPERIMENTAL ENCLOSURES,
Freshwater Biological Association, Windermere (England).
J. G. Jones.
Freshwater Biology, Vol. 7, No. 1, February 1977, p 67-91. 5 fig, 9 tab, 39 ref, 1 append.

Descriptors: *Statistical methods, *Estimating, *Bacteria, *Plankton, *Lakes, Temperature, Dissolved oxygen, Chlorophyll, Ammonia, Phosphates, Eutrophication, Regression analysis, Water pollution effects.
Identifiers: *Total bacteria counts, *Viable bacteria counts, *Experimental enclosures, Multivariate analytical techniques, Principal components analysis.

Analyses of total versus viable counts of planktonic bacteria in samples taken from various depths and from two experimental enclosures in English lakes demonstrate that most of the variability in these bacterial population estimates can be explained by five of the regressor variables (temperature, dissolved oxygen, chlorophyll-a, phosphate and ammonia) and that the factors most likely to provide more information would include some measure of predation and lake retention time. The results were taken from surveys of lakes of differing degrees of enrichment and from enclosures which, unlike the lakes, and their nutrients replenished by artificial addition and not by inflowing streams. Results from weekly sampling surveys were analyzed by principal components analysis and multiple regression computer programs, multivariate techniques which allowed the generation of new sets of variables and hypotheses on the factors controlling the planktonic bacteria. These were examined in relation to future planning of sampling programs and in light of results from (1) weekly sampling programs; (2) a period of sampling at shorter intervals; and (3) horizontal and vertical spatial variations. The viable count was, on average, 0.25% of the total count. Results taken from the whole water column showed the overwhelming effect of the process of stratifiction

on the bacterial population, accounting for 30-60% of its variability. Secondary components representing algal productivity could account for 10-20% of the variability. (Harris-Wisconsin)
W77-10147

UTILIZATION OF ALGAE BY SOME COMMON FISHES OF TWO PONDS,
Christ Church Coll., Kanpur (India). Dept. of Botany.
A. G. Gypta, and D. C. Roy.
Nova Hedwigia, Vol. 26, No. 2-3, p 509-516, 1975. 1 tab, 19 ref.

Descriptors: *Fish food organisms, *Food chains, *Carp, *Fisheries, Secondary productivity, Cyanophyta, Chlorophyta, *Algae, Fish, Ponds.
Identifiers: *Kanpur(India), Bacillariophyta.

In one of a number of studies aimed at assessing the value of planktonic and other algae as direct or indirect food for fish in the inland fisheries of India, the specific feeding habits of carp and other common fish in two ponds near Kanpur were studied by examination of gut contents. The observations showed that the carps exhibited selective feeding of algae and did not utilize all the varieties present in the ponds. Chlorella vulgaris, Coelastrum sphaericum, C. cambricum, Scenedesmus quadricauda, Merismopedia tenuissima, Microsystes aeruginosa, Spirulina major and S. subsalsa were all found in large quantities in the guts of the various carp varieties. Some of the more filamentous forms of chlorophyta, cyanophyta and bacillariophyta, although present in large quantities in the ponds, were not found in the carp. However, such filamentous forms as Oedogonium amplum, O. vulgare, in addition to the S. major and S. subsalsa described earlier, were so found. The gut contents of the carp were strongly correlated with the local algae, and it is concluded that the seasonal fluctuations in the composition of the algal flora decidedly affects the food of the fishes in the pond. (Harris-Wisconsin)
W77-10148

THE INFLUENCE OF ZOOPLANKTON ANESTHETISING SUBSTANCE PHYSOSTIGMINE SALICYLICUM ON PHOTOSYNTHESIS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
S. Wium-Andersen.
Archiv fur Hydrobiologie, Vol. 76, No. 3, November 1975, p 379-383. 1 fig, 1 tab, 11 ref.

Descriptors: *Analytical techniques, *Laboratory tests, *Photosynthesis, *Zooplankton, Digestion, Feeding rates, Grazing, Food habits, Foods.
Identifiers: *Physostigmine salicylicum.

In an earlier study, another author described the way he was able to measure the ingestion rate and choice of food particle size of a zooplankton population, by means of the addition of Physostigmine salicylicum to anaesthetize the zooplankton fraction of a plankton sample in an experimental jar. According to the earlier study, this blocking substance should only influence the muscle synapses and should only be considered useful in such investigations as a specific synapse poison. Whereas the earlier study claimed that the drug does not influence photosynthesis, it is shown in the present paper that the drug does in fact inhibit the maximum rate of photosynthesis by 41 percent, and it is further shown that it is the enzymatic processes of photosynthesis that are inhibited in these experiments. It is claimed that the first author did not use optimal experimental circumstances when checking the drug, but instead collected the plankton samples in the summertime when it can be expected that the plankton algae are adapted to optimal photosynthesis at about 20 klux. These first experiments had been carried out at only 2.5 klux, which is far from optimal. The conclusion is that the Physostigmine salicylicum method is invalid for measuring the influence of grazing zooplankton on the algae population. (Harris-Wisconsin)
W77-10149

SEASONAL CHANGES IN TWO ALGAL POPULATIONS FROM THE COASTAL WATERS OF WASHINGTON STATE,
Washington Univ., Seattle. Dept. of Oceanography.
T. Hruby.
The Journal of Ecology, Vol. 63, No. 3, p. 881-889, 1975. 2 fig., 2 tab., 21 ref.

Descriptors: *Rhodophyta, *Marine algae, *Washington, *Uniformity coefficient, *Graphical analysis, *Littoral, Marine biology, Pacific Coast region, Oceanography, Tides, Spatial distribution, Temporal distribution, Mathematical studies, Seasonal.
Identifiers: *Turn Point(San Juan Island Washington), *Rosario Beach(Fidalgo Island Washington), Iradaea cordata(Turner), Bory(Gigartinales), Quadrat analysis.

A study carried out in the coastal waters of Washington at two locations where the summer algal community was dominated by the red algal Iridaea cordata (Turner) Bory (Gigatinales) showed that the summer and winter communities could be differentiated by a similarity coefficient of quantitiative measurement which includes data on algal cover as well as species. The algal species and their coverage within five .25 sq. meter quadrats (measured by hand-placed aluminum frames) were recorded on a monthly basis from October 1972 to October 1973 at two locations in the coastal waters of Washington, off Turn Point on San Juan Island and at Rosario Beach on Fidalgo Island. Both locations had almost level bottoms of at least 300 sq. meters where the slope was less than 3% as measured relative to Mean Lower Low Water. The first quadrat was dropped randomly in the algal bed and subsequent ones were dropped within visual distance of the first. In the study, it was learned that coefficients which use only diversity data provided less information when studying changes in one location. However, the populations of algae were found to be too heterogeneous relative to cover, and valid comparisons between locations could be made only with these diversity-based coefficients. It was also found that the seasonal changes in the algal populations affect the species-area curve that can be plotted for a location. (Harris-Wisconsin).
W77-10150

THE DETERMINATION OF DISSOLVED INORGANIC CARBON, A POSSIBLE SOURCE OF ERROR IN DETERMINING THE PRIMARY PRODUCTION OF LAKE WATER PHYTOPLANKTON,
Helsinki Univ., Lammi (Finland). Lammi Biological Station.
K. Salonen, and A. L. Kotimaa.
Annales Botanici Fennici, Vol. 12, No. 4, 1975, p. 187-189. 1 fig., 1 tab., 8 ref.

Descriptors: *Primary productivity, *Analytical techniques, Eutrophication, *Phytoplankton, Measurement, Laboratory tests, Lakes, *Pollutant identification.
Identifiers: *Dissolved inorganic carbon(DIC), *Indirect DIC determinations, *Acid titration of alkalinity, *Back titration of alkalinity, Infrared gas analyzers.

In other studies made to determine the amount of concentration of dissolved inorganic carbon (DIC) in fresh waters, measurements have been based on indirect determinations of pH, alkalinity, conductivity and temperature. A second method of determining DIC indirectly using acid titration of alkalinity, suggested by some authors, has been known to produce erroneous results in certain instances. The present study was made to obtain a more general picture of the differences between the results of the applied methods in Finnish lakes. DIC was determined both by two indirect methods from pH and from alkalinity and by a direct method using an infrared gas analyzer. When the measurements were taken indirectly by acid titration of alkalinity, the results from weakly-buffered lakes were often tens of percentage points higher than for the results obtained directly with the infrared gas analyzer. When DIC was determined indirectly with back titration of alkalinity, results similar to infrared analysis were found. Based on these results, which were in agreement with those of other investigations, it is concluded that a technique other than the indirect one based on acid tritration of alkalinity should be preferred in the determination of DIC. (Harris-Wisconsin).
W77-10153

A FIELD AND LABORATORY STUDY OF OXYGEN UPTAKE BY PLANKTONIC BLUE-GREEN ALGAE,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
C. E. Gibson.
The Journal of Ecology, Vol. 63, No. 3, p. 867-879, 1975. 7 fig., 6 tab., 19 ref.

Descriptors: *Cyanophyta, *Oxygen demand, Hypolimnion, Lake morphometry, Dimensions, Optical properties, Photoperiodism, Light.
Identifiers: *Lough Neagh(Northern Ireland), *Oxygen uptake gradients, *Light-stimulated respiration, Oscillatoria redekei van Goor.

The annual cycle of oxygen demand in Lough Neagh (Northern Ireland) is reported, with particular reference to its distribution through the water column. The report is part of a larger study made of such oxygen demand of the lake water to elucidate conditions which bring about de-oxygenation of the water column, since this event is likely to be significant in the ecology of the lake which has no lasting hypolimnion die to the fact that the lake's largest axis coincides with the prevailing wind and the lake is well-mixed for most of the year. The present study shows that although the lake is unstratified, there is a persistent vertical gradient of dark oxygen uptake. Detailed profiles suggest that this is due to light stimulation of dark respiration rates. A laboratory study of a benic Oxcillatoria redekei van Goor shows that light stimulated respiration up to ten-fold. Carbohydrate contents of the cells were correlated with the respiration rates, both in the field and laboratory observations. It is likely that unless this effect is allowed for, respiration of field populations of blue-green algae is considerably overestimated by the usual methods of measurement in studies of oxygen demand in Lough Neagh (Harris-Wisconsin).
W77-10154

COMPARATIVE LIMNOLOGY OF DIFFERENTIALLY REGULATED SECTIONS OF COLORADO MOUNTAIN RIVER,
Colorado State Univ., Fort Collins. Dept. Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 6G.
W77-10155

INDICATOR VALUE OF BIOSESTON AND PERIPHYTON FOR EVALUATION OF POLLUTION DEGREE OF FLOWING WATERS, (IN POLISH),
Water Economics Research Inst., Wroclaw (Poland). Water Protection Research Section.
For primary bibliographic entry see Field 5B.
W77-10158

STREAM COMMUNITY RESPONSE TO ROAD CONSTRUCTION SEDIMENTS,
Virginia Commonwealth Univ., Richmond. Dept. of Biology
For primary bibliographic entry see Field 4C.
W77-10182

IATOM INDICATOR GROUPS IN THE AS-ESSMENT OF WATER QUALITY IN THE UKSKEI-CROCODILE RIVER SYSTEM TRANSVAAL, REPUBLIC OF SOUTH FRICA),
ational Inst. for Water Research, Pretoria (South frica).
or primary bibliographic entry see Field 5A.
77-10193

EAVY METAL ENRICHMENT IN MINE RAINAGE: I. THE RUSTENBURG PLATINUM INING AREA,
etoria Univ. (South Africa). Dept. of Chemistry.
T. Wittmann, and U. Forstner.
uth African Journal of Science, Vol. 72, No. 8, p 2-246, August 1976.

scriptors: *Heavy metals, Mine water, Sedi-nts, Monitoring, River, Sampling, Environmen- effects, Slimes, *Mine wastes, Spectrocopy, line drainage.
ntifiers: South Africa, Platinum, Elands River, alkop Dam, Crocodile River, Bospoort Dam, fantsnek Dam, Buffelspoort Dam, ndleyspoort Dam.

e effect of the mining activities in the Rusten-g area on the metal enrichment of the mines' inage area was investigated. Histroic review of ning in the area is presented; methods that were d in sampling and analyzing sediment samples en from rivers and dams in the area are cribed. The environmental impacts of the min-wastes are discussed and it is concluded that deleterious heavy metal contamination of the ercourses or man-made impoundements have ilted. In contrast, wastes from hydrometallur-l processes used in the refining of platinum s on the East Rand contained appreciable unts of poisonous heavy metals comparable to se of the gold mining industry. (So African ter Info Center)
7-10199

NERGISTIC EFFECTS OF MARINE POLLU-N,
ds Univ. (England). Wellcome Marine Lab.
Gray.
th African Journal of Science, Vol. 72, No. 2, p 6, February 1976. 1 fig.

criptors: Chemicals, Growth rate, Bioassay, tures, Metals, Water pollution effects, ozoa, Marine microorganisms, *Estuarine en-nment, Estuaries.
tifiers: *River Tees Estuary(England), North *Cristigera, Capitella capitata, *Synergism, rine pollution.

ore sensitive test has been developed for in-gating the effects of chemical pollutants on ne organisms, including the effects of mix-of pollutants. The reduction in the growth of a ciliate protozoan, Cristigera, was used as terion of pollution. The laboratory investiga- were extended to the estuary of the Tees, a ily polluted river on the east coast of England. arine meiofaunal species were probably the sensitive of all to pollution stress. (So African r Info Center)
10202

MIUM CONCENTRATIONS IN THE TIS-OF BULLIA DIGITALIS SOBRANCHIATA) FROM THE SOUTH CAN WEST COAST,
Town Univ. (South Africa). Dept. of Zoolo-

Cuthbert, A. C. Brown, and M. J. Orren.
African Journal of Science, Vol. 7, No. 2, p bruary 1976. 1 tab, 8 ref.

iptors: Beaches, *Cadmium, Metals, Heavy s, Scavengers, Animal behaviour, Experi-ments, Marine animals, Sea water, Bioindicators, Snails, Industrial wastes, Oxygen demand, *Gastropods, Pollution abatement, *Ecology, Pollutant identification.
Identifiers: *South Africa(West Coast), *Bullia digitalis.

Bullia digitalis Meuschen is a prosobranch gastropod which occupies an important position in the ecology of temperature sandy beaches in Southern Africa, and has been used for monitoring pollution in several studies. An investigation of whole body and visceral cadmium concentrations was undertaken and indicates an unexpectedly high cadmium content of the untreated animals. (So African Water Info Center)
W77-10203

METALS IN ORGANISMS FROM SALDANHA BAY AND LANGEBAAN LAGOON PRIOR TO INDUSTRIALIZATION,
Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries.
H. O. Fourie.
South African Journal of Science, Vol. 72, No. 4, p 110-113, April 1976. 3 fig, 3 tab, 6 ref.

Descriptors: *Cations, *Estuarine environment, Ecology, Ecosystems, *Metals, Iron, Industrial wastes, Bioindicators, Clams, Oysters, Mussels, Lobsters, Marine animals, Marine plants, Heavy metals, Trace elements, Pollutant identification.
Identifiers: *Saldanha Bay(South Africa), Langebaan Lagoon(South Africa), Ulva, Mactra, Crassostrea, Abalone, Chloromytilus, Haliotis, Jasus, Pyura.

An intensive research program has been initiated prior to extensive industrial development of Saldanha Bay. The purpose is to establish existing background levels of metals in the marine organisms of the area; to monitor any future metal pollution by means of indicator species; and to obtain information on inter-element relationships and the relationship between accumulation and size or age of indicator species. Preliminary findings on the levels of Fe, Zn, Cu, Mn, Pb, Cd, Ni, Al, Bi, Sb, Cr and Hg are reported. Crassostrea gigas and C, margaritacea were suitable indicator organisms. (So African Water Info Center)
W77-10205

THE SEASONAL HAEMATOLOGY OF THE SMALL-MOUTH YELLOWFISH (BARBUS HOLUBI),
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Dept. of Zoology.
J. H. Van Vuuren, and J. H. Hattingh.
Zoologica Africana, Vol. 11, No. 1, p 81-86, 1976. 1 fig, 2 tab, 9 ref.

Descriptors: Fish, *Seasonal, Electrophoresis, Laboratory studies.
Identifiers: Barbus holub, South Africa, Lsucocytes, Erytrocytes, *Haematology, *Yellow fish.

Haematological parameters in small-mouth yellowfish (Barbus holubi) have been examined from February to November. Seasonal variations were observed in several of the parameters studied. Sexual differences were slight and no significant changes in haematology could be related to breeding season. The results are discussed in relation to other published observations. (So African Water Info Center)
W77-10215

A SEASONAL STUDY OF THE HAEMATOLOGY OF CARP (CYPRINUS CARPIO) FROM A LOCALITY IN THE TRANSVAAL, SOUTH AFRICA,
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Dept. of Zoology.
L. R. Fourie, and J. Hattingh.
Zoologica Africana, Vol. 11, No. 1, p 75-80, 1976. 1 tab, 1 fig, 3 ref.

Descriptors: *Seasonal, Fish, *Carp, Electrophoresis, Laboratory studies, Breeding.
Identifiers: Leucoytes, Erythorocytes, *Haemoglobin, Transvaal(South Africa).

Various haematological parameters of carp blood were examined on a monthly basis from February to November. Seasonal variations were observed in red and white blood cell counts, in haemoglobin and plasma protein concentrations and in mean corpuscular gragilities. Sexual differences were evident in red blood cell counts, haematocrit values and haemoglobin concentrations. Plasma protein electrophoresis showed marked conformational changes during the study period. The results are discussed in relation to previous findings and also in relation to the use of blood as a possible indicator of breeding season in carp. (So African Water Info Center)
W77-10216

APPARATUS FOR THE AUTOMATIC DETERMINATION OF OXYGEN CONSUMPTION IN FISH,
Port Elizabeth Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W77-10217

DETECTION OF L-ASPARTATE: 2-OXOGLUTARATE AMINOTRANSFERASE IN TWO NITROGEN-FIXING CYANOPHYTA,
National Inst. for Water Research, Pretoria (South Africa).
D. J. Barlow, and W. E. Scott.
South African Journal of Science, Vol. 72, No. 8, p 240-242, August 1976. 8 fig, 14 ref.

Descriptors: *Cyanophyta, Anabaena, *Eutrophication, Nitrogen fixation, Electron microscopy, Ammonia, Enzymes, *Pollutant identification.
Identifiers: Nodularia, South Africa, Nitrogenase.

The heterocyst of aerobic nitrogen-fixing Cyanophyta contains nitrogenase capable of converting atmospheric nitrogen to ammonia. The activity sites were determined by means of both light and electron microscopy. A transamination gradient down the vegetative filament and several sites of active production in vegetative cells were identified. (So African Water Info Center)
W77-10223

BROWN TROUT (SALMO TRUTTA L.) GROWTH AT REDUCED PH,
Oslo Univ. (Norway). Inst. of Zoology.
O. J. Jacobsen.

Descriptors: *Brown trout, *Hydrogen ion concentration, *Environmental effects, *Growth rate, *Aquaculture, *Acidity, Trout, Water quality, Acidic water, Freshwater fish, Bioassay, Pollutant identification.

The growth of brown trout (Salmo trutta) yearlings (18 months) was studied at environmental pH levels of about 6.26, 5.44 and 5.00 and a daily ration of 2.9% of the initial body weight. Growth increments for fish at each pH level during a 48-day period were similar. (Katz)
W77-10227

INDICATORS OF HEAVY-METAL CONTAMINATION IN THE LOOE ESTUARY (CORNWALL) WITH PARTICULAR REGARD TO SILVER AND LEAD,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5A.
W77-10228

LIMB REGENERATION IN FIDDLER CRABS: SPECIES DIFFERENCES AND EFFECTS OF METHYLMERCURY,
Rutgers - The State Univ., Newark, N.J. Dept. of Zoology and Physiology.
J. S. Weis.
Biological Bulletin, Vol. 152, p 263-274, April 1977. 2 fig., 2 tab., 28 ref.

Descriptors: *Growth rates, *Life cycles, *Pigments, *Crabs, *Mercury, Water pollution effects, *Metals, *Animal physiology, Salinity, Seasonal, Inhibitors, Environmental effects, Laboratory tests, Invertebrates, Crustaceans, Tropical regions, Shellfish, Period of growth.
Identifiers: *Methylmercury, *Limb regeneration(Crabs).

When kept under identical conditions, Uca pugnax regenerates limbs and molts more rapidly than U. pugilator from the same location. The tropical species U. rapax and U. speciosa also regenerate faster than U. pugilator from the same location. When kept in groups, U. thayeri stops regeneration after basal growth and will not molt; U. pugilator is only slightly retarded when kept in groups. U. rapax is also affected by grouping, showing a lengthened proecdysial phase and terminal plateau, thus also delaying molting. Newly regenerated limbs are lighter in color than old limbs and are conspicuously banded. In U. pugilator the pale color remains for several months under laboratory conditions. When treated with 0.5 mg/liter methymercury, growth was inhibited entirely in U. thayeri. Partial inhibition was seen in U. pugilator, and the least inhibition in U. rapax with a few individuals completing regeneration of limbs containing no melanin. The lack of black pigment may be due to an inhibition of cell migration when kept in clean water after ecdysis. Seasonal differences were noted in all species. (Katz)
W77-10229

RESPONSES OF MOSQUITOFISH (GAMBUSIA AFFINIS) TO ASH EFFLUENT AND THERMAL STRESS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
D. S. Cherry, R. K. Guthrie, J. H. Rodgers, Jr., J. Cairns, Jr., and K. L. Dickson.
Transactions of the American Fisheries Society, Vol. 105, No. 6, p 686-694, 1976. 2 tab, 4 fig, 24 ref.

Descriptors: *Thermal stress, *Water temperature, *Heated water, Freshwater fish, *Powerplants, *Lethal limit, *Fish beavior, *Turbidity, *Metals, Water pollution sources, *Chlorine, Zinc, Calcium, Bromine, Habitats, Laboratory tests, Impaire water quality, Pollutants, Dissolved oxygen, Mortality, Trace element, Water analysis, Thermal water, *South Carolina.
Identifiers: *Mosquitofish, Avoidance, *Coal ash.

Mosquitofish, the only fish species inhabiting a drainage system that received high coal ash concentration at one end and thermal discharges at the other, appeared to successfully function in this environment with no apparent detrimental effects. Temperature conditions (44.5 C) were more limiting to the species' functional capcity than was coal ash turbidity (275 JTU) with high metal concentrations. Laboratory preference, avoidance, and lethal temperature trials supported the field observations. Mosquitofish had a final temperature preferendum at 34.7-35.1 C (both individual and group response), an upper temperature avoidance at 39 C when acclimated at 30 and 36 C, and an upper lethal temperature limit at 38 C. The species survived in this aquatic system in which elemental concentrations, determined by neutron activation analysis, were sufficiently high to be lethal to other fish species according to values from the literature and by in situ toxicity tests. Of the 40 elements measured, five (calcium, chlorine, selenium, zinc, and bromine) appeared to be concentrated by the mosquitofish, while the others were most highly accumulated in the benthic sediments. (Katz)
W77-10230

THE ROLE OF EFFLUENTS IN THE SPREAD OF SALMONELLAE, (IN DUTCH),
W. Edel, P. A. M. Guinee, M. Van Schothorst, and E. H. Kampelmacher.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe A Med Mikrobiol Parasitol. 221(4); p 547-549, 1972.

Descriptors: *Salmonella, Effluents, Food chains, Human diseases, Public health, Feeds, Disinfection, Path of pollutants.
Identifiers: Salmonella-Panama, Salmonella-Typhimurium.

Morbidity reports from 1960-1971 prove the continuous presence of certain serotypes such as Salmonella typhimurium and S. panama in humans. These types are probably cycling from animals through meats to consumers and from patients and healthy carriers through effluent and surface waters to animals as well as food. Feeds should be pelleted and effluent waters should be disinfected.--Copyright 1974, Biological Abstracts, Inc.
W77-10231

THE MACROBENTHIC FAUNA OF ROCKS AND BOULDERS IN THE LUBECK BAY (WESTERN BALTIC SEA) INVESTIGATED FROM THE UNDERWATER LABORATORY 'HELGOLAND',
Trondheim Univ. (Norway). Biological Station.
B. Gulliksen.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol. 27, p 439-449, 1975. 2 tab, 3 fig, 18 ref.

Descriptors: *Benthic fauna, *Biological communities, *On-site investigations, *On-site data collections, *Distribution, *Benthos, *Aquatic habitats, Sampling, Algae, Invertebrates, Spatial distribution, Temporal distribution, Bottom sediments, Marine animals.
Identifiers: *Lubeck Bay(Baltic Sea), *Dendrodoa, *Polydora, *Polychaaetes, Angle of inclination.

A comparison of the faunal composition with the angle of inclination of the substrates was investigated through the use of a diver-operated suction sampler in Lubeck Bay (Western Baltic Sea). The ascidian Dendrodoa grossularia and the polychaete Polydora ciliata constituted 95.6% of the total number of specimens samples. The lowest densities of both species occurred on overhanging substrates. In general, the angle of inclination of the substrate bore little relation to the qualitative composition of the fauna, but some of the species were more sparsely distributed on overhanging substrates. The three most abundant species (Dendrodoa, Polydora, and Nereimyra punctata) showed some degree of aggregated distribution according to FISHER'S 'coefficient of dispersion.' For the ultimate picture of the composition of fauna on rocky bottom substrates, the time of day at which the samples are taken is of importance, due to varying degrees of activity of motile benthic invertebrates. (Katz)
W77-10232

SURVIVAL OF MARINE PHYTOPLANKTON IN HIGH CONCENTRATIONS OF HEAVY METALS, AND UPTAKE OF COPPER,
Marine Lab., Aberdeen (Scotland).
J. A. Bentley-Mowat, and S. M. Reid.
Journal of Experimental Marine Biology and Ecology, Vol. 26, p 249-264, 1977. 14 fig, 20 ref.

Descriptors: *Absorption, *Copper, *Lead, Cadmium, *Growth rates, *Marine microorganisms, *Phytoplankton, *Plant physiology, *Inhibitors, *Mortality, Metals, Marine plants, Primary productivity, Environmental effects, Toxicity, Laboratory tests, *Heavy metals.
Identifiers: *Phaeodactylum, *Tetraselmis, *Dunaliella, *Cricosphaera, Ditylum, *Sublethal effects.

The growth of Phaeodactylum tricornutum, Tetraselmis spp., Dunaliella primolecta, and Cricosphaera elongata in batch culture in S88 medium is not arrested on addition of copper, cad mium or lead below a concentration of 10-4M. In contrast, Ditylum brightwelli undergoes osmotic disturbances in 10-5M and 10-4M copper, with swelling of the cell contents. Phaeodactylum grown in continuous culture survives single dose of up to 10-3M copper with no diminution in growth and with considerable uptake of copper Cricosphaera in continuous culture survives up to 10-4M copper with no long-term diminution in growth, but takes up between ten and a hundred times less copper than Phaeodactylum. (Katz)
W77-10233

THE EFFECT OF A NO. 2 FUEL OIL AND SOUTH LOUISIANA CRUDE OIL ON THE BEHAVIOR OF THE SOFT SHELL CLAM MYA ARENARIA L.,
Rutgers - The State Univ., Newar, N. J. Dept. of Zoology and Physiology.
D. M. Stainken.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 6, p 724-29, 1976. 1 tab, 16 ref.

Descriptors: *Clams, Animal behavior, *Oil wastes, Environmental effects, *Lethal limit, *Water temperature, *Mollusks, *Bioassay, *Oil pollution, *Fuels, Animal physiology, Laboratory tests, Metabolism, Water pollution effects, Benthic fauna.
Identifiers: *Sublethal effects, *Crude oil.

The sublethal effects of No. 2 fuel oil and South Louisiana crude oil on the soft shell clam, Mya arenaria, were studied in tests conducted at 4 and 14C, to simulate winter oil-spill conditions. At concentrations of 50 ppm, mucus was given off through the pedal opening and siphon. Higher concentrations resulted in poportionally higher mucus secretion, although crude oil effects were never as severe as the effect of fuel oil. Both depressed muscular contraction. At concentrations greater than 100 ppm, the pedal opening musculature became totally relaxed and did not contract. The adductor muscles also lost the ability to contract rapidly. These reponses were enhanced at 14C compared to 4C. The response of clams phenol was slightly different with less mucus secretion. Muscles remained at one length, turgid and lost their irritability. The energy drains imposed on the clam by mucus production and expulsion, and resulting disruption of normal feeding mechanisms occurred at oil concentrations below the LC50. (Katz)
W77-10234

THE SENSITIVITY OF YOUNG SALMONIDS TO OXYGEN DEFICIENCY,
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
L. B. Klyashtorin.
Journal of Ichthyology, Vol 15, No 2, p 337-3 1975. 3 fig, 9 ref.

Descriptors: *Dissolved oxygen, *Salmon, *Juvenile fish, *Oxygen requirements, *Sockeye salmon, *Chinook salmon, *Fish physiology, *Resistance, Laboratory tests, Sport fish, Trout.

Young char (Salvelinus alpinus), coho salmon (Oncorhynchus kisutch), chinook salmon (O. tschawytscha) and sockeye salmon (O. ne were used in studies to determine the range of oxygen content essential to maintain normal vital in the fish. The critical oxygen at which oxy consumption remains at the level of the stan

etabolism, differ negligibly for the four young lmonids and fluctuate between 33-35 mmHg at degrees. The threshold oxygen concentration, e level at which death of the animal from phyxiation begins, were also similar, at 19.5-18.0 mHg. The relative resistance of young salmonids oxygen deficiency tends to increase in the following order: sockeye, chinook salmon, coho salon, char. From the critical and threshold oxygen ncentration values of the fishes, the P95 (value the partial pressure of oxygen at which the od is saturated to 95%) and P50 hemoglobin lues of their blood may be approximately evalued. (Katz)
77-10235

ACTIONS OF YOUNG SALMONIDS TO RTAIN NATURAL CHEMICAL STIMULI,
oscow State Univ. (USSR). Dept. of Ichthyolo-
A. Marusov.
rnal of Ichthyology, Vol 15, No 2, p 341-343, 5.

scriptors: *Fish behavior, *Salmonids, llantic salmon, *Brown trout, *Rainbow trout, h physiology, *Juvenile fish, Laboratory tests, h food organisms, Trout, Sport fish, Animal avior.
ntifiers: Aggressive behavior(Fish), Skin ext, *Chemical stimuli.

rling Salmo salar, Salmo trutta, and Salmo rdneri were exposed to aqueous extracts from skin of salmonids and water from food items in ning water aquarium. A characteristic feeding ction was noted in most cases in the experimenfish during the action of extracts from live food s. This was expressed in a noticeable increase ne motor activity of the fish, agitated fin movets and the seizing of particles of sludge carried ards the fish by the current. No upward mming toward the source of the stimulus was erved. When there were refuges in the aquari the fishes did not leave them which is obably connected with the fact that young salid fish usually catch food items that pass by n in the current. The reactions to the fish to the on of aqueous extracts from the skin were niscent of the feeding reaction, but the fish ot seize mud particles. Individual fishes were to make unusual movements, seeming to roll side to side, and failing to seek refuge. The hm of the gill covers was frequently disturbed ne fish. In separate experiments, agressive vior and fighting was observed in young S. and steelhead in response to the addition of ct from their own species. Salmon yearlings 't react to extracts from underyearlings. z)
-10236

PERATURE AND RATE OF GASTRIC CUATION BY RAINBOW TROUT, SALMO RDNERI,
rado Univ., Boulder. Dept. of Environmental, lation, and Organismic Biology.
Windell, J. F. Kitchell, D. O. Norris, J. S. s, and J. W. Foltz.
sactions of the American Fisheries Society, 05, No 6, p 712-717, November, 1976. 4 tab, .

riptors: *Environmental effects, *Rainbow *Water temperature, Analytical techniques, stion, Fish physiology, *Fish diets, ochaetes, Pollutant identification, Regresanalysis, Temperature, Laboratory tests, olism, Animal physiology.
fiers: *Gastric evacuation.

g-of-the-year hatchery reared rainbow trout, gairdneri, were used to estimate the rate of evacuation of meals of oligochaetes and ercial pellets at water temperatures of 5, 10, d 20C. Different regression models produced different predictions for 25, 50, and 100% stomach emptying times for pellet meals consumed at 15C. Greatest variation occurred when predicting time required for 100% stomach evacuation. Estimates ranged from 22 to 35 h for a substantial 13-h difference. Because the semilog model consistently produced the highest F regression and the lowest F deviation it was selected as best for describing the data. Rate of gastric evacuation increased with increased temperature. Differences were greatest between 0 and 5C and least between 15 and 20C. An increase of 5C at the low end of the temperature range produced a much greater absolute effect than at the high range. Depending on food type, it took 3 to 4 times as long to empty the stomach by 50% or 100% at 5C as it did at 20C. Time to empty the stomach increased from a minimum of 16.4h at 20C for both foods to 58.5 h and 72.4 h at 5C for oligochaetes and pellets, respectively. (Katz).
W77-10237

MALACOLOGICAL STUDIES IN THE LUFIRA (KATANGA) ARTIFICIAL LAKE AREA: DISTRIBUTION AND ECOLOGY OF AQUATIC MOLLUSCS: EPIDEMIOLOGICAL ROLE OF INTESTINAL AND URINARY BILHARZIOSIS VECTORS, (IN DANISH),
G. Mandahl, F. Malaisse, and C. Ripert.
Bull Soc Pathol Exot. 65(1), p 146-165, 1972.

Descriptors: Africa, Lakes, Distribution, Ecology, *Epidemiology, Mollusks, Roots, Public health, Human diseases.
Identifiers: *Bilharziasis vectors, Biomphalaria-pfeifferi, Biomphalaria-sudanica-rugosa, Bulinus-globosus, *Congo, Katanga, Lymnaea-natalensis, Manioc, Reeds, Schistosoma-haematobium, Schistosoma-mansoni, *Malacological studies, *Lufira Lake(Congo).

The results of the malacological survey carried out in the Lufira lake area (Congo, Africa) agree with those of the study of the prevalence in man of intestinal and urinary bilharziosis. Bulinus globosus, an ubiquous species common in the lake, rivers, marshes, springs, irrigation canals, and the only vector of Schistosoma haematobium, is the 2nd most abundant species in the region. Lymneae natalensis, the most abundant species, is found in almost all biotopes where the stream is slow or null, even in putrid sites, almost desiccated or containing many manioc roots, where the molluscs are amphibious. Biomphalaria pfeifferi, vector of Schistosoma mansoni, is less often found, although it can develop in less clear and less oxygenated waters than Bulinus; it has never been found in the lake, which constitutes a separate ecosystem. Among potential vector species, Biomphalaria sudanica rugosa has the most strict ecology; it is limited to the reed-beds of the lake shore. However, this species does not seem to play an important part in S. mansoni transmission, although it is receptive to S. mansoni under laboratory conditions. Just as urinary bilharziosis is more frequent in the area than intestinal bilharziosis, B. globosus is more frequent than B. pfeifferi. The Bulinus and Biomphalaria species of the region resist desiccation in the sites where water completely evaporates only during the 2nd part of the dry season. Biotopes which are totally dry for many months do not contain any vector. The ports of the lake do not constitute a significant reservoir for intermediary hosts of schistosomas. The transmission sites in this area (about 285 km2) are practically reduced to 4 (S. haematobium) and 2 (S. mansoni). These observations on limitation of the number and extension of transmission sites is fundamental for the control of bilharziosis endemia.--Copyright 1974, Biological Abstracts, Inc.
W77-10238

A STUDY OF THE EFFECTS OF COPPER APPLIED CONTINUOUSLY AND DISCONTINUOUSLY TO SPECIMENS OF MYTILUS EDULIS (L.) EXPOSED TO STEADY AND FLUCTUATING SALINITY LEVELS,
Natural Environment Research Council, Bangor (Wales). Unit of Marine Invertebrate Biology.
J. Davenport.
Journal of the Marine Biological Association of the United Kingdom, Vol 57, p 63-74, 1977. 10 fig, 5 ref.

Descriptors: *Mussels, *Animal behavior, *Copper, *Salinity, *Toxicity, *Mortality, *Lethal limit, *Copper sulfate, *Bioindicators, *Monitoring, Environmental effects, Laboratory tests, Water pollution effects.
Identifiers: *Avoidance.

The survival and behavior of specimens of Mytilus edulis exposed to discontinuous and continuous regimes was investigated in both fluctuating salinity conditions and in constant full strength sea water. Copper at 0.5 and 0.25 ppm, constant level, caused damage to mussels within 1-2 days; the M.L.T. for 0.5 ppm copper ion (as Cu+2) was about 2 days and for 0.25 ppm it was 4-5 days. In full strength sea water a 6 h on 6 h off regime of 0.5 ppm copper ion caused no damage in 5 days and it was found that this was due to the ability of Mytilus to detect copper in its environment and to close its shell valves to avoid the detrimental consequences of exposure to copper. In fluctuating salinity regimes it was found that the timing of copper delivery was extremely important; animals survived copper delivery occurring at low or falling salinities because of interacting closure responses to copper and low salinities. It is suggested that these results cast doubt upon the usefulness of Mytilus, and other animals which possess similar closure mechanisms, in the role of a biological pollutant monitoring system. (Katz)
W77-10239

INTENSIVE POLYCULTURE OF FISH IN FRESHWATER PONDS. I. SUBSTITUTION OF EXPENSIVE FEEDS BY LIQUID COW MANURE,
Hebrew Univ., Jerusalem (Israel). Dept. of Genetics.
R. Moav, G. Wohlfarth, G. L. Schroeder, G. Hulata, and H. Barash.
Aquaculture, Vol. 10, p 25-43, 1977. 4 tab, 7 fig, 15 ref.

Descriptors: *Aquaculture, *Fish diets, *Aquatic productivity, *Tilapia, *Farm wastes, *Carp, *Stagnant water, Fish management, Fish populations, Pounds fish per acre, Nutrients, Diets, Freshwater fish, Growth rates, *Sewage.
Identifiers: *Cow manure.

Nine experimental treatments of fish polyculture in stagnant water ponds without aeration were conducted. The polyculture was composed of common carp, silver carp, white amur (grass carp) and Tilapia. The treatments differed in stocking densities, feeding, and manuring levels. The most productive treatment of the experiment, in which the fish were fed protein-rich pellets, produced 50 kg/ha per day. Two treatments (low and high stocking densities) fed exclusively with liquid cow manure produced an average yield of around 32 kg/ha per day. The yields of the treatment receiving high-protein pellets exceeded those of the treatments receiving grain pellets by 20 and 9.6 kg/day per ha, at high and low stocking densities, respectively, and justified the extra cost of high-protein feed. The common carp and white amur showed the greatest responses to increased feeding inputs while the silver carp and Tilapia, even at high densities, have done as well at low feeding levels. Total body fat contents of the common carp were 20%, 15%, and 6.2% when fed with high-protein pellets, grain pellets, and liquid cow manure, respectively. (Katz)
W77-10240

EFFECTS OF LIGHT AND AMMONIUM ON NITRATE UPTAKE BY TWO SPECIES OF ESTUARINE PHYTOPLANKTON,

City Coll., New York. Dept. of Biology.
S. S. Bates.

Limnology and Oceanography, Vol. 21, No. 2, p 212-218, 2 tab, 4 fig, 20 ref.

Descriptors: *Photosynthesis, *Light, *Ammonium compounds, *Nitrates, *Absorption, *Primary productivity, *Nutrient removal, *Chlorophyta, *Algae, *Estuaries, Light intensity, Nitrogen compounds, Kinetics, Environmental effects, Laboratory tests, Estuarine environment, *New York.
Identifiers: *Skeletonema, *Hudson River(New York).

The incident light intensity, preconditioning light history, and the presence or absence of ammonium affected the rate of nitrate uptake by a chlorophyte and Skeletonema costatum isolated from the Hudson estuary. In the absence of ammonium, shade-adapted cells reached the highest maximum velocity of nitrate uptake. S. costatum had a lower half-saturation constant for light than the chlorophyte and reached a greater maximum velocity of nitrate uptake. In the presence of ammonium, nitrate uptake was depressed at all light intensities, but more in shade-adapted than in sun-adapted cells of both species, and more in S. costatum than in the chlorophyte. The maximum velocity of ammonium uptake was greater in shade-adapted than in sun-adapted cells. Since nitrate and ammonium uptake were related to the chlorophyll a content of the cell, energy for uptake was probably derived primarily from photosynthesis in the light but may also be derived from respiration since substantial dark uptake was observed, especially in S. costatum. (Katz)
W77-10241

A DESCRIPTIVE EVALUATION OF THE EFFECTS OF NO. 2 FUEL OIL ON THE TISSUES OF THE SOFT SHELL CLAM, MYA ARENARIA L.,

Industrial Environmental Research Lab.-Cincinnati, Edison, N.J. Oil and Hazardous Materials Spills Branch.
D. M. Stainken.

Bulletin of Environmental Contamination and Toxicology, Vol 16, No 6, p 730-738, 1976. 1 tab, 3 fig, 25 ref.

Descriptors: *Oil wastes, *Water pollution effects, *Clams, *Animal pathology, *Cytological studies, Feeding rates, Absorption, Oil spills, Shellfish, Invertebrates, Environmental effects, Laboratory tests, *Oil pollution.
Identifiers: *Mya arenaria, *Sublethal effects, Histological changes, *Leukocytosis.

The soft shell clam, Mya arenaria, was exposed to emulsions of No. 2 fuel oil having concentrations of 10, 50, and 100 ppm for 28 days to simulate contact with winter oil spills. No radical tissue aberrations were observed at any oil concentration. At 100 ppm, some edema of the pallial muscle was observed. Leukocytes were observed in the pallial blood sinuses, under the mantle epithelium and within the anterior adductor muscle. The intestine, style cac, and diverticula appeared very vacuolar. At 50 ppm, the effects were less marked except in the diverticula and intestine. The clams exposed to 10 ppm showed some reduction in size of diverticula, and the diverticula, stomach and intestine were vacuolated in appearance. The vacuolization appeared in all clams and seemed to result from the laboratory environment. However, this effect was exacerbated in the oil exposed clams compared to controls. Cellular glycogen content was depleted and a reduction in cellular cytoplasm was observed, most markedly in clams exposed to 100 ppm oil, but also in clams exposed to 50 ppm. This may be a result of reduced feeding. (Katz)
W77-10243

THE ECOLOGY OF EELGRASS, ZOSTERA MARINA (L.), FISH COMMUNITIES. I. STRUCTURAL ANALYSIS,

National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
S. M. Adams.

Journal of Experimental Marine Biology and Ecology, Vol. 22, p 269-291, 1976. 7 fig, 9 tab, 31 ref.

Descriptors: *Biomass, *Fish populations, *Aquatic habitats, *Standing crop, *Biological communities, *Seasonal, *Shallow water, *Productivity, *Distribution patterns, Water temperature, Environmental effects, Primary productivity, Temporal distribution, North Carolina.
Identifiers: *Eelgrass, *Zostera, *Pinfish, *Caloric content, Lagodon.

Fish populations utilizing eelgrass, Zostera marina, beds in two different estuarine areas near Beaufort, North Carolina were analysed and compared to determine aspects of their community structure. The fish community of the eelgrass beds was characterized by low diversity and high standing crops of biomass and energy, both of which showed seasonal variation. Wide temperature fluctuations due to the shallowness of the beds probably regulated the diversity of fish utilizing the beds. Pinfish dominated the community, making up 45% and 67% of the fish biomass in the Phillips Island and Bogue Sound beds, respectively. Changes in total body caloric content were probably related to developmental stages and changes in diet. There was a significant correlation between fish biomass, temperature, and Zostera biomass. Fish biomass was highest when temperature and grass biomass were at a maximum. In general, water depth over the beds had little effect on the standing crop of fish within the bed, but cooler waters which occurred at night, darkness, or both, had a large effect. (Katz)
W77-10244

THE EFFECTS OF TEMPERATURE AND SALINITY ON THE EMBRYONIC DEVELOPMENT OF HYDROBIA ULVAE (PENNANT),

University Coll. of Wales, Aberystwyth. Dept. of Zoology.
J. D. Fish, and S. Fish.

Journal of Marine Biological Association of the United Kingdom, Vol. 57, p 213-218, 1977. 2 fig, 1 plate, 10 ref.

Descriptors: *Water temperature, *Salinity, *Embryonic growth stage, *Hatching, *Larval growth stage, *Environmental effects, *Snails, *Pigments, Invertebrates, Mollusks, Aquatic animals, Laboratory tests, Marine animals.
Identifiers: *Hydrobia ulvae, *Dovey estuary(Wales).

The effects of temperature and salinity on the rate of embryonic development and the survival of embryos to hatching have been analysed by fitting surface responses. Percentage survival is high over a wide range of temperature/salinity combinations and the estimated optimum combination of temperature and salinity is 19.9C and 37.6/ooS. Hatching was recorded in salinities ranging from 8-60/oo and at temperatures up to 35C. The minimum time taken to hatching (5 days) was recorded over a range of 13-41/oo and 22.5-33C; at higher salinities embryonic development is prolonged. The intensity of pigmentation of the veliger larvae is related to the salinity of the sea water in which development takes place; embryos incubated in low salinities hatch as larvae with little pigmentation, while those incubated in high salinities show intense pigmentation. (Katz)
W77-10245

EFFECTS OF FISH FACTORY EFFLUENT ON THE BENTHIC MACROFAUNA OF SALDANHA BAY,

Cape Town Univ. (South Africa). Dept. of Zoology; and Department of Planning and the Environment, Capetown (South Africa).
N. D. Christie, and A. Moldan.

Marine Pollution Bulletin, Vol. 8, No. 2, p 41-45, February 1977. 5 fig, 3 tab, 20 ref.

Descriptors: *Benthic fauna, *Water pollution effects, *Biomass, *Biological communities, Populations, *Organic wastes, *Distribution patterns, *Bottom sampling, *Anaerobic conditions, Industrial wastes, Sampling, Biochemical oxygen demand, Decomposing organic matter, Invertebrates, Mortality, Africa.
Identifiers: *Saldanha Bay(South Africa), *Species diversity.

A survey was conducted adjacent to a pelagic fish canning factory in Saldanha Bay, South Africa, to determine the effects of effluent on the benthic macrofauna. Pairs of samples were taken using Scuba diving techniques at each of five stations situated at increasing distances from the factory. The benthic macrofauna was analysed using numerical methods of classification and ordination thereby defining three groups of stations. The macrofauna nearest the factory was impoverished with several species having only small individuals but with distance from the factory species richness, species density, density of individuals and ash-free biomass increased. Although conditions adversely affected some of the macrofauna at the five stations, the situation has undoubtedly improved since June 1972, when a hugh benthic mortality occurred. (Katz)
W77-10246

EFFECTS OF POLLUTING SUBSTANCES O ENZYMES OF AQUATIC ORGANISMS,

Washington Univ., Seattle. Coll. of Fisheries.
G. W. Brown, Jr.

Journal of the Fisheries Research Board Canada, Vol. 33, No. 9, p 2018-2022, 1976. 1 fig, tab, 25 ref.

Descriptors: *Enzymes, *Heavy meta *Metabolism, *Rainbow trout, *Bioassa *Inhibitors, Copper, Mercury, Lead, Cadmiu *Toxicity, Biochemistry, Environmental effec Laboratory tests, Zinc.
Identifiers: Endistylia, Adaptation, Polychaetes.

The toxicity of heavy metal cations often co sidered as pollutants is discussed with respect several enzymes of nitrogen metabolism in t trout Salmo gairdneri and the polycha Endistylia vancouveri. Data on trout liver nithine aminotransferinase (EC 2.6.1.13) activ under inhibition by mercuric ion yield a straig line when percent inhibition on a probability axi plotted versus logarithm of mercuric ion conc tration. Allantoinase (EC 3.5.2.5) of E. vancouv is inhibited by divalent cations of Cu, Hg, Zn, and Cd. At low concentrations (about 10-8M) th ions lead to an enhancement of activity of all toinase. A short review is provided on the adap tion of fish to environmental changes. (Katz)
W77-10247

FATTY ACIDS AS ICHTHYOTOXIC CO STITUENTS OF A GREEN AL CHEATOMORPHA MINIMA,

Tokyo Univ. (Japan). Lab. of Marine Biochem try.
N. Fusetani, C. Ozawa, and Y. Hashimoto.

Bulletin of the Japanese Society of Scient Fisheries, Vol. 42, No. 8, 1976. 1 tab, 2 ref.

Descriptors: *Toxins, *Aquicult *Chlorophyta, *Mortality, *Pollutant identifi tion, *Organic acids, Larval growth st Oysters, Chemical analysis, Analyt techniques, Algae, Periphyton, Toxicity

dentifiers: *Cheatomorpha, *Ichthyotoxins, Fatty acids, Hemolysis.

igh mortality of pearl oyster larvae, was ob-rved in tanks having microalgae on the inside all. The green algae, Cheatomorpha minima, mprised the major portion of the specimen alyzed for its ichthyotoxic constituents. Extrac-n by organic solvents produced a substance nsisting mainly of four fatty acids, which killed llifish in 120 min at 50 ppm and showed a molytic activity of 1.99 SU/mg. (Katz)
77-10248

PTAKE FROM SEA WATER AND LEARANCE OF 14C-P,P'-DDT BY THE ARINE COPEPOD CALANUS FIN-ARCHICUS,
edford Inst. of Oceanography, Dartmouth (Nove otia).
C. H. Harding, and W. P. Vass.
urnal of the Fisheries Research Board of nada, Vol. 34, No. 2, p 177-182, February 1977. ab, 2 fig, 15 ref.

scriptors: *DDT, *Mathematical models, bsorption, *Path of pollutants, *Carbon lioisotopes, *Analytical techniques, opepods, Pesticides, Crustaceans, Inver-rates, Plankton, Zooplankton, Chlorinated drocarbon pesticides, Seawater.
ntifiers: Bioaccumulation, *Calanus fin-rchicus.

s impossible to measure the uptake rate of p,p'-T by copepods from sea water directly since ake and depuration occur simultaneously. pepods were found to lose DDT exponentially llowing sea water. Five experiments were per-med to obtain uptake rates with DDT concen-ions ranging from 32.5 to 1337 pptr in sea ter. A model for copepods uptake of DDT was ermined which accounts for influx and efflux DDT. Calculated influx rate constants varied ween 1.5 and 2.7 x 103/day. These results ena- prediction of DDT levels in non-feeding epods if the concentration of DDT in sea water nown. (Katz)
7-10249

CROORGANISMS OXIDIZING PETROLEUM D PETROLEUM PRODUCTS IN THE ESENCE OF HIGHER AQUATIC PLANTS, RUSSIAN),
thern Research Inst. of Hydraulic Engineering Land Reclamation, Kazan (USSR). Dept. of drology and Water Resources.
. Morozov, and A. V. Torpishcheva.
robiol Zh. 9(4), p 66-73, 1973.

criptors: *Microorganisms, Oil wastes, Oil ution, Aquatic plants, *Bacteria, *Microbial radation, Pseudomonas, Oxidation.
ntifiers: Achromobacter, Bacillus, Bacterium, omobacterium, Micrococcus, Planosarcina, ina, Scirpus lacustris, Typha-angustifolia, ha-latifolia, *Macrophytes, *Oil-oxidizing eria.

presence of macrophytes promotes an in-se of the number of oil-oxidizing bacteria and les and triples the bacterial decomposition of A determination of the species composition of eria participating in the breakdown of oil and roducts in water in the presence of higher tic plants showed that the qualitative com-ion is represented by the genera Bacillus, erium, Achromobacter, Pseudomonas, omobacterium, Micrococcus, Sarcina and osarcina. In experiments with plants the 1st 3 ra dominated quantitatively: Bacillus and erium accounted for 69% in the experiment Scirpus lacustris, Bacillus for 71% with a angustifolia and Achromobacter for 90% Typha latifolia. The bacteria accompanying acustris demonstrated maximum activity with respect to the oxidation of hydrocarbons.--Copyright 1974, Biological Abstracts, Inc.
W77-10250

TOXICITY OF DISTILLERY WASTES TO PUNTIUS SOPHORE (HAM.) AND MYSTUS VITTATUS (BLOCH) (PISCES, CYPRINIDAE, BAGRIDAE) PART 3: BIOASSAY STUDIES AND TLM DETERMINATION,
D. A. V. Coll., Muzaffarnagar (India). Dept. of Zoology.
S. R. Verma, and R. C. Dalela.
Acta hydrochomica et hydrobiologica, Vol 4, No 6, p 547-556, 1976. 5 tab, 4 fig, 14 ref.

Descriptors: *Toxicity, *Turbidity, Water pollution effects, *Water temperature, *Bioassay, *Fish behavior, *Mortality, *Lethal limit, Industrial wastes, Environmental effects, Laboratory tests, Stress, Acidity, Biochemical oxygen demand, Freshwater fish, Suspended solids.
Identifiers: *Pontius, *Mystus, *Distellery waste.

The toxicity of the distillation wastes with low acidity, high turbidity, and high organic load to the two fish species is tested by a laboratory test. The threshold value of toxicity is found at a 4 or 7 per cent dilution of wastewater. The statistical analysis of the survival rates has shown that the survival rates are significantly dependent on concentration and the time of exposure, for Puntius sophore also on temperature within the range of 20--34C. Mystus vittatus proves to be the significantly more resistant species. The maximum permissible concentration of the waste in the water is calculated too. (Katz)
W77-10251

THE ECOLOGY OF EELGRASS, ZOSTERA MARINA (L.), FISH COMMUNITIES. II. FUNCTIONAL ANALYSIS,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
S. M. Adams.
Journal of Experimental Marine Biology and Ecology, Vol 22, p 293-311, 1976. 6 tab, 3 fig, 42 ref.

Descriptors: *Respiration, *Productivity, *Biological communities, *Habitats, *Ecosystems, *Fish populations, *Energy conversion, Estuaries, Aquatic productivity, Energy dissipation, Metabolism, Shallow water.
Identifiers: *Phillips Island(North Carolina), *Bogue Sound(North Carolina), *Eelgrass, *Finfish, *Zostera.

Consumption, production, and respiration of fish communities utilizing two eelgrass beds in a shallow estuarine system near Beaufort, North Carolina, have been estimated for 1971-1972: annual production was 21.7 kcal/square meter in each bed with fish accounting for 45 and 68% of the production in the Phillips Island and Bogue Sound beds, respectively. Annual community respiration was 57.9 and 69.7 kcal/square meter in the two beds with fish counting for 62.6 and 26.7% of the total in the Bogue Sound and Phillips Island beds, respectively. Estimation of the annual food energy consumed by the eelgrass fish community using the Winberg and daily ration methods gave values within 6% of each other. Energy turnover was high, and the efficiency of energy dissipation was low for the two eelgrass fish communities, suggesting that the resident fish populations were adapted to the temperature extremes within the beds. High ecological efficiencies of 0.24 and 0.23 and the high overall efficiency of the eelgrass system (Production/solar radiation) of 0.0051 and 0.-0086% indicate that the eel-grass beds are efficient systems for converting consumed energy and solar radiation into fish. (Katz)
W77-10252

MERCURY IN AQUATIC ORGANISMS. II. MERCURY DISTRIBUTION IN MUSCLES OF TUNAS AND SWORDFISH, (IN JAPANESE),
For primary bibliographic entry see Field 5A.
W77-10253

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS-III, EFFECTS OF OIL-SPILL EMULSIFIERS AND SURFACTANTS ON THE GROWTH OF PORPHYRA-LAVER, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
H. Tokuda.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 43 (5), p 587-593, 1977. 2 tab, 5 fig, 5 ref.

Descriptors: *Oil, *Oil pollution, *Oil spills, *Surfactant, Water pollution effects, *Marine algae, *Emulsifiers, Laboratory tests, Bioassay, *Toxicity, Environmental effects, Plant diseases, Plant growth, Plant population, Plant tissues.
Identifiers: *Laver, Porphyra, *Oil-spill emulsifier, *Non-ionic surfactant, *Ester-type surfactant, Absorption spectrum.

The inhibitory effects of oil-spill emulsifiers (6 products) and non-ionic surfactants (4 products) on the growth of a laver, Porphyra yezoensis, were investigated by culture experiments. One oil-spill emulsifier composed of n-paraffin and ester-type non-ionic surfactants was so low in toxicity that its 1 ppm solution supported a layer growth rate nearly similar to that of the control, and even its 100 ppm solution exhibited a growth rate higher than 50% of the control. Polyoxyethylene (20 mole) sorbitan trioleate, an ester-type surfactant, was the least toxic of the surfactants tested and allowed the layer to grow even at the concentration of 100 ppm, while polyoxyethylene (5 mole) nonyliphenol ether was the most toxic of the ether-type surfactants used and the laver was killed within 24 hours in its 10 ppm solution. The absorption spectrum of the laver frond was not affected by a 20 hour immersion in a 1000 ppm solution of either polyoxyethylene (2 mole) oleyl ether or polyoxyethylene (20 mole) sorbitan trioleate. Changes in the cellular appearance of the laver induced by immersion in surfactant solutions prepared at various concentration were also studied by means of optimal microscopy. (Katz)
W77-10254

STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-IX, ISOLATION AND IDENTIFICATION OF PENTACHLOROPHENYL-B-GLUCORONIDE ACCUMULATED IN BILE OF GOLDFISH,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
K. Kobayashi, S. Kimura, and E. Shimizu.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 43(5), p 601-607, 1977. 1 tab, 4 fig, 18 ref.

Descriptors: *Freshwater fish, *Herbicides, Animal metabolism, *Fish physiology, Animal pathology, Animal physiology, *Biochemistry, Laboratory methods, Methodology, Gas chromatography, *Metabolism, Bioassay, Pollutant identification.
Identifiers: *Goldfish, *Pentachlorophenol-, PCP, Conjugated PCP, *Bioaccumulation, *Chlorophenols, *Detoxification, Fish metabolism.

A conjugated-PCP was found in the bile of goldfish, Carassius auratus after 5-hr exposure to PCP (0.1 ppm). The biliary concentration of the conjugated-PCP increased with exposure time and reached a level of 4.46 micromoles/g, corresponding to a concentration factor of 12000 at 48-hr. The conjugate was isolated by treating the bile with activated charcoal columns, followed by elution with an acetone-ammonia mixture, finally passing the

concentrated eluate through a Sephadex G-10 column. The isolated conjugate was identified as pentachlorophenyl-B-glucuronide by hydrolysis on incubation with B-glucuronidase, and by thin-layer and gas-liquid chromatography, and by determination of the molar ratio of PCP to glucuronic acid. No other conjugates including the sulfate conjugate were detected in the bile. (Katz)
W77-10255

HEAVY METALS IN THE GASTROPOD MOLLUSC HALIOTIS TUBERCULATA (L.),
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
G. W. Bryan, G. W. Potts, and G. R. Forster.
Journal of Marine Biological Association of the United Kingdom, Vol 57, 1977, p 379-390, 4 tab, 2 fig, 13 ref.

Descriptors: Metals, Mollusks, Gastropods, Marine animals, Silver, Aluminum, Calcium, Cadmium, Cobalt, Chromium, Copper, Iron, Magnesium, Manganese, Nickel, Lead, Zinc, Path of pollutants, *Heavy metals, Pollutant identification.
Identifiers: Abalone, Haliotis, *Marine gastropods, *Bioaccumulation, *Tissue concentration, Channel Islands.

The concentrations of 13 metals (Ag, Al, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Zn) have been measured in the whole soft parts, foot, viscera and individual tissues of the gastropod mollusc Haliotis tuberculata (.). In the edible foot, concentrations of most metals fell with increasing size but in the inedible viscera concentrations of cadmium, silver and copper increased. The viscera accounted for about 26% of the dry weight of the soft parts and contained more than 50% of all metals except nickel and 90% or more of cadmium, iron and cobalt. Analyses of the tissues showed that the highest levels of copper were found in the blood (haemocyanin) and in the left kidney. High levels of nickel were associated with surface tissues such as the mantle and epidermis of the foot, a similar situation to that observed in H. rufescens by Anderlini (1974). The highest concentrations of other metals were found in the digestive gland or the right kidney which seems to be functionally different from the left. A close correlation between concentrations of iron ad cobalt was observed in the viscera. Concentrations of calcium, magnesium and manganese were related in the digestive gland and this appears to result from their inclusion in what Crofts (1929) described as 'chalk' granules. A lack of variability in the results for zinc tends to confirm the contention by Anderlini that zinc is regulated in Haliotis. (Katz)
W77-10256

HEALTH AND ECOLOGICAL ASPECTS OF COBALT-60 TRANSFER IN SEAWATER FOOD CHAIN TYPICAL OF AN INTERTIDAL MUDFLAT,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Section de Radioecologie.
J. C. Amiard, and C. Amiard-Triquet.
International Journal of Environmental Studies, Vol 10, 1977. p 113-118, 3 tab, 1 fig, 12 ref.

Descriptors: *Metals, *Cobalt, *Marine algae, *Marine animals, Marine biology, Laboratory tests, *Radioactive wastes, Radioactivity effects, Radioisotopes, *Food chains, Path of pollutants, Water pollution effects, Public health, Littoral, Mud flats.
Identifiers: *Radionuclides, *Cobalt-60, *Cobalt 60-transfer, Marine trophic chain.

The assimilation and subsequent elimination of cobalt-60 by different marine organisms are affected by the mode of contamination: chronic or acute. Experimental cobalt-60 contamination of such organisms varies qualitatively and quantitatively according to whether the pollutant is transferred through the water or through the food. The concentration factor with respect to water, the transfer factor through food and the overall contamination estimate show a decrease for the highest trophic levels. (Katz)
W77-10257

CRITICAL THERMAL MAXIMA OF TWO SPECIES OF ESTUARINE FISH,
Environmental Research Lab., Narragansett, R.I.
D. Everich, and J. G. Gonzalez.
Marine Biology, Vol 41, 1966. p 141-145, 1 tab, 1 fig, 20 ref.

Descriptors: *Bioassay, *Mortality, Laboratory tests, Marine fish, Estuarine environment, *Thermal water, Water temperature, Methodology, Rhode Island, Aquaria, Laboratory equipment, Bottom fish, Water pollution effects, *Thermal pollution, *Thermal stress, Pollutant identification.
Identifiers: Winter flounder, Pseudopleuronectes, Scup, Stenotomus, *Critical thermal maxima(CTM), *Acclimation, Estuarine fish.

Critical thermal maxima (CTM) were determined for winter flounder (Pseudopleuronectes americanus, Walbaum) and scup (Stenotomus chrysops, L.), acclimated to ambient water temperature or constant increments above ambient. The acclimation regimes simulated a natural environment by tracking the temperature fluctuations in Point Judith Pond, a small Rhode Island estuary. An elevation in CTM from 30.2 to 35.6C was observed for scup as the mean acclimation temperature increased from 14.8 to 22.2C. CTM for flounder increased from 26.4 to 32.4C over an acclimation range of 4.2 to 23.0C. The use of CTM studies for predicting the effects of heated effluents is discussed. (Katz)
W77-10258

POLYCHLORINATED BIPHENYLS IN COASTAL MARINE ZOOPLANKTON: BIOACCUMULATION BY EQUILIBRIUM PARTITIONING,
Washington Univ., Seattle. Dept. of Oceanography.
J. R. Clayton, S. P. Pavlou, and N. F. Breitner.
Environmental Science and Technology, Vol 11(7), July 1977. p 676-682, 4 tab, 5 fig, 43 ref.

Descriptors: *Aroclor, *Chlorinated hydrocarbon pesticides, *Polychlorinated biphenyls, *Zooplankton, Estuaries, Pacific Ocean, *Lipids, Sea-water, Biological membranes, Water pollution effects, *Path of pollutants, *Food chains, Marine animals, Trophic levels.
Identifiers: *Bioaccumulation, *Biomagnification, *Residue levels, North Eastern Pacific Ocean, Lipid concentration, *Equilibrium partitioning, Amplification factors, Pelagic biota.

Chlorobiphenyl concentrations in marine zooplankton from estuarine zones of the North Eastern Pacific Ocean were measured from 1973 through 1975. Concentrations in the lipid fraction of the organisms ranged between 1 and 16 ppm. For the low levels detected in seawater (0.7-3.4 ppt), the data suggest that bioaccumulation is predominantly controlled by equilibrium partitioning of the chemical between the internal lipid pools of the biota and ambient water. Amplification factors of 10 to the sixth power are determined in terms of lipid water concentration ratios, k sub 1 to the Nth power. These quantities are uniform over a wide range of spatial and temporal regimes, species composition, and lipid content of the organisms. The results from this study provide good evidence that at least for pelagic biota at the lower trophic levels, food chain biomagnification is not a controlling factor in attaining the observed residue levels. (Katz)
W77-10259

SHORT-TERM EFFECTS OF HIGHWAY CONSTRUCTION ON THE LIMNOLOGY OF A SMALL STREAM IN SOUTHERN ONTARIO,
Guelph Univ. (Ontario). Dept. of Zoology.
B. A. Barton.
Freshwater Biology Vol. 7(2), p April, 1977, p. 99-108, 4 tab, 3 fig, 42 ref.

Descriptors: *Streams, Limnology, *Highway effects, *Highway relocation, Highway, *Road construction, *Sediments, Suspended solids, Water pollution effects, *Channeling, Water quality, Fish populations, Benthos, Invertebrates, On-site investigations, Sampling, *Canada.
Identifiers: *Species composition, *Standing fish crop, *Southern Ontario.

A limnological investigation was carried out to document the effects of constructing a modern highway across a small stream in southern Ontario. During construction, suspended solids increased to as high as 1390 mg/l but later returned to pre-construction levels of <5 mg/l. Similarly, sediment deposition increased ten-fold to 0.61 g dry wt/cm2 day directly below the construction site during stream rechannelization after completion of the culvert. Decreased proportion of organic matter in sediments indicated that they came from the construction site. Sediments were readily removed by spates and apparently settled out in downstream ponds. There was no change in water chemistry. Standing crop of fish was reduced from 24 to 10 kg/ha immediately below the site. The decrease did not occur further downstream and fish populations at the affected site returned to original levels after construction. However, there was a noticeable shift in species composition. In vertebrates present during construction activities may have remained in sheltered areas avoiding sedimentation effects. Evidence from invertebrate sampling in denuded areas around the site strongly suggests that organisms which may have been removed during construction were replaced quickly by drift. (Katz)
W77-10260

COPPER TOXICITY EXPERIMENTS IN RELATION TO ABALONE DEATHS OBSERVED IN POWER PLANT'S COOLING WATERS.
California State Dept. of Fish and Game, Monterey. Marine Bioassay Lab.
M. Martin, and M. D. Stephenson.
California Fish and Game, Vol. 63(2), 1977, p. 100, 3 tab, 10 ref.

Descriptors: *Metals, *Copper, *Toxicity, Bioassay, Mortality, *Water pollution effects, Sea-water, Benthos, Mollusks, *Gastropods, *Nuclear power plants, Water quality, Cooling water, *Animal pathology, *Thermal pollution.
Identifiers: *Abalone, Haliotis, *Red abalone, *Black abalone, *Copper accumulation, Studies, Histopathology, Tissue analysis, TL, Histopathological abnormalities.

Toxicity of copper as copper sulfate to adult and larval red abalone, Haliotis rufescens, and adult black abalone, Haliotis cracherodii, was determined by static bioassay in seawater at 14 C (57 Copper accumulation studies and histopathological analysis in digestive gland and gill tissues were conducted. The TL50's for adult red and black abalone were 65 ppb and 50 ppb copper, respectively. The TL50 for larval red abalone was 50 ppb copper. Copper was found to accumulate in gill tissues of red and black abalone at 56 ppb copper concentration. Histopathological abnormalities in gill tissues occur at concentrations above 32 ppb. (Katz)
W77-10261

EFFECT OF NO. 2 FIEL OIL AND SOUTH LOUISIANA CRUDE OIL WATER-SOLUBLE FRACTIONS ON HEMOGLOBIN COMPENSATION AND HYPOXIA TOLERANCE IN

OLYCHAETOUS ANNELID, NEANTHES RENACEODENTATA (MOORE),
cripps Institution of Oceanography, La Jolla, alif. Marine Biology Research Div.
. S. Ross, and J. W. Anderson.
larine Science Communications, Vol. 13(2), 1977, 117-131, 1 tab, 1 fig, 15 ref.

escriptors: *Oil wastes, *Oil spills, Water pollu-on effects, *Animal physiology, Biochemistry, ioassay, *Toxicity, *Dissolved oxygen, Annelids, Spectrophotometry, Laboratory tests, il pollution.
lentifiers: *No. 2 fuel oil, *South Louisiana ude oil, *Water-soluble fraction, Hemoglobin mpensation, Hypoxia tolerance, Polychaetus nelid, Neanthes, *Naphthalenes, Total dis-lved hydrocarbons, Respiratory physiology, arine infauna.

xposure to sublethal concentrations of No. 2 fuel l water-soluble fractions (WSFs) did not affect e ability of Neanthes arenaceodentata to in-ease its body hemoglobin content in response to poxia. Similar treatment using water-soluble actions of South Louisiana crude oil likewise in-cated little disruption of compensatory ability. educed dissolved oxygen (D.O.) concentrations d not significantly alter the toxicity of No. 2 Fuel l WSFs to N. arenaceodentata. Low D. O. con-ntrations markedly increased the toxicity of So. . crude oil WSFs, producing a synergistic ef-ct. Results were defined relative to the concen-tion of naphthalenes and total dissolved drocarbons in experimental media. Possible ef-cts of petroleum hydrocarbons on the respirato-physiology of marine infauna were briefly con-ered. (Katz)
77-10262

TRIFICATION POTENTIAL OF RIVER EN-RONMENTS,
tgers - The State Univ., New Brunswick, N. J. pt. of Environmental Science.
S. Finstein, and V. A. Matulewich.
ailable from the National Technical Informa-n Service, Springfield, VA 22161 as PB-270 782, ce codes: A04 in paper copy, A01 in microfiche. mpletion Report, Rutgers Water Resources search Institute, May 1977. 49 p, 16 fig, 7 tab, 8 . OWRT A-039-NJ(2), 14-31-0001-5030.

scriptors: *Nitrification, Nitrogen cycle, Waste imilative capacity, Rivers, Biochemical oxygen nand, *New Jersey, Outfall sewers, Water pol-on sources, Ammonium.
ntifiers: *Nitrogenous biochemical oxygen de-nd, Microbial ecology, Waste load allocation, sile nitrifying populations, Streambed habitat.

dence from field and laboratory studies in-ates that the NH+4 discharged to Mine Brook, ., is nitrified by organisms associated with the ambed within 2.2 mi (approx 5.5 hr) travel from outfall. During a period in which steady-state ditions were approached, the NH+4-N load below the outfall was 256 mg/sec, and 8 sec at the terminal station. The number of nitri-g bacteria in the water phase was insignificant pared to those associated with streambed s and sediment. Only about 1/3 of the NH+4-at disappeared in the Brook was accounted for O-w-N+NO3-N. In laboratory trials involving s but not sediment or deeper streambed ls, all of the NH+4-N that disappeared was vered as NO-3-N. In these trials nitrification menced more quickly as the samples esented greater distance from the outfall. mencement was much faster in the presence cks than in their absence. Ammonium started sappear immediately when contacted to rocks all stations downstream of the outfall. For 2 this was true only with rocks from the more nt stations. Up to 45 days storage of rocks in nended Brook water had little effect on the se of NH+4-N disappearence. Although the growth of nitrifying bacteria relative to heterotrophs might be expected to delay the nitrification of effluent NH+4, no such delay occurs in the mine Brook because the responsible organisms are pre-grown on streambed surfaces.
W77-10265

STUDIES ON THE NATURAL RELATIONSHIPS OF CYANOPHAGES AND THEIR HOSTS AND THE NATURE OF RESISTANCE,
Livingston Coll., New Brunswick, N. J. Dept. of Biology.
F. G. Jenifer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 781, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, Water Resources Research Institute, New Brunswick, N.J., June 1977. 24 p, 4 tab, 6 fig, 15 ref. OWRT A-040-NJ(1), 14-31-0001-5030.

Descriptors: *Cyanophta, *Eutrophication, *Algal control, *Biocontrol, *Selectivity, Aquatic algae, Viruses, Resistance, *New Jersey, Drainage basins.
Identifiers: *Cyanophages, Lipopolysaccharide, Raritan River basin(NJ), Plectonema boryanum, Anacystis nidulans.

The cyanophages LPP-1 and/or LPP-2 were isolated from 19 natural water bodies of the Raritan River drainage basin in New Jersey. The seasonal fluctuations of LPP-1 and LPP-2, and Plectonema and 13 others genera of blue-green algae were monitored for the first time in the same water system. There is a direct relationship between the occurrence of the LPP cyanophage group and Plectonema boryanum. This finding suggests that the LPP cyanophages may play a role in the natural control of Plaectonema boryanum and are of potential use as biological controls for this alga. Studies on the AS-1/Anacystis nidulans system clearly indicate that mutants of A. nidulans resistant for AS-1 rapidly develop during AS-1 infection. AS-1 is unable to attach to the surface of these mutants. AS-1 is also irreversibly inactivated by the lipopolysaccharide (LPA) isolated from wild type A. nidulans. These results suggest that if mutants of other blue-green algae develop as rapidly under cyanophage selection pressure as is the case in A. nidulans and if the nature of their resistance is similar, then the use of cyanophages as specific biological controls seems of dubious value.
W77-10266

EXPERIMENTAL STUDIES ON CHANGING ALGAL POPULATIONS FROM BLUE-GREENS TO GREENS,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 5G.
W77-10269

THE EFFECT OF FIRE ON THE CALIFORNIA CHAPARRAL VEGETATION,
Academia Sinica, Taipei (Taiwan). Inst. of Botany.
C.-H. Chou.
Bot Bull Acad Sin (Taipei). 14(1), p 23-34, 1973.

Descriptors: *Chapparral, Vegetation, *California, *Succession, *Burning, Rainfall, Temperature, Herbicides, Toxins, Toxicity, Plant growth.
Identifiers: Arctostaphylos, *Herbaceous plants, *Phytotoxins.

Fire is a very important ecological factor in determining the succession of the California chapparral vegetation. It occurs frequently in the 'Mediterranean region' of southern California. The luxuriant growth of herbaceous plants appear in the 1st growing season after a fire. However, a high toxicity is found in the burned land. The quantitative comparison of phytotoxins in the herb, shrub and burned soil was determined. It was found that the phytotoxins in the herb, shrub and burned soil was determined. It was found that the phytotoxin in the burned soil is much higher than that in the herb and shrub soils. However, the toxicity of burned soil is tremendously decreased after a sequence of rainfalls. The toxicity of the aqueous extract of Arctostaphylos leaf litter, heated by a series of temperatures from 60-240C with 20C interval, reaches its maximum peak at 160C, and the toxicity then decreased greatly at temperatures above 180C and was totally lost at 200C. The toxin distribution in the treated leaf litter agrees with this bioassay result. Phytotoxins in the burned soil are water soluble and can be leached out by rainfall. Apparently fire plays a significant role in enhancing the leachability of toxins by rain.--Copyright 1974, Biological Abstracts, Inc.
W77-10324

EFFECTS OF ORAL ADMINISTRATION OF CADMIUM ON FISH - II, RESULTS OF MORPHOLOGICAL EXAMINATION, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
J. Koyama, and Y. Itazawa.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 43(5), p 527-533 (1977), 1 tab, 2 fig, 11 ref.

Descriptors: *Cadmium, Metals, *Toxicity, Bioassay, *Animal pathology, *Fish diseases, Growth, Feeds, Feeding rates, Laboratory tests, Water pollution effects, *Path of pollutants, *Biochemistry, Metabolism, Methodology.
Identifiers: *Tissue changes, Weight gain, *Histological observations, Kidney, Hepatopancreas, *Vertebral column.

Weight gain and hepato-somatic index decreased depending on the Cd content of the feed in most experiments. Lateral curvature of the vertebral column by lateral bending of a/a few centrum/centra was observed in the fish (14% of 93 individuals in fish administered with Cd > 140 ppm) that had exhibited violent swimming and tetany during the experiment. In Cd administered fish, abnormal black granules which accumulated around blood vessels were observed in the liver, and degeneration (thin walls) of proximal renal tubules and cells that seemed to have lost the protoplasm were observed in the kidney. A possible mechanism for the lateral curvature of the vertebral column may be conjectured as follows: disturbance of the balance between Ca and inorganic P in the plasma caused by degeneration of renal tubules attributable to orally administered Cd leading to low Ca and high inorganic P levels of the plasma as well as low Ca content of vertebrae leading to hyperexcitability of the nervous system and muscles leading to violent swimming and tetany leading to lateral bending of a/a a few centrum/centra leading to lateral curvature of the vertebral column. (Katz)
W77-10361

GROWTH OF AN ESTUARINE PSEUDOMONAS SP. ON POLYCHLORINATED BIPHENYL,
Maryland Univ., College Park. Dept. of Microbiology.
G. S. Sayler, M. Shon, and R. R. Colwell.
Microbial Ecology 3, p 241-255, 1977, 2 tab, 6 fig, 21 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, Bacteria, *Marine bacteria, *Biodegradation, Biological treatment, *Food chains, Estuaries, Estuarine environment, Methodology, Biochemistry, *Pseudomonas, Laboratory tests, Analytical methods, Radioactivity techniques, Pollutant identification.
Identifiers: *Aroclor 1254, *PCB, PCB residues, *Bioaccumulation.

In the course of a study of the microbial degradation of polychlorinated biphenyls (PCB), 16 cultures, representing 5 genera of bacteria, were isolated. A Pseudomonas sp. was found to degrade mixtures of PCB (Aroclor 1254) and pure isomers, i.e., hexachlorobiphenyl (HCB). Degradation was variable, depending on length of incubation, purity, and degree of chlorination of the biphenyl molecule. In addition to apparent degradation of PCB, it was observed that PCB stimulated growth and oxygen uptake. Bioaccumulation of PCB residues was suggested, since 11C-labeled material derived from 11C-PBC by microorganisms indicates this may be an important mechanism for removal or mobilization of PCB into food chains in the estuarine environment. (Katz)
W77-10362

THE FISH COMMUNITY IN A SECTION OF ROKYTNA CREEK AFTER TWENTY YEARS,
Ceskoslovenska Akademie Ved, Brno. Ustav pro Vyzkum Obratlovcu.
J. Libosvarsky.
Folia Zoologica, Vol 26(1), 1977, p 57-60, 2 tab, 5 ref.

Descriptors: *Freshwater fish, *Environment, *Streams, Minnows, Animal grouping, *Animal populations, Fish types, Fishing gear, Sampling, *Eutrophication, Environmental effects, Electrofishing.
Identifiers: *Czechoslovakia, *Species composition, *Species fluctuation, *Rokytna Creek(Czeck), Chub, Barb, Gudgeon, Leuciscus, Barbus, Bogio, Chondrostoma.

Two bags of fish sampled by means of electrofishing are compared. They were collected in a section of the Rokytna Creek during two different decades (1956 and 1974 to 1976). While the number of fish species living in the section obviously did not change, the proportions of the species caught were different. The chub (Leuciscus cephalus) prevailed by far in the community in the seventies. The share of the barb (Barbus barbus) increased, while the occurrence of the gudgeon(Gobio gobio) and Chondrostoma nasus decreased. The changes may be also relative to some environmental effects in the stream, such as lower polymorphism or the stream bed, lower water discharge in the recent years and the progressive eutrophication of the water through nutrients from the farmland. (Katz)
W77-10363

INFLUENCES ON THE CARBON DIOXIDE BALANCE OF SUBMERSED HIGHER AQUATIC PLANTS IN FLOWING WATER BY NOXIOUS SUBSTANCES CONTAINED IN WATER, (IN GERMAN),
Technische Universitaet, Dresden (East Germany). Bereich Hydrobiologie.
W. Horbach, L. Hornig, and G. Weise.
Acta Hydrochimica et Hydrobiologica Vol. 14(4), 1976, p. 363-384, 12 tab, 9 fig, 8 ref.

Descriptors: Water quality, *Carbon dioxide, *Nickel, *Zinc, *Copper, Metals, *Algae, Aquatic plants, Aquatic environment, On-site investigation, Plant physiology, *Plant growth, *Photosynthesis, *Metabolism, Aquatic productivity, *Submerged plants, Water pollution effects.
Identifiers: *Zwickauer-Mulde River, *CO2 bond, Respiratory CO2-release, Oxygen consumption, Submerged macrophytes, Potamogeton, *Pondweed, Amblystegium.

Under water-ecological conditions investigations are described for the gas-metabolism physiological behavior of the submersed macrophytes Potamogeton pectinatus (pondweed) and Amblystegium riparium on the basis of the IRGA measurement technique by means of a mobile laboratory. Both species predominate in a selected flow section of the Zwickauer Mulde river. Experimentally determined rates of decrease of assimilation for the heavy metals, Ni2+, Zn2+ and Cu2+ allow the prediction of matter balance values when the corresponding heavy metal loads are present, since the photosynthetic CO2-bond with O2-liberation and the respiratory CO2-release are correlated with the oxygen consumption in the water analyzed. (Katz)
W77-10364

THE EFFECTS OF ORGANIC POLLUTION ON BENTHIC ORGANISMS NEAR MARSEILLE,
Durham Univ. (England). Dept. of Botany.
B. P. Jupp.
International Journal of Environmental Studies, Vol. 10, p. 119-123, 1977, 4 tab, 8 ref.

Descriptors: On-site investigations, *Benthos, *Water pollution effects, *Marine algae, *Organic wastes, *Detergents, Littoral, *Sewage, Shallow water, Marine animals, *Sewage effluents.
Identifiers: *Mediterranean(Gulf of Marseilles), *Marseille(France), *Sea grass, Sublittoral organisms, Rocky substrates, Posidonia, *Sea urchins, Echinoids, Organic pollution.

A quantitative survey of sublittoral marine organisms was carried out in polluted and unpolluted waters near Marseille (France). Samples from rocky substrates indicate that organic pollution effects have not decreased since earlier surveys. Studies on beds of Posidonia oceanica, the dominant Mediterranean sea grass, show that its biomass is low in the polluted Gulf of Marseille compared with that in unpolluted bays near Marseille and with data from Malta. Crops were particularly low in shallow water to 15m where it is suggested that grazing by echinoids, whose numbers are probably encouraged by high levels of organic material, could be an important factor limiting growth, as well as other factors such as low underwater irradiance and detergent toxicity. Along the most polluted coastline near the main sewer outlet at Cortiou, Posidonia was absent and is probably excluded by indirect and direct effects of the effluent. The decline of these sea grass beds has serious implications for sediment stability and the survival of associated biota. (Katz)
W77-10365

IMPACTS OF NUCLEAR RELEASES INTO THE AQUATIC ENVIRONMENT.
International Atomic Energy Agency Vienna (Austria).
Proceedings of an International Symposium on Radiological Impacts of Releases from Nuclear Facilities into Aquatic Environments held by the IAEA at Otaniemi, Finland, June 30-July 4, 1975. STI/PUB/406. 524 p, $30.00.

Descriptors: *Conferences, *Environmental effects, *Water pollution effects, *Radioactive wastes, *Aquatic environment.

The proceedings includes a total of 33 papers in the areas of behaviour of radioactive contaminants and their stable natural isotopes in aquatic systems; plutonium and other transuranium nuclides in the aquatic environment; identification of critical pathways relative to the physical, chemical and biological systems; methods of monitoring and evaluation of effects on and doses to man and aquatic biota; and factors determining the environmental capacity for receiving releases from nuclear facilities in the aquatic environment. A report of a general discussion session and an author index are included. (See W77-10385 thru W77-10417) (Chilton-ORNL)
W77-10384

THE RADIOLOGICAL CONSEQUENCES OF RELEASES FROM NUCLEAR FACILITIES TO THE AQUATIC ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England).
A. Preston.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 3-23, 6 tab, 43 ref. IAEA-SM-198/57.

Descriptors: *Environmental effects, *Water pollution, Radioisotopes, Aquatic environment, Nuclear energy, Nuclear wastes.

The paper reviews experience of the past three decades in respect to the release of radioactive materials to the environment and draws some conclusions relevant to the regulatory problem: standards of radiation exposure recommended by ICRP provide a suitable basis for regulating the introduction of material to aquatic environments; dose limits should be kept as low as achievable; application of critical path analysis techniques to impact assessments provides a suitable basis for applying and interpreting dose limits in environmental terms; protection of public health provides adequate protection for the marine ecosystem; a need exists for research efforts in respect to deep sea processes; problems posed by the introduction of long-lived transuranic elements are no different in principle to those posed by, and solved for, other radionuclides. (See also W77-10385) (Chilton-ORNL)
W77-10385

RADIOLOGICAL IMPACTS OF RELEASES FROM NUCLEAR FACILITIES INTO AQUATIC ENVIRONMENTS-USA VIEWS,
Energy Research and Development Administration, Washington, D.C. Div. of Biomedical and Environmental Research.
For primary bibliographic entry see Field 5B.
W77-10386

ETUDE DE L'INFLUENCE DU CADMIUM STABLE SUR LE TRANSFERT DU ZINX-65 ... ECOSYSTEME IRRIGUE PAR SUBMERSION (RIZIERE IRRIGUEE), (STUDY OF THE ... FLUENCE OF STABLE CADMIUM ON ... TRANSFER OF ZINC-65 IN AN ECOSYSTE... IRRIGATED BY SUBMERSION (IRRIGAT... RICE FIELD),
Commission of the European Communities, Is... (Italy). Joint Research Centre.
C. Myttenaere, M. Merlini, R. Bittel, P. Dabin, a...
J. M. Mousny.

Descriptors: *Environmental effects, *Water p... lution, *Radioisotopes, *Zinc, *Cadmium, Po... tants, Irrigation, Industrial wastes, Nucl... wastes.
Identifiers: Associate contaminants.

The interaction of a nuclear contaminant (zinc ... and a conventional contaminant (stable cadmi... was studied under controlled mini-rice-field co... tions. The water was enriched with 1 ppm st... zinc and 0.0025, 0.005, and 0.050 ppm stable c... mium. Fish were introduced into each comp... ment of the ecosystem and samples of irriga... water and surface were taken during cultiva... and at the end of cultivation. Stable zinc, radio... tive zinc, and stable cadmium were determine... each component of the ecosystem. Res... justified the use of the term associate contamin... to describe the influence of a conventional c... taminant on the transfer of a radionuclide. ... also W77-10384) (Chilton-ORNL)
W77-10387

ETUDE DE LA CONTAMINATION DE C... STITUANTS DU MILIEU MARIN PAR ... FORMES SOLUBLES ET INSOLUBLES ... RADIONUCLIDES, (STUDY OF THE C... TAMINATION OF COMPONENTS OF ... MARINE ENVIRONMENT BY SOLUBLE ... INSOLUBLE FORMS OF RADIONUCLIDES)
CEA Centre de la Hague, Cherbourg (Fran...
Laboratoire de Radioecologie Marine
A. Fraizier, and J. C. Ancellin

n: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 49-62, 8 ab, 3 fig, 9 ref. IAEA-SM-198/8.

Descriptors: *Environmental effects, *Water pollution, Pollutants, Radioisotopes, *Cesium, Cobalt, Iron, Aquatic environment, Physicochemical properties, Animal physiology, Physiological ecology.
Identifiers: *Cerium, *Rubidium.

Cs 137, Cr 51, Co 60, Ru 106, and Fe 59 were used o clarify the relationships between the physicochemical states of the radionuclides, the variations n the environmental conditions, and the properties of the experimental samples. Marine organisms were more readily contaminated by the inoluble forms of Ru 106 and Fe 59 than they were y the soluble forms. The physiology of the organisms appeared to influence the degree and evolution of the contamination whatever the physicoemicl state of the radionuclide. In some cases, e contamination level was independent of the ariations in environmental conditions and the reted variations in the physiology of the organism. See also W77-10384) (Chilton-ORNL)
W77-10388

EHAVIOUR OF CAESIUM-137 IN THE ARINE ENVIRONMENT,
inistry of Agriculture, Haifa (Israel). Dept. of sheries.
Gilat, Y. Laichter, and N. H. Shafrir.
: Impacts of Nuclear Releases into the Aquatic nvironment, Proceedings of a symposium held at aniemi, Finland, June 30-July 4, 1975. p 63-76, 7 o, 2 fig, 21 ref. IAEA-SM-198/18.

escriptors: *Environmental effects, *Water pollion, Pollutants, *Cesium, Radioisotopes, Food ains, Aquatic environment.
entifiers: Maximum permissible concentran(Cesium).

find the concentration and pathway of Cs 137 the marine environment, the behaviour of Cs 7 originating from fallout was investigated. sults of the Cs 137 concentrations obtained for face waters and for a depth of 1000 m showed variations by a factor a depth of 1000 m showed variations by a factor ten (0.65-0.07), maximum concentrations being nd at a depth of 100-300 m. Cs 137 concentrans in marine biota representing a food chain of thic algae, invertebrates and fish were deterned. Results showed concentration factor ues within the range of 10-300 in all three ups. A concentration factor for Cs 137 in sedint samples of approximately 200 was found. ng a value of 150 for the most common edible of the food chain as an upper limit for Cs 137 centration factor, a reduction of the recomnded maximum permissible concentration ue in sea water is suggested. (See also W77-84) (Chilton-ORNL)
7-10389

UDIES ON RARE EARTH ELEMENTS IN AWATER AND UPTAKE BY MARINE ORNISMS,
ional Inst. of Radiological Sciences, Chiba an).
Suzuki, T. Koyanagi, and M. Saiki.
Impacts of Nuclear Releases into the Aquatic ironment, Proceedings of a Symposium held at niemi, Finland, June 30-July 4, 1975. p 77-91, 4 5 fig, 15 ref. IAEA-SM-198/19.

criptors: *Environmental effects, *Sea water, dioactive wastes, Path of pollutants, sorption.
tifiers: Bioaccumulation, *Rare earth ele-ts, *Cerium, *Europium, *Terbium.

water and certain marine organisms were yzed for determination of rare earth elements. Some of the seawater was treated with HCl before filtration (prior to analysis) and some after filtration. Concentrations of the rare earth elements acidified with HCl after filtration were slightly lower than those acidified before filtration. It was concluded that concentration factors are affected by the existing state of the elements in the seawater. If only the dissolved state is assumed available for marine organisms, values about one order of magnitude higher are obtained, especially for cerium, europium, and terbium. The higher values of concentration factor should be used when studying bioaccumulation of rare earth elements at points near to the discharge point of radioactive liquid wastes. (See also W77-10384) (Chilton-ORNL)
W77-10390

A TRACE ELEMENT STUDY IN THE THAMES ESTUARY,
Royal Naval Coll., Greenwich, London (England). Dept. of Nuclear Science and Technology.
C. D. Bevan, S. A. Harbison, L. A. Nelson, and J. R. Lakey.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 93-106, 5 tab, 1 fig, 19 ref. IAEA-SM-198/30.

Descriptors: *Environmental effects, *Water pollution, Pollutants, Suspended load, Suspension, Aqueous solutions, Sediments, *Trace elements.

Concentration of trace elements in the dissolved fraction and the non-dissolved fraction of the water and in sediments from part of the Thames Estuary is reported. Six groups of elements were identified with correlations indicating relationships within each group. Ten elements were identified in the suspended particulate fraction including iron. Cerium, chromium and thorium were on the same level in the suspended particulate fraction as in muddy deposits but cobalt, cesium, europium and scandium were enriched in the suspended particulate fractions. Hafnium was at a higher concentration in the sediments. In general, concentrations were lower in sandy deposits than in muddy deposits but with insignificant differences for iron and cobalt. (See also W77-10384) (Chilton-ORNL)
W77-10391

ENVIRONMENTAL BEHAVIOUR OF THE BINUCLEAR OXYGEN-BRIDGED NITRATONITROSYLRUTHENIUM COMPLEX,
Japan Atomic Energy Research Inst., Osaka; and Kinki Univ., Osaka (Japan).
Y. Nishiwaki, Y. Honda, Y. Kimura, T. Ishiyama, and T. Matsumura.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 107-120, 6 fig, 3 tab, 36 ref. IAEA-SM-198/45.

Descriptors: *Environmental effects, *Aquatic environments, Chemical analysis, Radioactive wastes.
Identifiers: *Ruthenium.

The technique used in this investigation were filter paper electrophoresis, paper chromatography, and infrared absorption spectra of a decomposition product in fresh water. Filter paper electrophoresis resulted in the complex being fractionated into at least four anionic species, one neutral species and one cationic species. After one day's aging, the anionic fraction increased and reached 75% of total Ru. Paper chromatographic determination of (Ru-O-Ru) nitrate complex species showed that about 90% of total Ru in the fresh water environment was taken up in the fraction with flow rate R sub f less than 0.2, corresponding to the anionic mononitro-, mononitratonitrosyl and uncomplexed species. Infrared studies were undertaken to verify the results obtained by paper chromatography. (See also W77-10384) (Chilton-ORNL)
W77-10392

LE TRANSFERT DU ZINC-65 DE SEDIMENTS A DES LARVES DE CHIRONOMIDES ET A UN POISSON D'EAU DOUCE ET L'EFFET DU CADMIUM SUR CE TRANSFERT, (TRANSFER OF ZINC-65 FROM SEDIMENTS TO CHIRONOMID LARVAE AND TO A FRESHWATER FISH AND THE EFFECT OF CADMIUM ON TRANSFER),
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
A. R. Berg, and G. M. Weiss.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 121-132, 3 fig, 2 tab, 13 ref. IAEA-SM-198/47.

Descriptors: *Environmental effects, *Water pollution, *Path of pollutants, *Zinc, *Cadmium, Sediments, Larvae, Fish, Diptera.

Chironomid larvae were reared on a sediment rich in organic matter, in cadmium concentrations of 0, 10, and 20 ppm. The larvae were then fed to Haplochromis buttoni which were kept in water at the same cadmium concentrations. Transfer of zinc and cadmium through the chain (sediments-water-larvae-fish) was traced and the results showed that cadmium strongly inhibited the exchange of zinc for the larvae but this inhibition was not apparent in the case of the fish in the concentrations of cadmium studied. The equilibration time for the accumulation of radiozinc by fish is very long but cadmium accumulation reaches equilibrium in 5-7 days. Excretion of accumulated cadmium was found to take place at a relatively slow rate. (See also W77-10384) (Chilton-ORNL)
W77-10393

THE BEHAVIOUR OF SR90 AND CS137 IN THE WATERS OF THE BALTIC SEA,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow.
For primary bibliographic entry see Field 5B.
W77-10394

PLUTONIUM ISOTOPES IN AQUATIC FOODCHAINS IN THE BALTIC SEA,
Helsinki Univ., (Finland). Dept. of Radiochemistry.
J. K. Miettinen, T. Jaakkola, and M. Jarvinen.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 147-155, 2 tab, 1 fig, 9 ref. IAEA-SM-198/10. CH E(11-1)-3011.

Descriptors: *Environmental effects, *Water pollution, *Path of pollutants, Radioisotopes, *Plutonium, Food chains, Aquatic environment.
Identifiers: *Baltic Sea.

The study was undertaken to establish a base line for plutonium concentration in biota of the Baltic Sea to be used for comparison of changes which may occur when nuclear power plants presently under construction come into operation. Sea water, bottom sediment, algae, benthic fauna, and fish samples were analyzed. Fish (ruff, flounder, cod) contain 0.04-0.14 pCi (Pu239 and Pu240)/kg fresh wt., blue mussel 0.6 pCi/kg fresh wt., brown alga 5 pCi/kg fresh wt. and sediment 0.18 nCi/kg in the top centimeter. The Pu 239, 240 level in samples are comparable with those from the Great Lakes. The food chains seem to lead to reduction in Pu levels. The values from sediment and mussel in the Baltic were twice as high as those from the North Atlantic. (See also W77-10384) (Chilton-ORNL)
W77-10395

EXPERIMENTAL STUDIES ON PLUTONIUM KINETICS IN MARINE BIOTA,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-10396

ADSORPTION-DESORPTION CHARACTERISTICS OF PLUTONIUM AND AMERICIUM WITH SEDIMENT PARTICLES IN THE ESTUARINE ENVIRONMENT, STUDIES USING PLUTONIUM-237 AND AMERICIUM-241,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-10397

SOME INVESTIGATIONS INTO THE BEHAVIOR OF PLUTONIUM IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. A. Hetherington, D. F. Jefferies, and M. B. Lovett.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 193-212, 6 fig, 6 tab, 19 ref. IAEA-SM-198/29.

Descriptors: *Environmental effects, *Water pollution, *Path of pollutant, Radioisotopes, *Plutonium, Cesium, Sedimentation, Sediments.

A preliminary survey of the behaviour of Pu239 discharged from Windscale to the Irish Sea showed that a large fraction of the plutonium discharged is lost rapidly from the water phase and that the residual amount behaves thereafter conservatively and in a similar fashion to Cs137. Measurements of Pu239 in seabed sediment showed no accumulation in the vicinity of the outfall and it was concluded that once the plutonium is lost from the water it is dispersed in association with the general sediment transport processes in the area. A similarity between Pu239 and Cs137 distributions with depth in core samples was noted and it was suggested that this implies that sedimentation is the primary mechanism by which these nuclides are incorporated into the sediments. (See also W77-10384) (Chilton-ORNL)
W77-10398

PLUTONIUM IN THE AQUATIC ENVIRONMENT AROUND THE ROCKY FLATS FACILITY,
Dow Chemical Co, Golden, Colo. Rocky Flats Div.
For primary bibliographic entry see Field 5B.
W77-10399

THE BEHAVIOUR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, I. BIOLOGICAL TRANSPORT, SEASONAL CYCLING, AND RESIDENCE TIMES IN THE WATER COLUMN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10400

THE BEHAVIOR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, II. PATTERNS OF DEPOSITION IN THE SEDIMENTS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10401

CONSEQUENCES DU DEPLACEMENT DES SEDIMENTS SUR LA DISPERSION DES RADIONUCLEIDES, (THE EFFECT OF SEDIMENT DISPLACEMENT ON THE DISPERSAL OF RADIONUCLIDES),
Electricite de France, Chatou.
For primary bibliographic entry see Field 5B.
W77-10402

BEHAVIOR OF DISCHARGED RADIONUCLIDES FROM FUEL REPROCESSING OPERATIONS IN THE AQUATIC ENVIRONMENT OF BOMBAY HARBOUR BAY,
Bhabha Atomic Research Centre, Bombay (India). Environmental Studies Section.
K. C. Pillai, N. N. Dey, E. Mathew, and B. U. Kothari.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 277-300, 8 fig, 9 tab, 16 ref. IAEA-SM-198/16

Descriptors: *Environmental effects, *Water pollution, Radioactivity, *Radioisotopes, Strontium, Ruthenium, Cerium, Cesium, Plutonium, Nuclear wastes.
Identifiers: *Bombay Harbour(India).

High accumulation of Sr 90, Ru 106, Ce 144, Cs 137 and Pu 239 were found in suspended and bottom sediments of Bombay Harbour Bay. In spite of the fact that releases of Pu were small, measurable quantities of this radionuclide were found near the discharge area. In areas near the discharge, benthic organisms showed selective accumulation of radioisotopes of Cs and Ru. A significant portion of Ru 106 found in the outer layers of the Arco shell was found to be present in the organically bound form. Pu uptake by benthic organisms indicated the possibility of higher accumulation of this radionuclide from waste effluents than from fallout. Sr 90 was accumulated in salt from salt pans along the coastline. Transient high levels of radioactivity were observed only at close proximity to discharge locations. The fuel reprocessing operations and the consequent waste releases into the bay have not created any significant environmental radiation problems. (See also W77-10384) (Chilton-ORNL)
W77-10403

CONCENTRATION OF RADIOACTIVE COBALT BY SEAWEEDS IN THE FOOD CHAIN,
National Inst. of Radiological Sciences, Chiba (Japan).
For primary bibliographic entry see Field 5B.
W77-10404

TRANSPORT AND ACCUMULATION OF RADIOCOBALT IN THE MARINE SEDIMENT OF URAZOKO BAY,
National Inst. of Radiological Sciences, Chiba (Japan).
For primary bibliographic entry see Field 5B.
W77-10405

RADIOCAESIUM DYNAMICS IN A CONTAMINATED FLOODPLAIN ECOSYSTEM IN THE SOUTHEASTERN UNITED STATES,
Savannah River Ecology Lab., Aiken, S. C.
C. T. Garten, Jr., J. B. Gentry, J. E. Pinder, III, R. R. Sharitz, and M. H. Smith.
In: Impacts of Nuclear Release into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 331-347, 1 fig, 3 tab, 28 ref. IAEA-SM-198/41.

Descriptors: *Environmental effects, *Water pollution effects, *Radioisotopes, Nuclear wastes, Cesium, Food chains, Sediments, Absorption, Flood plains, *Southeast U.S.

In the study area, the sediments were the primary repository for radiocesium but the radiocesium was not fixed by kaolinite in the sediments and was available for plant uptake. The plants concentrated radiocesium up to 20 times soil concentrations and made it available for entry into food chains. Uptake varied between areas and this variation may be dependent upon potassium availability and abundance of soil organic matter. A reduction in variability of radiocesium concentrations from soils to producers to consumers was noted. This reduction in the variability in contamination levels is an important point to consider in evaluating hazards to man from low-level contamination of food sources. (See also W77-10384) (Chilton-ORNL)
W77-10406

UPTAKE OF COBALT-60 FROM SEA WATER AND FROM LABELLED FOOD BY THE COMMON SHRIMP CRANGON CRANGON (L),
Reactor Centrum Nederland, Petten.
A. W. Van Weers.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 349-361, 4 fig, 3 tab, 5 ref. IAEA-SM-198/44.

Descriptors: *Environmental effects, *Water pollution, Radioisotopes, *Shrimp, *Absorption, Seawater, Radiation.
Identifiers: Radiation exposure.

Results of this study show that the shrimp Crangon crangon accumulates Co60 from sea water mainly by adsorption to the exoskeleton with concentration factor of about 13 for non-moulted whole shrimps being reached after one month uptake. The low concentration factor for whole animals and the large fraction of Co60 being bound by the exoskeleton indicate that in soft parts a concentration factor of Co60 will not be reached by direct uptake from seawater but Co60 will be taken up by shrimps mainly through the food chain. Uptake from food resulted in a relatively high concentration of Co60 in the digestive gland with the concentration in the abdominal muscles being much lower. Human radiation exposure resulting from consumption of shrimps tends to be overestimated when concentrated factors for whole animals or whole soft parts are used in the dose estimate. (See also W77-10384) (Chilton-ORNL)
W77-10407

HEALTH CRITERIA FOR ESTIMATING ACCEPTABLE CONTAMINATION OF COASTAL WATERS BY RADIONUCLIDES,
Ministerstvo Zdravookhraneniya SSR, Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5B.
W77-10408

DOSE ESTIMATION AND PREDICTION OF RADIATION EFFECTS ON AQUATIC BIOTA RESULTING FROM RADIOACTIVE RELEASES FROM THE NUCLEAR FUEL CYCLE,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
B. G. Blaylock, and J. P. Witherspoon.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 377-395, 8 tab, 25 ref. IAEA-SM-198/35.

Descriptors: *Environmental effects, *Water pollution, *Nuclear wastes, *Radioactivity, Aquatic environment, Radioisotopes, Radioecology.
Identifiers: Radiation effects, Dose estimates.

The potential for greater radiation doses to aquatic biota is indicated to be associated with the nuclear fuel supply facilities. Higher doses were found to be due to the naturally occurring radionuclides Ra226, Po210 and Th230. It was concluded that somatic or genetic effects produced on aquatic biota at the dose rates estimated for conversion, enrichment, fuel fabrication, nuclear power reactors and reprocessing facilities would not significantly affect the exposed aquatic population. Dose estimates were made by using radionuclide concentration measured in the liquid effluents or representative facilities and, where measurements were not available, predicted radioactive releases to the aquatic environment were used. (See also W77-10384) (Chilton-ORNL)
W77-10409

ONVENTIONAL AND RADIOACTIVE POLLU-ANTS OF INLAND WATERS IN AUSTRIA,
ederal Inst. for Water Control, Vienna (Austria).
or primary bibliographic entry see Field 5B.
/77-10410

SSESSMENT OF DOSES IN THE ENVIRON-IENT FOR LIQUID RELEASES FROM UCLEAR POWER REACTORS,
uclear Regulatory Commission, Washington, D.
Div. of Technical Review.
Kastner, and J. S. Bland.
: Impacts of Nuclear Releases into the Aquatic nvironment, Proceedings of a Symposium held at taniemi, Finland, June 30-July 4, 1975. p 405-414, tab, 14 ref. IAEA-SM-198/37.

escriptors: *Environmental effects, *Water pol-tion, Radioactivity, Radionuclides, Assess-ents, Nuclear powerplants, Sites, Evaluation.
entifiers: Environmental impact assessment.

ne method of assessment of radiological impact proposed commercial power reactors is scussed. Detailed evaluations are presented of e impact of liquid releases to the environment, cluding exposure pathways and probable expo-res of individuals and populations. The funda-ental equation for calculations of this assess-ent is R sub ipr equals C sub ip, U sub p, D sub r. R sub ipr is the dose rate to organ r from clide i via p, and D sub ipr is the dose factor of clide i, pathway p, and organ r. It was concluded at the majority of light water reactors have kept eir off-site doses well within the Appendix I sign objectives even though in several cases the dionuclide distribution was different from that edicted. (See also W77-10384) (Chilton-ORNL)
77-10411

OCHEMICAL AND PHYSIOLOGICAL HANGES IN EGYPTIAN NILE FISH SUB-CTED TO VARYING LEVELS OF GAMMA RADIATION,
tional Centre for Radiation Technology, Cairo gypt).
M. Roushdy, H. S. El-Kashef, and A. E. Imam.
Impact of Nuclear Releases into the Aquatic vironment, Proceedings of a Symposium held at aniemi, Finland, June 30-July 4, 1975. p 415-430, fig, 29 ref. IAEA-SM-198/51.

scriptors: Environmental effects, *Water pollu-n effects, *Radioactivity, *Gamma rays, Fish, ochemistry, Animal physiology, Growth rates.
ntifiers: *Clarias lazera, Tilapia nilotica, Hae-tology, Glycogen levels, *Nile River(Egypt).

estigations of the effect of gamma irradiation Clarias lazera showed the fish to have changed matological levels (a significant drop in throcytic count with adult males being slightly re affected than females), a slight increase in percentage protein dry weight of muscle, and nificant retardation in rate of growth of both ju-ile and adult males and females. Investigation h Tilapia nilotica showed a marked initial erglycemia and later the blood glucose level reased with a case of hypoglycaemia dominat-Whole-body irradiation caused an initial nsitory rise i glycogen store concentration in r. At radiation levels of 500 R, the glycogen re showed a prolonged higher level than normal at levels of 1000 R, a decrease in glycogen re concentration prevailed for the remainder of 40 day experiment period. (See also W77-84) (Chilton-ORNL)
7-10412

ANALYSIS OF CRITERIA FOR DETERMIN-; THE EXTENT OF PERMISSIBLE DIOACTIVE WASTE DISPOSAL FROM CLEAR POWER STATIONS INTO RIVER STEMS,
drometeorological Service of the USSR, scow. Inst. of Applied Geophysics.
V. V. Pisarev, and I. S. Tzybizov.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 431-440, 1 fig, 1 tab, 12 ref. IAEA-SM-198/52.

Descriptors: *Environmental effects, *Water pollution, Radioactivity, Nuclear powerplants, Ecology, Hydrology, Radioecology, *Radioactive wastes, *Radioactive waste disposal.

Hydrological, ecological and radiological criteria are discussed for the disposal of liquid radioactive wastes into river systems. Measurement of mixing and dilution of wastes in river flows and determination of interaction between river waters and surrounding valleys can be made through the use of hydrological criteria. Ecological criteria are used in establishing quantitative relations between contamination and the environment and in making predictions and analysis of radiation conditions. Radiological critiera concerning maximum concentration values and dose limits can be used if attention is paid to hydrological and ecological factors. (See also W77-10384) (Chilton-ORNL)
W77-10413

A SYSTEM OF RADIATION MONITORING, AND METHODS AND EQUIPMENT FOR MEASURING WATER OF LOW SPECIFIC ACTIVITY,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow. Institut Atomnoi Energii.
For primary bibliographic entry see Field 5B.
W77-10414

RADIOLOGICAL EFFECTS OF A NUCLEAR POWER PLANT ON A RIVER SYSTEM, AS DEMONSTRATED BY THE GUNDREMMINGEN BWR ON THE DANUBE,
Bayerische Biologische Veruchsanstalt, Munich (West Germany).
H. Herrmann, M. Ruf, K. Hubel, and W. Lunsmann.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held in Otaniemi, Finland, June 30-July 4, 1975. p 461-472, 7 tab, 6 ref. IAEA-SM-198/14.

Descriptors: *Environmental effects, *Water pollution, Nuclear powerplants, Radioactivity, Rivers.
Identifiers: *Germany(Danube River).

Radiological data based on analysis of water, sediment, and seston samples collected both upstream and downstream of the Gundremmingen nuclear power plant are presented. The most important critical pathway to man for radioactive waste products is the consumption of Danube fish. With the future larger nuclear power stations there will be an annual release rate of 10 Ci in the form of fission and activation products (without H3) and 1000 Ci of H3 per 100 MW(e) installed. Thus nuclear power plants with a total output of about 50,000 MW(e) could be built on the German part of the Danube. (See also W77-10384) (Chilton-ORNL)
W77-10415

THE FISH/WATER ACCUMULATION FACTOR-AN IMPORTANT PARAMETER FOR DETERMINING THE ENVIRONMENTAL CAPACITY OF SURFACE WATERS,
Board of Nuclear Safety and Radiation Protection, Berlin (East Germany).
For primary bibliographic entry see Field 5B.
W77-10416

RELEASE PATHWAYS FOR DEEP SEABED DISPOSAL OF RADIOACTIVE WASTES,
Sandia Labs-I, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W77-10417

PHOTOSYNTHETIC PROPERTIES OF MARINE BENTHIC GREEN ALGAE FROM DIFFERENT DEPTHS IN THE COASTAL AREA, (IN JAPANESE),
Tokyo Univ. of Education (Japan). Shimoda Marine Biological Station.
Y. Yokohama.
Bull Jap Soc Phycol. 21(2), p 70-75, 1973.

Descriptors: *Photosynthesis, *Algae, *Chlorophyll, *Cladophora, Coasts, Benthos, *Chlorophyta, Coasts, Light, Marine biology, Depth.
Identifiers: Cladophora-wrightiana, *Japan(Shimoda coast), Monostroma-nitida, Ulva-japonica.

Five species of Chlorophyta were collected from different depths in the coastal area of Shimoda, Izu Peninsula (Japan). Photosynthesis-light curves of algae from the intertidal zone were of sun pattern but those of ones from deeper range were of shade pattern. Ulva japonica growing in the range deeper than 10 m. utilized green light by the same efficiency as white light, while Monostroma nitidum and U. pertusa growing in the intertidal zone had an efficiency of green light lower than that of white light. In the absorption spectrum of the living frond of U. japonica a notable bulge was observed in the range around 540 nm where the deep trough existed in the case of Monostroma and U. pertusa. The ratios of chlorophyll a to chlorophyll b in Uivales were 1.9 in M. nitidum, 1.5 in U. pertusa and 1.2 in U. japonica, and those in Cladophora sp. were 1.8 and 1.3 in C. wrightiana. The high efficiency in utilization of the green light observed in U. japonica suggests the adaptation of this alga to the deep water in the coastal area where illumination is greenish. Such a high efficiency may be mainly due to the existence of unknown pigment having an absorption peak at 540 nm in its living frond as well as to its high ratio of chlorophyll b to a. Such a pigment composition may contribute to maintenance of the shade pattern of photosynthesis-light curve in this algae.--Copyright 1974, Biological Abstracts, Inc.
W77-10466

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM: COMPONENT STUDY OF BIOLOGICAL COMMUNITIES.
Illinois Natural History Survey, Urbana.
For primary bibliographic entry see Field 2H.
W77-10505

RED TIDE IN THE SETO INLAND SEA, (IN JAPANESE),
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
A. Murakami.
Bull Plankton Soc Jap. 19(2), p 131-132, 1973.

Descriptors: *Eutrophication, Nitrogen, Phosphorus, *Red tide, *Dinoflagellates, Water pollution effects, Sea water.
Identifiers: *Japan(Seto Inland Sea).

In the past 10-yr, a serious situation of (phytoflagellate) red tide has developed in the Seto Inland Sea (Japan). The probable cause is excessive eutrophication. In the Seto Inland Sea, the concentration of soluble inorganic N and P in sea water has increased greatly compared with concentrations found 20 yr ago. The only countermeasure of such red tide is to eliminate the source of excessive eutrophication.--Copyright 1974, Biological Abstracts, Inc.
W77-10509

INFLUENCE OF DOMESTIC WASTES ON THE STRUCTURE AND ENERGETICS OF INTERTIDAL COMMUNITIES NEAR WILSON COVE, SAN CLEMENTE ISLAND,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
M. M. Littler, and S. N. Murray.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 072, Price codes: A05 in paper copy, A01 in microfiche. California Water Resources Center, Contribution No 164, June 1977, 88 p. (California Water Resources Center Project UCAL-WRC-W-491). OWRT A-054-CAL(4).

Descriptors: *Domestic wastes, *Intertidal areas, *Biological communities, Seasonal, Fluctuations, *California, Marine animals, Marine biology, Water pollution effects, *Primary productivity, *Outfall sewers, Food webs, Fish food organisms, Waste disposal.
Identifiers: *San Clemente(Calif), *Wilson Cove(Calif).

This project was directed toward studies of the role of stresses imposed by domestic waste waters on marine intertidal organisms, how natural communities of such organisms deal with high-energy inputs from the particulate matter derived from human wastes and the processes controlling community development, food web structure, primary productivity, and seasonal fluctuations in polluted waters. A primary effect of sewage stress in the upper to mid-intertidal was to maintain community development in an early disclimax stage. The outfall area successional plots showed rapid recovery--nearly 100% after less than a month, whereas communities that developed on the unpolluted experimental plots had not fully recovered after one year. The communities occupying the peripheral margins of the outfall habitat showed enhanced abundance of suspension-feeding animals. Species comprising much of the mid-intertidal turf characteristic of the sewage-disturbed area showed considerably greater productivity per unit of thallus area than most of the other macrophytes measured. Outfall populations tended to have higher energy contents than did populations from the unpolluted area. Energy-rich compounds appear to be entering the intertidal food web through the omnivores and suspension feeders of the outfall community. The outfall serves as an attractant and food source for a few species of finfish that are generalized feeders. Macrophytes with higher sewage-tolerance display low photosynthetic quotient values during exposure to effluent; higher values are associated with forms having low physiological tolerance to sewage. It is suggested that tolerant species exhibit carbohydrate metabolism during exposure to effluent stress, whereas intolerant forms tend toward protein and lipid metabolism.
W77-10512

ENVIRONMENTAL IMPACTS OF ADVANCED WASTEWATER TREATMENT AT ELY, MINNESOTA,
Corvallis Environmental Research Lab., Oreg.
For primary bibliographic entry see Field 5D.
W77-10536

THE PRESENT STATE AND PROBLEMS ON THE RED TIDE RESEARCH IN JAPAN, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5B.
W77-10551

ELECTROBIOCHEMICAL NEUTRALIZATION OF ACID MINE WATER,
Geological Survey, Reston, Va. Geologic Div.; and Geological Survey, Reston, Va. Conservation Div.
For primary bibliographic entry see Field 5B.
W77-10569

ACTIVITY OF INTESTINAL ARYL HYDROCARBON HYDROXYLASE IN GUINEA PIGS FED HIGH ELEMENT CONTAINING SLUDGE-GROWN CABBAGE,
Institute of Food Science, Geneva, N. Y.
G. S. Stoewsand, J. G. Babish, and D. J. Lisk.
Federation Proceedings, Federation of American Societies for Experimental Biology, Vol 36, No 3, p 4626, March, 1977.

Descriptors: *Heavy metals, *Toxicity, *Enzymes, *Growth rates, *Vegetable crops, Sludge disposal, Industrial wastes, Municipal wastes, Diets, Waste disposal, Waste water treatment.
Identifiers: Aryl hydrocarbon hydroxylase, Sludge-grown cabbage.

The high levels of heavy metals present in municipal sewage sludge and industrial wastes represent a barrier to agricultural application of these products. A study was performed to examine the potential toxic effects of this application by feeding young male guinea pigs for 100 days on a diet, of which 45% was cabbage grown in municipal sewage sludge. This sludge-grown cabbage contained Al, As, Ba, Cd, Cr, Co, Cu, Eu, Na, Mo, Sr, Th, and Yb at levels 100% more than those in soil-grown cabbage. No adverse effects were apparent in the animals. The guinea pigs fed sludge-grown cabbage had a slightly elevated growth. Aryl hydrocarbon hydroxylase activity in the test animals was 130% of controls. This finding correlates with increased enzyme (hepatic and tissue microsomal mixed-function oxidase) levels observed in prior studies on animals fed high trace-metal, waste-amended diets. (Collins-FIRL)
W77-10576

TRACE ELEMENTS IN WASTEWATER,
California Univ., Riverside. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-10577

A HYGIENIC EVALUATION OF BORON IN POTABLE WATERS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Medisinskii Institut (I) (USSR). Dept. of Public Hygiene
T. S. Khachatryan, and A. F. Nazarenko.
Zh Eksp Klin Med. 13(1), p 29-34, 1973.

Descriptors: *Boron, *Potable water, Diseases, *Public health, Water supply, Enzymes, Evaluation, Water pollution effects, *Animal diseases.
Identifiers: *USSR(Moscow).

The effect of water with various B contents on the secretory enzymatic activity of the gastrointestinal tract was observed on 3 dogs in 200 experiments of 6 h each. Solutions of B were made with Moscow (USSR) tap water in 0.5, 1.5, 2.0, 3.0, 4.5, 9.0 and 15.0 mg/l. The animals had their stomachs isolated by the Pavlov method, fistula of the large stomach and an isolated section of the thin intestine by the Tir-Bella method. A depression of secretory and acid-forming functions of the stomach and a lowered quantity of unbound and general acidity of the gastric juices were noted in concentrations of 3 mg/l or more. B lowers enterokinase activity of the intestinal juices and feces by 1.5 x with 3 mg/l concentration and 5-6 x with 2 mg/l concentration. A correlation between the acid-forming function of the stomach and alkaline phosphatase was noted. Introduction of a 15 mg/l concentration of B water led to morphological changes in the epithelium of the mucous membranes and glandular apparatus of the stomach and in the mucous membrane of the intestine.--Copyright 1974, Biological Abstracts, Inc.
W77-10582

THE EFFECT OF URBAN SEWAGE AND INDUSTRIAL WASTES OF BIALYSTOK ON THE PURITY AND BIOCOENOSIS OF THE SUPRASL AND NAREW RIVERS (WPLYW SCIEKOW MIEJSKICH I PRZEMYSLOWYCH M. BIALEGOSTOKU NA CZYSTOSC I BIOCENOZE RZEKI SUPRASLI I NARWI),
Bialystok Medical Academy (Poland). Div. of Hygiene.
T. Januszko, and E. Malyszko.
Gaz, Woda i Technika Sanitarna, Vol. 51, No. 2, p 48-51, 1977. 22 ref.

Descriptors: *Water pollution effects, *Municipal wastes, *Industrial wastes, Water pollution control, Rivers, Turbidity, Odor, Oxidation, Ammonia, Nitrites, Chlorides, Bacteria, Waste disposal, Waste water treatment.
Identifiers: Bialystok(Poland), Suprasl River, Narew River.

The effect of a tributary river, Biala, carrying urban sewage and industrial waste material, on the purity and biocoenosis of the downstream section of the Suprasl and Narew Rivers is evaluated. Five water-testing positions at varying distances from the pollution source were selected. Water samples for physico-chemical, bacteriological, and hydrobiological tests were taken, as were plankton samples. Physico-chemical properties were determined by domestically developed mthods. Differentiation of microorganisms was undertaken by routine processes. It was determined by standard methods that the pollution of the downstream section of the sewage and waste-carrying Biala River was very high. Wastes in the Biala caused high water pollution of the lower segment of the Suprasl River, as indicated by higher water turbidity, specific odor, high oxidizability, and much higher ammonia, nitrite, and chloride levels. However, by physico-chemical standards, Suprasl River contaminants did not significantly affect the Narew River. This phenomenon could be explained by the considerable dilution of the pollutants entering the Narew River. Microbiologically the Biala River exhibited a superiority of rods over cocci; the Suprasl had at first a low bacteria index, and downstream had an increase of rods. In the Narew, cocci at first slightly dominated over rods; in its lower part, affected by the water of the Suprasl, rods numerically equalled cocci. The downstream portions of the Suprasl and Narew Rivers polluted by the waters of the Biala were characterized by the disappearance of pollution-sensible hydrobiological species and dominance of saprobic species. (Takacs-FIRL)
W77-10593

GREAT LAKES EUTROPHICATION: THE EFFECT OF POINT SOURCE CONTROL ON TOTAL PHOSPHORUS,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
S. C. Chapra, and A. Robertson.
Science, Vol 196, No 4297, p 1448-1450, June 1977. 1 fig, 13 ref.

Descriptors: *Eutrophication, *Mathematical models, *Phosphorus, *Great Lakes, Water quality standards, Loads(Forces), Domestic wastes, Surface runoff, Waste water treatment.

A mathematical model was developed to describe phosphorus-induced eutrophication in the Great Lakes. The model of the total phosphorus budget for the Great Lakes was based on the assumption that a lake's trophic state is predominantly determined by its phosphorus levels. Basic forcing functions of the model were variables which represented human activities in each drainage basin. These variables were translated into phosphorus loadings by a waste source submodel. Three groups of waste sources were considered: domestic sources, land runoff, and atmospheric inputs. The model acknowledges exchange between lakes and in-lake losses. The latter was a first-order loss whose basic parameter was the apparent settling velocity of total phosphorus. The model was a set of ordinary differential equations. The model revealed that a 1 mg/liter effluent restriction would provide significant water quality improvements. Phosphorus levels in central and eastern basins of Lakes Erie and Ontario would fall from over 20 micrograms/liter to about 10 micrograms/liter. Even lower concentrations would be achieved in Lake Michigan. Minor

rovements would be effected in Lakes Superior nd Huron. The western basin of Lake Erie, aginaw Bay, and lower Green Bay have naturally igher phosphorus concentrations. The proposed estriction would not reduce total phosphorus in ese areas below 20 micrograms/liter. (Collins-IRL)
W77-10597

NNUAL CYCLE OF PRIMARY PRODUCTION ND ITS RELATION TO THE NUTRIENTS IN ANARY ISLAND WATERS, (IN SPANISH),
stituto Espanol de Oceanografia, Madrid Spain).
. R. De Leon, and J. G. Braun.
ol Inst Esp Oceanogr. 167, p 1-24, 1973.

escriptors: *Primary productivity, *Atlantic cean, *Chlorophyll, Light, *Nutrients, Oxygen, easonal, Temperature, Thermocline, *Annual.
entifiers: *Canary Islands(Spain).

or 12 mo. investigations were carried out at a sta- on situated in the Atlantic Ocean 2 miles from the ast, off Santa Cruz de Tenerife, at a depth of 0 m. During this time we measured the primary oduction, chlorophyll a, light penetration, tem- erature, O2, phosphate, nitrite, nitrate and sil- ate within the upper 200 m. of the station. A asonal cycle of production was observed, with aximum values in spring, 954 mg C/m2/day and inimum in summer 129 mg C/m2/day in ac- rdance with the distribution of chlorophyll a. oduction was dependent upon vertical mixing, sociated with the presence of a seasonal ther- ocline. Nutrient concentration was very low and owed little evidence of seasonal variability, with aximum values of 0.18 micrograms-atm P/l. and 0 micrograms-atm N/l. Production depended on apid recycle of nutrients on the first 200 m.-- pyright 1974, Biological Abstracts, Inc.
7-10598

THOGENIC AMOEBAS FROM BRACKISH ND OCEAN SEDIMENTS, WITH A DESCRIP- ON OF ACANTHAMOEBA HATCHETTI, N.
tional Marine Fisheries Service, Oxford, Md.
K. Sawyer, G. S. Visvesvara, and B. A. Harke.
ience, Vol. 196, No. 4296, p 1324-1325, June, 7. 1 fig, 1 tab, 12 ref.

scriptors: *Water pollution sources, athogens, *Aquatic microorganisms, Sewage posal, Algae, Water pollution control, Water lution effects, Diseases, Infection, Waste posal.
ntifiers: Acanthamoeba culbertsoni, anthamoeba hatchetti, n. sp., New York Bight, timore Harbor(Maryland).

ean disposal of sewage wastes was considered study on pathogenic amoebas from brackish ocean sediments. Sediments from various lo- ions, including the New York Bight and the timore Harbor, were examined. Acanthamoeba ertsoni were isolated from Bight sediment and anthamoeba hatchetti, n. sp., were found in timore Harbor sediment; both proved deadly to oratory mice. Since Acanthamoeba are erally found in soil and freshwater, their dis- ution in brackish water and ocean sediment attributed to stream and river runoff and to ine disposal of sewage and dredge spoils. The posal of sewage in previously unaffected ine areas should be carefully considered. oeba-virus interactions should be further stu- since amoebas feed on filamentous blue- n algae and are a reservoir for strain LPP-1 nophage. (Collins-FIRL)
7-10639

TIVITY OF PHYTOPLANKTON EXCRETED FISH,
yo Metropolitan Univ. (Japan). Faculty of nce.
N. Nakamoto, and T. Okino.
Bull Plankton Soc Jap. 19(1), p 1-4, 1972.

Descriptors: *Phytoplankton, Algae, *Chlorophyta, Eutrophication, *Chlorophyll, Ponds, Water pollution.
Identifiers: *Goldfish, Fish ponds.

When green algae bloomed in a fish pond, omnivorous goldfish (Carassius carassius) ate them. The ingested green algae were excreted without digestion. The chlorophyll in the feces was almost unchanged from the chlorophyll in the phytoplankton of the fish pond. The phytoplankton excreted by the fish still had the same activity as the phytoplankton in the fish pond.--Copyright 1974, Biological Abstracts, Inc.
W77-10642

THE PHYSIOLOGICAL CHARACTERISTICS OF NERITIC RED TIDE FLAGELLATES, (IN JAPANESE),
Hiroshima Univ. (Japan). Faculty of Fishesies and Animal Husbandry.
Bull Plankton Soc Jap. 19(2), p 104-114, 1973.

Descriptors: *Red tide, *Dinoflagellates, *Neritic, *Plant growth, vitamins, Gymnodinium, Iron, Manganese, Nitrogen, *Nutrients, Phosphorus, Proteins, Rainfall, Salinity, Runoff, Temperature.
Identifiers: B-12, Biotin, Eutreptiella sp, Exuviaella sp, Gymnodinium nelsoni, Heterosigma akashiwo, Heterosigma inlandica, *Japan, Peridinium hangoei, Polykrikos schwartzi, Purines, Pyrimidines, Rhodomonas ovalis, Thiamine.

This article is a collective summarization of the 6 serial reports on the neritic red tide flagellates. Axenic cultures of the organisms were obtained by micropipette washings, then, the growth response to the ecological factors, such as temperature, salinity, pH and the nutrient requirements, with special reference to the growth promoting substances, were examined on 8 spp. of flagellates. All the organisms tested grow well in the water temperature higher than 20C (optimal temperature 21-26C). Most of them are euryhaline over a wide range. The organisms can utilize nitrate-N, ammonium-N, and urea. Nitrate-N is the best N source, and is utilized by all the organisms. Several organisms grow greatly in the low concentration of ammonium-N (< 300 micrograms-N/l). All the organisms are able to utilize both inorganic and organic P and store the P in excess. All the organisms need vitamin B12 for growth. Three of them, Rhodomonas ovalis, Polykrikos schwartzi and Eutreptiella sp. also require thiamine and biotin. These organisms are divided into 3 types by nutrient requirements. Great multiplication of the organisms is induced by supply of N, P and vitamins under good combination of ecological factors. The red tide caused by these organisms may be expected to occur by addition of water washed from the land after heavy rainfall or by polluted water (Heterosigma akashiwo, Rhodomonas ovalis). The growth of the organisms is stimulated by supply of the high concentration of Fe or/and Mn (Eutreptiella sp. (I), Exuviaella sp.). The growth of the organisms is accelerated by addition of the special organic substances such as purines and pyrimidines or decomposed matter of proteins. A majority of the neritic red tide flagellate belong to this type (Heterosigma inlandica, Peridinium hangoei, Gymnodinium nelsoni, Polykrikos schwartzi and Exuviaella sp.). Frequent occurrence of red tides in the Inland Sea (Japan) is probably caused mainly by the organic pollution of the sea-water. The growth mechanisms of flagellates leading to the red tide are illustrated.--Copyright 1974, Biological Abstracts, Inc.
W77-10686

SEASONAL CHANGE OF GROWTH PROMOTING EFFECT OF MUD EXTRACTS AND SEA WATER COLLECTED DURING VARIOUS SEASONS AT ISE BAY ON A RED TIDE FLAGELLATE HETEROSIGMA INLANDICA HADA, (IN JAPANESE),
Mie Prefectural Univ., Tsu (Japan). Faculty of Fisheries.
F. Uyeno, and K. Nagai.
Bull Plankton Soc Jap. 19(2), p 97-103, 1973.

Descriptors: *Seasonal, *Red tide, *Plant growth, *Mud, *Sea water, Bays, Dinoflagellates, Mixing, Eutrophication, Water pollution, Nutrients.
Identifiers: Heterosigma-inlandica, *Japan(Ise Bay).

To clarify whether the growth promoting effect on the red tide flagellates of sea mud has a seasonal variation, and when the effect reaches the photosynthetic layer, a series of experiments were performed with samples of sea mud and sea water collected at a station of Ise Bay (Japan) during various months. H. inlandica was used as an indicator. Mud collected in Sept., Oct., and Dec. showed a large growth promoting effect; samples taken from May-Aug. showed about half the growth effect of the Oct. one. Generally, water samples from deeper layers showed larger effects, but throughout Oct. only from bottom to surface, there was a rather large uniform effect. There is a seasonal variation in the growth promoting effects of bottom mud on red tide organisms, but the supply of the factor to the upper layers may be dependent on the moderate autumnal vertical transport of bottom water to the euphotic zone. Perhaps, the coincidence of the season during which the growth promoting effects by the mud and by the water occur prominently is not a general pattern in Ise Bay, because the mechanism in both cases is completely different. This means that there is possibility to grow a red tide by the mixing of mud and water. In shallow waters, the growth promoting substances can easily attain the surface at any season.--Copyright (c) 1974, Biological Abstracts, Inc.
W77-10701

TOXICITY OF EFFLUENTS FROM THE PURIFICATION OF TALL OIL PRODUCTS AND CRUDE TURPENTINE FOR THE MICROFLORA OF TREATMENT FACILITIES (OPREDELENIE TOKSICHNOSTI STOCHNYKH VOD OT USTANOVOK PO OCHISTKE TALLOVYKH PRODUKTOR I SKIPIDARA-SYRTSA PO OTNOSHENIYU K MIKROFLORE OCHISTNYKH SOORUZHENII),
Z. K. Kuptsova, N. P. Drozdov, and N. G. Konovalova.
Lesokhimiya Podsochka, No. 4, p 7-8, 1976. 2 tab.

Descriptors: *Toxicity, *Microorganisms, *Effluents, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Activated sludge, Waste water treatment, Water pollution treatment, Waste treatment, Biochemical oxygen demand, Chemical oxygen demand, Phosphorus, Nitrogen, Ammonia, Nitrates, Bacteria, Burning, Neutralization, Byproducts.
Identifiers: *Tall oil, *Turpentine, Nitrites, Black liquor.

Effluents from sulfate soap decomposition, tall oil rectification, and crude turpentine rectification were purified by the activated sludge process, using the sludge from the Kotlas and Bratsk wood-processing complexes. The overall effluents from the two mills, purified under the same conditions, served as controls. The course of purification was evaluated by weekly determinations of BOD, COD, contents of phosphorus, ammonia nitrogen, nitrites and nitrates, and total bacterial counts. The initial reduction of the number of bacteria, due to adaptation to the substrate, was followed within a few days by normal growth. No toxic effects of the tall oil and turpentine products on the activated sludge were observed. Consequently, effluents form the distillation of tall oil and turpentine can be purified jointly with the overall mill ef-

fluents. The effluent from sulfate soap decomposition, because of its high content of pollutants, should not be purified jointly, but should either be burned or neutralized and evaporated jointly with black liquor. (Stapinski-IPC)
W77-10703

A SUMMARY OF RECEIVING WATER DISSOLVED OXYGEN CONDITIONS BELOW PULP AND PAPER MILL LOCATIONS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5B.
W77-10705

GYMNODINIUM TYPE-'65 RED TIDE IN OCCURRING ANOXIC ENVIRONMENT OF OMURA BAY, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
S. Iizuka.
Bull Plankton Soc Jap. 19(1), p 22-33, 1972.

Descriptors: *Red tide, *Gymnodinium, Bays, Ammonia, Dissolved oxygen, Phosphates, Silicates, Vitamins, Salinity, Oxygen requirements, Hydrogen ion concentration.
Identifiers: *Anoxic environment, *Japan(Omura Bay).

The Gymnodinium type-'65 red tide in Omura Bay (Japan) may be classified into 'July red tide' associated with the inflow of fresh water in rainy season and 'September red tide' connected to the anoix bottom water. The frequent occurrence of September red tide has been limited to the regions in the vicinity of the anoxic central part of the bay and the red tide occurred when O2 tension in the bottom water of the regions attained less than 0.5 cc/1. Then, the pH value of the bottom water was less than 7.8, which coincided with the optimum pH value for the growth of the causative organisms. Field observations and laboratory work established that Gymnodinium type-'65 and 2 other strans were highly tolerant of low O2 concentration and were stimulated by sulfide in the medium. Phosphate and ammonia may be released from the bottom mud when oxygen tension is very low. A scheme is presented to show how the seasonal red tides could occur in Omura Bay.--Copyright 1974, Biological Abstracts, Inc.
W77-10706

GROWTH OF GYMNODINIUM TYPE-'65, CAUSATIVE ORGANISM OF RED TIDE IN OMURA BAY, IN MEDIUM SUPPLIED WITH BOTTOM MUD EXTRACT,
Nagasaki Univ. (Japan). Faculty of Fisheries.
K. Hirayama, and K. Namaguchi.
Bull Plankton Soc Jap. 19(1), p 13-21, 1972.

Descriptors: *Gymnodinium, *Plant growth, *Benthos, Mud, *Red tide, Nutrients, Bays, Sea water, Eutrophication, Growth rates, Degradation(Decomposition).
Identifiers: Anoxic conditions, *Japan(Omura Bay).

Regarding the red tide which occurred in Omura Bay, Japan, detailed field observation shows that the outbreak of the red tide is preceded by the anoxic or nearly anoxic status in the bottom water owing to the bloom on 1 of the species of Gymnodinium, Iizuka and Irie (1969) found. The possibility that the dissolution of materials from the bottom mud into sea water accelerated the growth of this species is studied. A hot water extract of bottom mud collected in Aug. when red tide frequently occurred, promoted the growth of the organism. It could not be clarified whether or not the bottom mud collected in April when red tide rarely occurred had such an effect. Growth in the medium supplied with supernatant fluid of anaerobically decomposed mud was more accelerated than in the medium supplied with aerobically decomposed fluid. Sodium sulfide added to the medium in low concentration promoted growth. The dissolution of anaerobically decomposed bottom mud into sea water could be one of the causes of the outbreak of the red tide in Omura Bay.--Copyright 1974, Biological Abstracts, Inc.
W77-10707

HOLOZOIC NUTRITION OF THE CILIATED PROTOZOA: ITS CONSEQUENCES IN THE NATURAL AND ARTIFICIAL PURIFICATION OF WATER, (IN FRENCH),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
D. Dive.
Annee Biol. 12(7/8), p 343-380, 1973.

Descriptors: *Protozoa, Nutrients, *Water purification, Self purification, *Bacteria, Microorganisms, Pathogenic bacteria.
Identifiers: Holozoic nutrition.

A review of experiments and observations of ciliated Protozoa in the complex interactions among microflora in natural and artificial media is discussed along with possible applications in the fields of water purification and pisciculture. These protozoa flourish in water with high microorganism concentrations. Nutritional selectivity often results in the eradication of fecal bacteria and pathogenic germs and the subsequent formation of the biocenosis composed of microorganisms nonbeneficial to these Ciliates. Bacteria studied included numerous species of Escherichiae, Salmonellae, Klebsiellae, Proteae, Pseudomonas, Chromobacterium, Spirillaceae, Micrococcacae, Lactobaccilacea, Bacillacae and mycobacteria. Protozoa tested included Amoebae spp., Peritricha, Hypotricha, Holotricha, Trichostoma, Tetrahymenidae, and Paramecium.--Copyright (c) 1974, Biological Abstracts, Inc.
W77-10708

DAPHNIA PULEX PULLS ITS WEIGHT IN PULP MILL TOXICITY TESTS,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5A.
W77-10718

A PRESENTATION OF THE NORWEGIAN EFFECT 'ACID PRECIPITATION-EFFECTS ON FOREST AND FISH',
Royal Norwegian for Scientific and Industrial Research, Kjeller.
L. N. Overrein.
Water, Air and Soil Pollution, Vol. 6, No. 2-4, Sept.-Nov. 1976, p 167-172.

Descriptors: Foreign projects, Foreign research, Acid-base equilibrium, Precipitation(Atmospheric), Runoff, Eutrophication, Path of pollutants, Soil contamination, Water pollution, Fishkill, Forests, *Air pollution effects.
Identifiers: *Norway, *Acid precipitation.

An overview is given of the Norwegian SNSF Project, a research effort mounted in 1972 for the purposes of establishing as precisely as possible the effects of acid precipitation on forests and on freshwater fish, and of investigating the effects of air pollutants on soil, vegetation, and water, to the extent needed to learn about the acid precipitation effects of these pollutants. The multidisciplinary, project-oriented, cross-institutional, self-governing research effort involved mainly four institutes and is coordinated by the Norwegion Institute of Air Research. The whole of Norway is used as the field of operation. No findings are published for the project, but initial basic ongoing research areas are catalogued for studies of air pollution deposition, effects on the forest environment, effects on aquatic ecosystems and effects on inland fishing. Intensive studies are being carried out to quantify damages to forest growth caused by long-range transported air pollutants. Also being studied are high pH levels in runoff waters from snowfields in terms of effects on ecosystems in Norwegian lakes and rivers. (Harris-Wisconsin)
W77-10724

POLYCHLORINATED BIPHENYL INHIBITION OF MARINE PHYTOPLANKTON PHOTOSYNTHESIS IN THE NORTHERN ADRIATIC SEA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
L. W. Harding.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 5, p 559-566, 1976. 1 fig, 1 tab, 33 ref. NSF GF31947X and GA 3127X.

Descriptors: *Polychlorinated biphenyls, *Marine algae, *Photosynthesis, *Inhibition, Sea water, Ecological distribution, Analytical techniques, Water pollution effects.
Identifiers: *Adriatic Sea.

The extent of photosynthetic inhibition of natural phytoplankton assemblages from the northern Adriatic Sea by PCBs was investigated by taking samples at various stations and then placing them in incubation bottles to which were added the PCB Aroclor 1254 to yield concentrations of 1.0, 10.0, 50.0 or 100.0 microgram/l. The PCB reduced phytoplankton photosynthesis in doses as low as 10 microgram/l. Analysis of variance indicated differences among stations as an important factor governing the magnitude of PCB-induced photosynthetic inhibition. The manner in which PCBs are introduced into marine waters and partitioned among particulate components, and the form in which these contaminants are available to phytoplankton are important variables in the degree of photosynthetic inhibition. The amount available to phytoplankton may be far greater than the quantities detected in seawater as PCBs are removed through various biological and physical uptake mechanisms almost immediately upon the introduction, thus PCB concentrations may reflect merely the transient presence of these compounds. Elevated phytoplankton standing crops and increased concentrations of suspended organic material could influence the manner in which lipophilic compounds (which enhance solubilization of PCBs) are partitioned among the particulate components. Also different phytoplankton species exhibit different tolerances for PCBs, thus similar doses may elicit dissimilar responses from various phytoplankton aggregates. (Auen-Wisconsin)
W77-10728

THE EFFECTS OF VARIOUS AROCLOR FRACTIONS ON THE POPULATION GROWTH OF CHLORELLA PYRENOIDOSA,
Wheaton College, Norton, Mass. Dept. of Biology.
M. L. Hawes, J. C. Kricher, and J. C. Urey.
Bulletin of Environmental Contamination and Toxicology, Vol 15, No 1, p 14-18, 1976. 2 tab, 1 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Chlorella, *Environmental effects, Inhibition, Chlorine, Toxicity, Pesticide residues, Water pollution effects.

The effects of the PCB Aroclor at different chlorine contents (Aroclor fractions 1242, 1254 and 1268) on Chlorella pyrenoidosa populations were tested at concentrations of 1 ppm and 10 ppb. Aroclor 1242 treated populations were reduced by 64% in 8 hours. Aroclor 1254 produced a 45% reduction, and Aroclor 1268 resulted in a 36% reduction at 8 hours. Aroclor 1242 populations remained at much lower densities than the control but the difference between the controls and the cultures decreased as populations grew. The Aroclor 1254 treated populations equaled the controls by 129 hours. Aroclor 1268 reached the control population levels by 56 hours. The results indicate that the initial perturbation caused by each Aroclor was inversely related to the

chlorine content of the PCB. These experimental results agree with the theory that sublethal effects of PCB toxicity are not directly correlated with chlorine content whereas lethal effects are inversely correlated, provided only if Chlorella cells are killed by PCB concentrations. However, the actual cause of the reduced populations was unknown. Experiments with Aroclor concentrations of 100 ppb compared with concentrations of 1 ppm demonstrated that lower concentrations of PCB had decidedly less effect on the Chlorella population growth. The indications are that these PCBs exert a temporary depressing effect on these populations and only at a concentration substantially higher than currently found in most ecosystems. (Auen-Wisconsin)
W77-10729

A PRODUCTION MODEL FOR MYRIOPHYLLUM SPICATUM L.,
Wisconsin Univ., Madison. Dept. of Botany; and Oak Ridge National Lab., Tenn.
J. Titus, R. A. Goldstein, M. S. Adams, J. B. Mankin, and R. V. O'Neill.
Ecology, Vol 56, No 5, p 1129-1138, 1975. 5 fig, 1 tab, 33 ref. NSF AG-199, BMS69-01-147A09, EFG2-6308.

Descriptors: *Aquatic weeds, *Productivity, Mathematical models, Submerged plants, Wisconsin, Photosynthesis, Temperature, Light, Plant growth, Depth, Growth rates, Eutrophication, Lakes.
Identifiers: Water milfoil, *Lake Wingra(Wis), Myriophyllum spicatum L, Model WEED.

A mathematical model--WEED--was developed to study the productivity and growth form for the submerged macrophyte (Myriophyllum spicatum L. in Lake Wingra, Madison, Wisconsin. The model coordinates four biomass compartments (leaves, stems, roots and carbohydrates) with selected physiological processes evaluated for a stratified sq m water column. Light and temperature are the primary forcing functions. The model considers growth form (depth distribution of biomass), total biomass/sq m, the depth profile of photosynthesis and macrophyte contributions to dissolved and particulate organic matter pools. Model explorations of depth distribution as a function of turbidity have generated a general hypothesis about growth strategies in macrophytes. In shallow turbid waters, there may be a selective advantage to the production of photosynthetic tissue near the base of the plant with later sloughing of this tissue when a canopy is formed at the surface. In deeper water, there may be a distinct advantage to increasing overwinter storage permitting rapid surfacing in spring. The response of Myriophyllum growth to temperature and light is emphasized. (Auen-Wisconsin)
W77-10731

THE INTERACTION OF NITROGEN ASSIMILATION WITH PHOTOSYNTHESIS IN NITROGEN DEFICIENT CELLS OF CHLORELLA,
University Coll. of Swanea (Wales). Dept. of Botany and Microbiology.
J. Thomas, C. R. Hipkin, and P. J. Syrett.
Planta, Vol 133, No 1, p 9-13, 1976. 2 fig, 4 tab, 30 ref.

Descriptors: *Chlorella, *Photosynthesis, *Nitrogen, *Respiration, *Nitrites, *Nitrates, Inorganic compounds, Biochemistry, Cultures, Light, Denitrification, Carbon dioxide.
Identifiers: Chlorella fusca, *Nitrogen assimilation.

The effects of adding inorganic nitrogen on the photosynthesis of nitrogen-deficient chemostat cultures of Chlorella fusca were investigated to determine their carbon dioxide fixation capacity. Addition of nitrate or nitrite reduces carbon dioxide fixation by as much as 75% due to the competition for electrons; the nitrite reduction step is the main competitor. The rate of nitrate disappearance is not affected by light nor greatly inhibited by DCMU, (3-(3',4'-dichloro)-1-1-dimethyl urea). But in darkness, or in light plus DCMU, about half of the nitrate which disappears accumulates as nitrite. Similarly, the rate of nitrite assimilation is only half as fast in darkness as in light and the addition of DCMU reduces the rate in light to the rate in darkness. The conclusion is that in nitrogen-deficient cells reduction of nitrate to nitrite can efficiently proceed by electrons derived from dark respiratory reactions, but the nitrite reduction step takes electrons both from dark respiration and from the photochemical mechanism. Tests with CCCP (carbonyl cyanide m-chlorophenylhydrazone) indicated that phosphorylation is less important; although nitrate assimilation is somwehat inhibited, no nitrite accumulates. Ammonium also reduces the carbon dioxide fixation rate by nitrogen-deficient cultures although its effect is less marked than that of nitrate or nitrite. (Auen-Wisconsin)
W77-10732

EFFECTS OF ACIDITY ON THE PHYTOPLANKTON AND PRIMARY PRODUCTIVITY OF SELECTED NORTHERN ONTARIO LAKES,
Guelph Univ. (Ontario). Dept. of Zoology.
R. E. Kwiatkowski, and J. C. Roff.
Canadian Journal of Botany, Vol 24, No 22, p 2546-2561, 1976. 8 fig, 6 tab, 49 ref.

Descriptors: *Acidic water, *Primary productivity, *Biological communities, *Air pollution effects, Varieties, Dominant organisms, Plankton, Hydrogen ion concentration, *Canada, Lakes.
Identifiers: Sudbury lakes(Ontario), Canadian Shield Lakes, Ruth and Roy Lake(Ontario), Johnnie Lake(Ontario), Carlyle Lake(Ontario), Spoon Lake(Ontario), Attlee Lake(Ontario), Daoust Lake(Ontario).

How depressed pH affects primary productivity and the planktonic and benthic communities was investigated in six lakes of the Sudbury area of Ontario, (Canada), where atmospheric sulfur dioxide fallout from a local nickel-copper mining complex increases the hydrogen ion concentration. The purpose of the study was to determine hydrogen ion levels which limit primary production and consequent changes in numbers and species composition of the phytoplankton, zooplankton and zoobenthos communities. Hydrogen ion activity varied from pH of 4.05 to 7.15 in the six lakes, with higher pH values associated with the harder water lakes. Heavy metals concentrations were well below limits lethal to the majority of the plankton species. Declining pH reduced chlorophyll-a with resultant increases in transparency. As pH declined, Chlorophyta diminished in importance and the Cyanophyta became dominant. The phytoplankton diversity index retained relatively unchanged between pH values of 7.0 to 5.0 but decreased at lower values. Primary production (mg C/cu m/hr) was reduced in lakes below pH 5.5; however, as a result of the increased depth of the phobic zone in more acidic conditions, primary production remained high down to pH 4.4, below which it was drastically reduced. The plankton species found in these six lakes are listed. (Auen-Wisconsin)
W77-10733

A BASIC STUDY ON APPLICATION OF SYSTEMIC INSECTICIDES: V. EFFECTS OF RAINFALL ON TOXICITY OF VAMIDOTHION AND MALATHION, (IN JAPANESE),
Shionogi Co. Ltd., Shiga (Japan). Aburahi Lab.
T. Ishiguro, and S. Katayama.
Jpn J Appl Entomol Zool. 18(1), p 32-35, 1974.

Descriptors: *Insecticides, *Insect control, Rice, *Spraying, Rainfall, Crops, *Toxicity, Water pollution effects.
Identifiers: Leafhopper, *Malathion, Nilaparvata lugens, *Vamidothion.

Young rice plants were sprayed with vamidothion and malathion; artificial rain was administered before and after spraying. The plants were then placed in a polyethylene tube with 10 brown leafhoppers, Nilaparvata lugens. The effect of rainfall on the insecticidal properties of vamidothion and malathion was evaluated. In the case of vamidothion, rainfall before spraying had no influence on the insecticidal effect; with malathion, however, this rate decreased slightly. Rainfall after spraying diminished the insecticidal effects of both substances. Copyright 1975, Biological Abstracts, Inc.
W77-10737

TOXICITY OF ALKYLDINITROPHENOLS TO SOME AQUATIC ORGANISMS,
Fisheries and Marine Service, St. Andrews (New Brunswick).
V. Zitko, D. W. McLeese, W. G. Carson, and H. E. Welch.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 5, p 508-515, 1976. 2 tab, 21 ref.

Descriptors: *Phenolic pesticides, *Toxicity, Atlantic salmon, Crayfish, Lobsters, Fungicides, Acaricides, Herbicides, Agricultural runoff, Juvenile fish, Pesticide drift, Mode of action, *Phenols.
Identifiers: *Alkyldinitrophenols, Godin Brook(NH).

The acute toxicity levels of 18 2-alkyl-4,5-dinitrophenols (used as fungicides, acaricides, and herbicides) to juvenile Atlantic salmon, crayfish and lobster are presented, based on their respective octanol-water partition coefficients. The lethal threshold of alkyldinitrophenols to juvenile salmon, ranges from 0.70 mg/l for 2,4-dinitrophenol to 0.02 mg/l for dinocap. An equation was written to predict the lethal threshold of these compounds to the salmon. The tested compounds included both phenols and their esters and indications are that the ester group increases the transport rate of the compound to the active site but has no effect on the toxic mechanism. Octydinitrophenols are the most toxic of the alkyldinitrophenols. Dinoseb is extremely toxic to lobster larvae and has a lethal threshold of 0.0075 mg/l. Adult lobsters are more resistant, with an estimated threshold at 0.3 mg/l or lower. Crayfish are considerably more resistant since they survived exposures to 10 mg/l for 144 h. Alkyldinitrophenols are not bioaccumulated or biomagnified and their presence would be undetectable by analyses of aquatic fauna. The losses of alkyldinitrophenols by evaporation, adsorption, and uptake by the test animals were practically negligible and the hydrolysis rate is quite slow. Godin Brook, New Hampshire, polluted with dinoseb at a concentration of 4.81 mg/l, was devoid of fish and contained virtually no insects. (Auen-Wisconsin)
W77-10738

HEAVY METAL CONCENTRATIONS IN ORGANISMS FROM AN ACTIVELY DREDGED TEXAS BAY,
Texas A and M Univ., College Station. Dept. of Oceanography.
R. R. Sims, and B. J. Presley.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 5, p 520-527, 1976. 3 tab, 16 ref. DACW64-62-C-0046.

Descriptors: *Environmental effects, *Heavy metals, *Dredging, *Bays, Mollusks, Crustaceans, Fish, *Texas, Arsenic compounds, Cadmium, Copper, Lead, Mercury, Zinc, Oysters, Clams, Shrimp, Crabs.
Identifiers: *San Antonio Bay(Texas), *Bioaccumulation.

Concentrations of arsenic, cadmium, copper, lead, mercury and zinc were determined by laboratory analysis in mollusks, crustaceans and bony fish of San Antonio Bay, Texas, which has been dredged for more than 50 years. Oysters and clams contained the highest levels of these metals but concentrations were lower than those mollusks from other areas along the Gulf of Mexico not subjected to dredging. Higher copper and zinc levels in these organisms are due to their use of these elements as metabolites, but showed no relationship to dredging in the bay. Brown and white shrimp and blue crab did not differ appreciably in heavy metal content from crustaceans in other regions. The bony fish appeared to be lower in cadmium, copper, lead and zinc than the same species from non-dredged and relatively unpolluted areas. Various fish tissues showed a distinct preferential uptake; the liver tended to concentrate cadmium, copper and zinc while the heart concentrated lead. The stomach and flesh showed lower metals concentrations than other tissues. It is apparent that metal concentrations in the sediments from depths up to 2 meters are both low and uniform, indicating that the sediments do not represent any unusual metal reservoir for dredging to disturb and that no recent increase in metal input to the bay had occurred. (Auen-Wisconsin)
W77-10739

STUDIES ON THE MECHANISMS OF RED TIDE OCCURRENCE IN HAKATA BAY: II. GENERAL FEATURES OF RED TIDE FLAGELLATE, HETEROSIGMA SP., (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
T. Jonjo, and T. Hanaoka.
Bull Plankton Soc Jap. 19(2), p 75-81, 1973.

Descriptors: *Red tide, *Chlorophyll, Asia, Bays, Vitamin B, Nitrates, Hydrogen ion concentration, Phosphates, Pigments, Salinity, Silicates, Growth rates.
Identifiers: *Flagellates, *Heterosigma-sp, *Japan(Hakata Bay), Vitamin B-12.

A red tide flagellate, Heterosigma sp., was isolated from the sea water of Hakata Bay (Japan). The present work was designed to find out some general features of the organism under laboratory conditions. The organism found to be euryhaline (Cl 9.0-19.0‰) and the optimal chlorinity was 13.5‰. The optimal pH range was from 8.0-8.5. The organism could not develop and multiply without addition of the 'mud supernatant' even in the sea water enriched with NaNO3, K2HPO4, Na2SiO3, and vitamin B12. The optimal volume of the 'mud supernatant' to be added for the growth was 0.1-0.5 ml per 5 ml medium. The optimal inoculum size was 4 x 10 to the 4th power cells per 5 ml medium. Some morphological variations were observed under different cultural conditions. As to the intracellular pigments, the percentage of the pheo-pigments (Fa) to the pheopigments and chlorophyll-a (Fo) combined, i.e., Fa/(Fa + Fo) x 100(%) ranged from 25% in the exponential growth phase to 55% in the stationary phase.--Copyright 1974, Biological Abstracts, Inc.
W77-10740

THE ABUNDANCE OF DIATOMS IN THE SOUTHWESTERN NEARSHORE REGION OF LAKE ONTARIO DURING THE SPRING THERMAL BAR PERIOD,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
G. J. Lorefice, and M. Munawar.
In: International Association Great Lakes Research, Proceedings 17th Conference Great Lakes Research, p 619-628, 1974. 3 fig, 4 tab, 25 ref. EPA R 800701.

Descriptors: *Lake Ontario, *Seasonal, *Thermal stratification, *Thermal properties, *Diatoms, Great Lakes, International commissions, On-site data collections, Spatial distribution, Phytoplankton.
Identifiers: *Thermal bar period, Niagara River.

Analysis of phytoplankton collected from 45 stations on the southwestern nearshore of Lake Ontario during cruises in spring 1972 and compared with thermal bar analysis of the area suggest that the thermal bar might have acted as a barrier to water movement as indicated by the temperature contours found around the mouth of the Niagara River, where the river water 'pushed out' the 3C, 4C, and 5C isotherms and yet appeared to have not broken through. Phytoplankton was counted with an inverted microscope and total phytoplankton was counted at the 45 sampling stations. During the investigation period, the thermal bar remained within the study area. In April it stayed shoreward of the 4-km station, dipping into and out of the shore. By May it had advanced farther out but in most cases to less than 8 kms. In close agreement to the movement of the thermal bar, average biomass was greatest at the 1/2 and 4-km stations and low at the 8-km distance from shore. During April the 1/2-km stations had double the biomass as the 4-km stations and quadruple the biomass of the 8-km stations. In May the 1/2-km stations had half as more biomass than the 4-km stations and three as much as at the 8-km stations. Diatoms also showed an inshore to offshore decreasing trend for both periods except in the vicinity of the Niagara River mouth. (Harris-Wisconsin)
W77-10741

CONVERSION OF 1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE (DDT) TO WATER-SOLUBLE PRODUCTS BY MICROORGANISMS,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
F. W. Juengst, and M. Alexander.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A024 692, Price codes: A02 in paper copy, A01 in microfiche. Agricultural and Food Chemistry, Vol. 24, No. 1, p 111-115, 1976. 1 fig, 1 tab, 19 ref. N00014-67A-0077-0027, Nr 306-067.

Descriptors: *DDT, *Biodegradation, *Aquatic microorganisms, *Sea water, Water pollution sources, Microbial degradation, Model studies.
Identifiers: *Mucor alternans.

In efforts to learn if water-soluble compounds represent new groups of DDT metabolites generated by pathways of chemical or biodegradation not previously found, a study was made of the possible synthesis of water-soluble products from DDT by marine microorganisms and attempts were made to characterize the water-soluble metabolites formed from the insecticide by Mucor alternans. Forty-three percent of the bacteria, isolated from sea water and marine sediments, converted 5-10% of the DDT in the test to water soluble products and 35% of the bacteria transformed less than 5% of the insecticide to water-soluble metabolites. Several of these compounds so generated by the action of M. alternans were partially characterized in the investigation and found to be different from known products of DDT metabolism. But no conversion took place in models made of marine ecosystems which were supplemented with a large number of organic compounds and incubated aerobically, anaerobically and with supplemental inorganic nutrients. The evidence presented here suggests that the water-soluble compounds produced by M. alternans are distinct from known DDT metabolites. In addition, at least three components are apparently present, and they may all be acids. If chlorine is in fact absent from these compounds, they may be generated by a pathway involving the most extensive degradation of DDT so far reported by a single organism, since all products described to date contain chlorine. (Harris-Wisconsin)
W77-10742

INFLUENCE OF SEDIMENT INFLOW IN PHYTOPLANKTON PRIMARY PRODUCTIVITY IN LAKE TAHOE (CALIFORNIA-NEVADA),
California Univ., Davis. Div. of Environmental Studies.
M. M. Tilzer, C. R. Goldman, R. C. Richards, and R. C. Wrighey.
Internationale Revue der Gesamten Hydrobiologie, Vol. 61, No. 2, p 169-181, 1976. 5 fig, 7 tab, 32 ref.

Descriptors: *Lake sediments, *Primary productivity, *Photosynthesis, *Sediment load, *Nutrients, Light penetration, Phytoplankton, Chlorophyll, California, Eutrophication, Iron, Sediment distribution, Sediment transport, Sediment discharge, Suspended solids, Light intensity, Nevada.
Identifiers: Lake Tahoe(Calif-Nev), Sediment density.

The effects of both dissolved and particulate allochthonous materials on phytoplankton primary productivity were studies under conditions of reduced underwater light intensities and higher nutrient concentrations in a Lake Tahoe sediment plume during maximum spring runoff. Nutrient concentrations in the plume increased in proportion to sediment density whereas light transmission of the water was reduced with little effect on the spectral composition except for red light. Comparison with clear lake water conditions showed that light inhibition of photosynthesis at the lake surface was less pronounced in the plume than in clear water and light limitation occurred more rapidly in deeper layers. Lake experiments and laboratory bioassay results suggested that iron had the greatest stimulatory effect on both photosynthetic activity and biomass growth at maximum sediment densities. It was concluded that: (1) Increased turbidity reduces integral photosynthesis though this effect is diminished by less surface light inhibition, (2) increased nutrient inputs lead to higher primary productivity, and (3) the effects of combined sediment and nutrients inputs is dependent on the increase of the biomass relative to the increase of non-living seston in influencing the portion of underwater light which is absorbed and utilized by the photosynthetic pigments of the algae. (Luedtke-Wisconsin)
W77-10743

CHEMISTRY AND VEGETATION OF HIGHLY ACIDIC STREAMS,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5A.
W77-10744

THE TOXICITY TO FISH OF HERBICIDES RECOMMENDED FOR WEED CONTROL IN THE REWA,
University of the South Pacific, Suva (Fiji). School of Natural Resources.
L. T. Sun, and M. L. Gorman.
Fiji Agric J. 35(1), p 31-33, 1973.

Descriptors: *Toxicity, *Herbicides, Fish, *Aquatic weed control, Copper sulfate, *Paraquat, *Diquat, Water pollution effects, Asia, Pacific Ocean.
Identifiers: Fiji(Rewa River), *Poecilia-mexicana.

Laboratory tests of the toxicity to fish (test species Poecilia mexicana) of a herbicide mixture recommended for water-weed control in the Rewa river showed the copper sulfate component to be highly toxic and the diquat (paraquat in the tests) the copper sulfate component to be highly toxic and the diquat (paraquat in the tests) component less so.--Copyright 1974, Biological Abstracts, Inc.
W77-10745

SURVEY OF INDUSTRIAL PROCESSING DATA. TASK II--POLLUTION POTENTIAL OF POLYBROMINATED BIPHENYLS,
Midwest Research Inst., Kansas City, Mo.

For primary bibliographic entry see Field 5B.
W77-10750

WATER POLLUTION AND HUMAN HEALTH,
Ohio Univ., Athens. Dept. of Economics.
R. K. Koshal.
Water, Air, and Soil Pollution, Vol 5, p 289-297, 976. 5 tab, 26 ref, append.

Descriptors: *Public health, *Water purification, Water pollution effects, Water supply, Water reatment, Bacteria, Water pollution, Mortality, Morbidity, Statistical methods, Regression analysis, Diseases, Human diseases, Organic matter, Model studies.
dentifiers: Kidney infection, Sclerosis, Nephritis, Nephrosis, Solid particulates.

A statistical model is offered as a uniform measure f judging the quality of water and to study the effect of bacteria and solid particle water pollution n mortality rates of diseases which are primarily aused by water pollution. The model relates mortality rates from disease by water pollution caused o the level of 'pure' water used by the population n a state measured by the percentage of ouseholds using publicly-supplied water, race, ex, and age composition. Using three-year data rom 48 states centered around the 1970 census ear and applying a multiple regression technique, tatistical results are obtained for sclerosis, kidney nfections, and nephritis and nephrosis. It is shown nat a ten-point increase in the percentage of ouseholds using public water, ceteris paribus, ould decrease the death rate by 2.4 due to kidney nfection, by 2.3 due to sclerosis, and by 1.7 due to ephritis and nephrosis. While data limitations and mits in the present technical knowledge about ater pollution and its effects make these results ggestive rather than conclusive, they have broad nplications particularly for developing nations here a small proportion of the population is rved by publicly supplied water. (Luedtke-Visconsin).
W77-10751

RTHOPHOSPHATE TURNOVER IN EAST FRICAN LAKES,
unich Univ. (West Germany). Zoologisches Institut.
H. Peters, and S. MacIntyre.
ecologia, Vol 25, No 4, p. 313-319. 1976. 3 fig, 2 b, 23 ref.

escriptors: Seston, *Africa, Lakes, Phosphorus, *Cycling nutrients, Analytical chniques, Absorption, *Phosphates, Pollutant entification, Bioassay.
entifiers: *Orthophosphates, *Turnover te(Nutrients), *Nutrient availability, Kenya, oluble reactive phosphorus.

an investigation in which uptake kinetics were easured as an alternative using a nutrient bioasy for gauging nutrient availability, turnover rates 32P-P04 and concentrations of chemically-termined orthophosphate as soluble reactive osphorus (SRP) are reported for five East rican Lakes. Concentrations of SRP in surface ters ranged from 2,000 micrograms P/L to less n 3 micrograms/l. Lake Elmenteita, the main sin of Lake Naivasha, and Naivasha Crater ke had rapid turnover rates and very little pply of orthophosphate. Turnover was slow and hophosphate concentration high in both Lake kuru and the Crescent Island Crater basin of ke Naivasha with an average rate of 0.0023/min Lake Nakuru and no significant uptake observed in Crescent Island Crater basin. The conion that a large quantity of orthophosphate is ilable for algal growth was tested in Lake kuru by two further experiments. Results inated that colloidal binding of orthophosphate s limited and that particles retained by an 8.0 ro filter incorporated 66% as much tracer as ticles retained by a 0.1 micro filter. (Luedtke-sconsin).

W77-10752

NITROGEN UPTAKE AND RELEASE IN A FORESTED WATERSHED, LAKE TAHOE BASIN, CALIFORNIA,
California Univ., Davis. Div. of Environmental Studies.
R. N. Coats, R. L. Leonard, and C. R. Goldman.
Ecology, Vol 57, No 5, p. 995-1004, 1976. 8 fig, 2 tab, 29 ref. NSF GI-22.

Descriptors: *Nitrification, *Water quality, *Forest watersheds, *California, Soil water, Nitrogen cycle, Nitrogen, Ammonia, Nutrient removal, Precipitation(Atmospheric), Snowmelt, Forest soils, Coniferous forests, Streams, Runoff, Absorption, Land use, Watershed management.
Identifiers: Lake Tahoe(Calif), Land disturbances.

The role of soils in modifying water quality in a watershed of the Lake Tahoe basin, California was studied to relate water quality to land disturbance and to provide basic information on the nitrogen cycle in a coniferous forest ecosystem. Samples of precipitation and soil and stream water were collected and analyzed for NO3-N, NH4-N and to a lesser degree, dissolved organic nitrogen. Factors controlling nitrification in selected plots were studied using a soil perfusion technique. Results indicate that inorganic nitrogen input to the watershed by precipitation is 1-2kg/ha/yr. Output to the lake is 10-30% of the input. Inorganic nitrogen is removed from snowmelt water almost totally by well-developed conifer stands but less efficiently by poorly developed or disturbed stands. Alder stands release NO3-N to soil water, particularly in fall and early winter. Nitrification occurs in some coniferous forest soils and closely associated with NO3-N release. Significant nitrification is related more to the C:N ratio and stand basal area than to pH or release of toxic substances by decaying litter. (Luedtke-Wisconsin)
W77-10753

IN VIVO EXCRETIONS OF THE BLUE-GREEN ALGAE ANACYSTIS NIDULANS AND SYNECHOCYSTIS AQUATILIS IN MONO- AND MIXED CULTURES,
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
G. A. Karaush, and V. D. Fedorov.
Soviet Plant Physiology, Vol. 22, No. 3, p. 510-516, May-June 1975. 2 fig., 1 tab., 12 ref.

Descriptors: *Cyanophyta, *Algae, Cultures, Metabolism, Biochemistry, Chemical properties, Carbohydrates, Lipids, Amino acids, Organic acids, Nutrient requirements.
Identifiers: *Mixed cultures, *Photoheterotrophic metabolism, *Anacystis nidulans, *Synechocystis aquatilis, Filtrates, In-vivo excretions.

The content of carbohydrates, organic acids, amino acids, and lipids in filtrates of monocultures of the blue-green alga Anacystis nidulans and Synechocystis aquatilis and their mixtures was determined, to STET on the interrelationship between these cyanophyta in mixed cultures. Protein was not detected in any of the filtrates of investigated algal cultures. Results indicated that predominantly nitrogen containing compounds and lipids as well as carbohydrates accumulated in filtrates of A. nidulans before mineral nitrogen and phosphorus were exhausted from the medium. These compounds were then used by the culture as a source nitrogen after the mineral nitrogen from the medium was exhausted. Cultures of S. aquatilis primarily excreted organic acids as long as mineral nitrogen and phosphorus were present in the medium. However, after their exhaustion, the organic substances accumulated in the filtrate were not used by the culture. In mixed cultures, it is suggested that photoheterotrophic metabolism A. nidulans essentially utilizes the carbohydrate, organic acids, and lipid components of S. aquatilis and ultimately displaces the more autotrophic species. (Luedtke-Wisconsin)
W77-10755

SUMMER ZOOPLANKTON DISTRIBUTION IN A GEORGIA ESTUARY,
Skidaway Inst. of Oceanography, Savannah, Ga.
R. R. Stickney, and S. C. Knowles.
Marine Biology, Vol. 33, No. 2, p. 147-154, 1975. 4 fig., 1 tab., 11 ref. NSF GX-33615.

Descriptors: *Zooplankton, *Distribution, *Diurnal distribution, *Estuaries, *Georgia, Distribution patterns, Tidal waters, Summer, Light, Fish food organisms, Baseline studies.
Identifiers: *Acartia tonsa, *Copepod nauplii.

Distribution of zooplankton in the water column was studied as a way of assessing their utilization by the fish community as well as to provide baseline data on the zooplankton community of northern Georgia estuaries. Zooplankton were collected with Van Dorn bottles at two estuarine stations, at the surface, at two meters and at four meters depth, and at the bottom of the water column at two hour intervals for 11 days. Acartia tonsa was most concentrated at the surface at night and during high and rising tide but was more evenly depth distributed during day time, suggesting a negative phototaxic response. On the other hand, copepod nauplii were more abundant in surface waters than near the bottom, during all hours with the greatest concentration occurring during low tide. However, determination could not be made of utilization of the zooplankton community by fish because of the ability of species such as Pseudodiaptomus coronatus, Neomysis americana and other adult forms to escape the Van Dorn bottles. Of the 30 species collected during the sampling program, only A. tonsa and copepod nauplii are discussed quantitatively. (Luedtke-Wisconsin).
W77-10756

PHYSIOLOGICAL STUDIES OF SUBTIDAL RED ALGAE,
New Hampshire Univ., Durham. Dept. of Botany; and Jackson Estuarine Lab.
A. C. Mathieson, and T. L. Norall.
Journal of Experimental Marine Biology and Ecology, Vol. 20, No. 3, December 1975, p. 237-247. 11 fig., 12 ref. N0AA11.

Descriptors: *Photosynthesis, *Light, *Temperature, *Rhodophyta, Optimization, Seasonal, Spatial differences, Depth.
Identifiers: Euthora cristata, Phycodrys rubens, Phyllophora truncata, Ptilota serrata, Subtidal.

Photosynthetic responses of four subtidal red algae were determined under a variety of light and temperature conditions and evaluated for spatial, seasonal, and genetic differences. Optimal light requirements for net phosynthesis were relatively consistent, 465 to 747 ft. c at 5 degrees and 15 degrees C, though tetrasporic Euthora cristata reached a maximum net photosynthesis at 747-1080 ft.-c. Ptilota serrata and Phyllophora truncata increased their light optima with an increase in temperature. Depth and seasonal differences were also found in their photosynthesis-light relationships; winter plants exhibited lower light optima for net photosynthesis than spring plants. Deep-water populations of Ptilota showed lower light optima and reduced net photosynthesis compared with shallow subtidal populations. Photosynthesis-temperature relations of E. cristata, Phycodrys rubens, and Phyllophora truncata varied seasonally; winter plants displayed higher rates of apparent photosynthesis at low temperature, lower temperature optima, and reduced tolerance to high temperatures than summer plants. It is suggested tha optimal light and temperature requirements are adaptively adjusted to the respective New England habitats of the species. (Luedtke-Wisconsin)
W77-10757

LAKE MAHEGA: A MESOTHERIC, SULPHATO-CHLORIDE LAKE IN WESTERN UGANDA,
Duke Univ., Durham. Dept. of Zoology.
J. M. Melack, and P. Kilham.
Afr J Trop Hydrobiol Fish. 2(2), p 141-150, 1972.

Descriptors: Africa, Lakes, *Mesothrophy, *Eutrophication, Bacteria, *Cyanophyta, *Thermal water, *Chlorides, *Sulfates, Ions, Anions, Water chemistry, Sodium.
Identifiers: Inversion(Lake), *Synechococcus-bacillaris, *Uganda(Lake Mahega).

In May, 1971, Lake Mahega had pronounced mesothermy (40.0C at 1 m). Solar heating of a bloom of bacteria and the blue-green alga, Synechococcus bacillaris, probably caused the high temperature. A total ionic concentration gradient increasing from 192,000 mg-1-1 at the surface to 415,200 mg-1-1 at 3 m stabilized the thermally inverted water. Nearly equal amounts of chloride and sulphate accounted for about 90% of the anionic composition. Na was the major cation. Crystals of the triple salt, north-upite (Na2CO3-MgCo3-NaCl) and of thenardite (Na2SO4) were mixed with the surface sediment. It is possible that primary northupite deposition is occurring. Lake Mahegan is also the 1st mesothermic, sulfato-chloride lake reported for East Africa.--Copyright 1974, Biological Abstracts, Inc.
W77-10759

COMPARISON OF BACTERIAL AND ALGAL UTILIZATION OF ORTHOPHOSPHATE IN AN ESTUARINE ENVIRONMENT,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
M. A. Faust, and D. L. Correll.
In: Marine Biology, Vol 34, No 2, 1976, p. 151-162. 5 fig, 3 tab, 27 ref.

Descriptors: *Bacteria, *Algae, *Estuaries, Filtration, Biomass, *Phosphates, Phosphorus, Chesapeake Bay, Filters, *Absorption, Cycling nutrients, Microscopy, *Maryland, Estuarine environment.
Identifiers: Rhode River(Md).

In an effort to overcome lack of information about the role of various microorganisms in the process of phosphorus cycling in estuarine environments, finer-controlled filtration and microscopy was used to distinguish between bacterial and algal utilization of orthophosphate by plankton in the Rhode River sub-estuary of Chesapeake Bay. The differential filtration technique incorporated tests with flow filters of 5.0, 1.2 and 0.45 micrometer pore size. Light microscopy examination revealed that most of the bacterial population passed through a 5.0 micrometer filter while most algae were retained. Phosphorus uptake by algae and bacteria was closely correlated with cell biomass. Phosphorus uptake by algae was high only in the summer months whereas P-uptake was correlated with temperature or dissolved orthophosphate, total organic phosphate or total phosphate concentrations. Algal cell numbers had a high correlation with bacterial cell numbers (0.950) as did the algae and bacteria biomass (0.902) though high standard deviations from the means were found. The rate of P-uptake from water by algae and bacteria varied with season and with the species composition of the natural population. Bacterial and algal cell numbers and biomass were estimated in all experiments. (Luedtke-Wisconsin)
W77-10760

SORPTION AND HYDROLYSIS OF ADDED ORGANIC PHOSPHORUS COMPOUNDS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W77-10799

5D. Waste Treatment Processes

PROCEEDINGS: WORKSHOP ON NON-POINT SOURCES OF WATER POLLUTION.
Illinois Univ. at Urbana-Champaign. Coll. of Agriculture; and Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5G.
W77-10159

PROBLEMS AND POLICY ALTERNATIVES: URBAN AREAS,
Envirex, Milwaukee, Wis.
For primary bibliographic entry see Field 5G.
W77-10160

INFLUENCE OF ORGANIC CARBON AND MICROORGANISMS ON IRON AND SULFIDE CONCENTRATIONS IN GROUNDWATER,
Missouri Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-10183

MATERIALS RECOVERY AND ENERGY PRODUCTION FROM SOLID WASTES,
Stellenbosch Univ. (South Africa). Dept. of Chemical Engineering.
M. A. Conner
Chemsa, Vol. 2, No. 5, p 79-80, May 1976. 2 tab, 12 ref.

Descriptors: *Solid wastes, *Energy, Agricultural wastes, Industrial wastes, Domestic wastes, Fuels, Metals, Economics, Waste disposal, Costs, *Waste treatment.
Identifiers: *South Africa, *Materials recovery, *Energy production(Wastes).

The solid waste treatrment situation in South Africa is considered and the present and future importance of different options is assessed. The emphasis is on materials recovery and energy production and their relationship. It is concluded that integrated energy and materials recovery processes can make a significant contribution to the conservation of energy and certain materials. (So African Water Info Center)
W77-10200

OCCURRENCE AND POSSIBLE USE OF NON-SULPHUR PURPLE BACTERIA IN EFFLUENT TREATMENT PROCESSES,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W77-10207

BIOFLOCCULATION IN THE ACTIVATED SLUDGE PROCESS,
Wessex Water Authority, Bristol (England).
C. F. Forster.
Water SA, Vol. 2, No. 3, p 119-125, July 1976. 5 fig, 5 tab, 36 ref.

Descriptors: *Activated sludge, Proteins, Nucleic acids, Esters, Nitrogen compounds, Surface properties, *Flocculation, Metals, Molecular weight, Enzymes, Field tests, Fractionation, Polymers, Sewage treatment, *Waste water treatment.
Identifiers: *Bioflocculation, Gel filtration, Ultrafiltration.

The nature of the matrix of activated sludge has been investigated by a number of workers who have identified proteins, nucleic acids, poly-esters and poly-saccharides amongst the surface components. All of these polymers are potentially capable of being ionogenic and contributing to the surface charge of the sludge particles. Since the surface charge has been found to be directly related to the sludge settling characteristics, it is obviously important to ascertain how the various components interact and which are the more important. The mechanism for the uptake of metals by the sludge (or the sludge surface polymers) has been shown to depend on whether the polymer is in a fixed (or solid) state or in solution. Treatment of sludge by enzymes (cellulase and lysozyme) was also examined and this tended to confirm the ideas that flocculation is a multi-stage process. (So African Water Info Center)
W77-10208

DISINFECTION OF MUNICIPAL WASTE WATER WITH GAMMA RADIATION,
Johannesburg City Health Services (South Africa).
L. N. Melmed.
Water SA, Vol. 2, No. 3, p 131-135, July 1976. 2 fig, 4 tab, 2 ref.

Descriptors: *Disinfection, *Radiation, *Municipal water, Sewage effluents, Cobalt, Water reuse, Bacteria, Chlorination, Potable water, Ponds, Radioactivity, *Waste water treatment, Sewage treatment, *Gamma rays.
Identifiers: *Johannesburg (South Africa).

Disinfection of sewage effluents by means of gamma radiation, to render them suitable for reclamation and reuse, was investigated. Using Cobalt 60 as the radiation source, laboratory experiments showed that a total radiation dose of 50 krad reduced the E. coli count in settled biological filter effluent from between 2 x 10 to the 6th power and 5 x 10 to the 5th power/100 ml to 1 000/100 ml and the total viable count from 6 x 10 to the 6th power to 4 x 10 to the 3rd power/ml. A total radiation dose of 500 krad could produce a bacteriologically potable water from maturation pond effluent having an original E. coli content of 150/100 ml and a total viable count of 2 x 10 to the 5th power/ml. Preliminary experiments, to detect possible synergistic effects when chlorine and radiation are applied to settled filter effluent simultaneously or in series, were also carried out. The addition of 1 mg/l of chlorine applied simultaneously, or before radiaton, reduced the radiation dose required to produce a water containing 1 000 E coli per 100 ml from 50 krad to 30 krad. (So African Water Info Center)
W77-10210

A REVIEW OF BIOLOGICAL PHOSPHORUS REMOVAL IN THE ACTIVATED SLUDGE PROCESS,
Meiring (P. G. J.) and Partners, Pretoria (South Africa).
J. L. Barnard.
Water SA, Vol. 2, No. 3, p 136-144, July 1976. 9 fig, 12 ref.

Descriptors: *Phosphorus, *Activated sludge, Denitrification, Nitrates, Phosphates, Anaerobic conditions, Sewage treatment, Pilot plants, Oxidation ponds, Retention, Oxidation reduction potential, *Waste water treatment.
Identifiers: South Africa.

The conditions under which phosphate precipitation was observed in the activated sludge process were reviewed. These include phosphate removal in plug-flow systems such as was found in San Antonio, Baltimore and at the Hyperion plant of the City of Los Angeles, in the Pho-strip method and in the Bardenpho method designed originally for denitrification. An anaerobic basin is proposed at the head of those activated sludge plants in which either no nitrification takes place or nitrates are denitrified. The clarifier underflow and the feed can then be mixed in this basin in order to induce the anaerobic conditions required for phosphate removal. This basin is then followed by either an aeration basin in which no nitrification is allowed to take place, or is followed by a series of anoxic and aerobic basins for nitrification and denitrification. In either process, the mixed liquor would need to be aerated to a dissolved oxygen level of between 2 to 4 mg/l before passing it into the final clarifier. (So African Water Info Center)

V77-10211

IETERMARITZBURG'S NEW SEWAGE PU-IFICATION FACILITIES,
ietermaritzburg City Engineer's Dept. (South frica).
. V. Harris.
Municipal Engineer, Vol. 7, No. 5, p 63-67, 1976. 4 llus.

Descriptors: *Sewage treatment, *Sludge igestion, *Activated sludge, Screening, Settling anks, Sludge thickening, Chlorination, Methane, cum, Remote control, Incineration, *Waste ater treatment, *Treatment facilities.
dentifiers: South Africa, Umsindusi River, Pietermaritzburg(South Africa).

he Darvill Sewage Purification Works has been xtended from a capacity of 27 Ml per day in twen-y years. The new egg-shaped high rate digestors re the first to be constructed in Southern Africa. esign features and a description of the plant are iven. (So African Water Info Center)
V77-10212

A SANITARY ENGINEER'S VIEWPOINT ON TALL BUILDINGS,
Murray (Alex) Pty Ltd., Durban (South Africa).
For primary bibliographic entry see Field 8A.
V77-10213

THE KWA DABEKA-CLERMONT SEWERAGE CHEME-PLANNING, DESIGN AND OPERA-TION,
heron (J. C.), Burke and Isaac, Inc. (South frica).
. F. Antoni.
Municipal Engineer, Vol. 7, No. 1, p 37-41, 1976. 3 ig. map, 2 ref.

Descriptors: *Design, *Waste water treatment, ites, Industrial wastes, Housing, Planning, ewage treatment, Sewerage, Sewers, Design ata, Capital costs, Sludge treatment, Waste isposal, Sewage, *Operations.
dentifiers: *South Africa, Kwa Zulu, Kwa abeka, Clermont.

A new housing development with an estimated ul-mate population of 80 000 and an existing adjoin-ng township of 30 000 will be served by the new ewerage scheme. The early planning, final design nd plant selection, cost comparisons and operat-ng problems of the sewerage scheme and as-ociated works are described. (So African Water nfo Center)
V77-10220

OSSIBILITIES OF RECYCLING IN SOUTH FRICA, CHOICES AND CONFLICTS,
ohannesburg City Council (South Africa). Dept. f Health Services.
. Bolitho.
Municipal Engineer, Vol. 7, No. 1, p 19-21, 1976. 1 ab.

Descriptors: *Recycling, Municipal wastes, Waste isposal, Solid wastes, Incineration, Landfills, Costs, Planning, Transportation, Economics, Ad-inistration, *Water reuse.
dentifiers: *South Africa.

he re-use of waste components, net cost of alter-ative disposal processes, and methods of limiting ie quantities of waste are discussed. Urban lanning, transportation, and regional administra-on of waste collection and disposal are in-estigated. It is concluded that there are irrecon-ilable conflicts between potential reclamation echniques, and that conceptual models must be eveloped to indicate the direction of change of conomic and resource relationships. The most ensible and economic direct recycling procedure in the immediate future will be the reclamation of derelict land and the creation of recreation areas. (So African Water Info Center)
W77-10221

FISH WATER FLATS RECLAMATION WORKS.
Municipal Engineer, Vol. 7, No. 1, p 55-59, 1976. 3 illust.

Descriptors: *Sewage treatment, *Water reuse, Sewage disposal, Sewerage, Aeration, Pumping stations, Operating capacity, Aeration tanks, Settling tanks, Mechanical equipment, Thickeners, Scrubbers, Detritus, Equipment, *Treatment facilities, *Waste water treatment.
Identifiers: South Africa, *Port Elizabeth(South Africa).

The Port Elizabeth Municipality's sewerage water reclamation works, situated at Fish Water Flats near the Swartkops River mouth, is nearing completion. The commissioning is expected to start early this year. This project is not only one of the largest works to be constructed in one stage in Southern Africa, but is also one of the largest single schemes which the Port Elizabeth Council has undertaken. The operation, cost, and mechanical equipment of the plant are described. (So African Water Info Center)
W77-10222

CONTROL OF ALGAE IN LAKES, LAGOONS AND SMALL RESERVOIRS WITH BIOGROWTH PARTITIONS,
Missouri Univ.-Rolla. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-10268

MODELLING, SIMULATION AND CONTROL OF STOCHASTIC SYSTEMS WITH APPLICATIONS IN WASTEWATER TREATMENT,
Oxford Univ. (England). Dept. of Engineering Science.
C. J. Harris.
International Journal of Systems Science, Vol. 8, No. 4, April 1977, p 393-411. 8 fig, 19 ref.

Descriptors: *Waste water treatment, *Simulation analysis, *Algorithms, *Water quality control, *Stochastic processes, *Activated sludge, Markov processes, Biological treatment, Sewage treatment, Biochemical oxygen demand, Evaluation, Optimization, Equations, Mathematical models, Systems analysis.
Identifiers: *Nonlinear programming, Cost minimization.

A first-order simulation algorithm for multivariable nonlinear stochastic integral equations of the Ito type is derived, which utilizes the second-order properties of incremental Brownian motion. Various questions of stability and convergence of the algorithm are investigated. By way of application, the algorithm is used in evaluating models and optimal control laws for biological wastewater treatment plants of the activated sludge type. Objective functions include cost minimization and the minimization of plant output (effluent) biochemical oxygen demand concentration. It is concluded that whatever control algorithm is used, the simulation algorithm presented enables the controllers' regulation capabilities to be investigated without recourse to solving the dynamic equations explicity. (Bell-Cornell)
W77-10294

AQ. DETERGENT EFFLUENT PURIFICN. - BY EXTN. USING 4 TO 20 CARBON ALCOHOL(S) OR THEIR ESTERS OR ETHERS.
French Patent FR 2319-585. Issued January 4, 1977. Derwent French Patents Abstracts, Vol. Y, No. 19, p D15, June, 1977.

Descriptors: *Detergents, *Foaming, *Separation techniques, *Solvent extractions, *Surfactants, *Waste water treatment, Chemical wastes, Liquid wastes, *Patents.

A patent for a purification process which removes up to 99.5% of the detergent from effluent containing nonionic and/or cationic detergents is described. Liquid-liquid extraction at 20-100 C, especially at 60-80 C, using 4-20 carbon alcohols or mixtures with their esters or ethers is used. Optically branched 8-10 carbon alcohols, and the adipates, sebacates, phthalates, maleates, and fumarates of 4-20 carbon alcohols are the preferred solvents. The described process is useful in reducing COD of effluent from detergent, minimizing foaming, and reducing pollution. (Schulz-FIRL)
W77-10335

THE TREATMENT OF TOXIC EFFLUENTS: INVESTIGATIONS BY THE BCRA,
R. L. Cooper.
Effluent Water Treatment Journal, Vol. 17, No. 5, p 230-237, May, 1977. 16 ref.

Descriptors: *Waste water treatment, *Waste treatment, *Activated sludge, *Biological treatment, *Oxidation, *Sludge digestion, *Microbial degradation, Chemical wastes, Sludge treatment, Sludge disposal, Biodegradation, Analytical techniques, Design criteria, Aeration.

The British Carbonization Research Association (BCRA) has investigated biological treatment methods for the disposal of a wide variety of effluents, particularly strong and toxic industrial wastes. Studies by the BCRA since 1955 have led to the conclusion that the activated-sludge process, when accompanied by adequate surface aeration and mixing, is the most efficient method for treatment of wastes produced by the carbonization of coal in steel production. Because many of the constituents of carbonization wastes are lethal to bacteria, biological oxidation may be inhibited unless aeration and mixing are sufficient to lower levels of toxic constituents in all parts of the aeration tank. As this has not always been accomplished at older plants, the BCRA has developed a comprehensive design profile for treatment of particular effluents so that optimal design features can be incorporated into future waste treatment plants. The BCRA has also investigated other methods of biological treatment, including the conventional percolating filter, rotary biologic contactors, and tower processes. It was concluded that these processes are not generally as advantageous from a cost/benefit standpoint as the activated-sludge process. The BCRA has also assessed existing methods for the chemical analysis of effluents and has developed procedural guidelines for the analysis of water, sewage, effluents, and their associated sludges and sediments. (Schulz-FIRL)
W77-10336

PROCESSING OF INDUSTRIAL WASTE FOR SOLAR EVAPORATION,
Pacific Disposal Systems, Inc., Martinez, Calif.
V. R. Johnson.
AIChE Symposium Series, Vol. 73, No. 162, p 74-76, 1977.

Descriptors: *Evaporation, *Ponding, *Water quality control, Industrial wastes, Waste water treatment, Air pollution, Flooding, Percolation, Levees, Waste disposal.
Identifiers: *Solar evaporation.

Where land costs are low and when proper planning is used, solar evaporation can be the most economical waste water volumetric reduction and disposal method available that meets current air and water standards. Water quality control or protection from percolation, flooding, and levee failure is handled primarily by selection of a site with natural protection against horizontal and ver-

tical movements of pond water into the groundwater. Construction of perimeter monitoring wells for rapid detection of any percolations, well-engineered levees, and monitors on the levels of incoming water are also necessary. Air pollution control is a real problem. Incoming materials must be controlled to eliminate direct volatilization of undesirable input components and/or incompatible biological or chemical reactions between incoming and current wastes. The lab equipment needed for analysis of wastes is discussed. Certain wastes must first be treated to a form which is compatible with current pond composition or can be handled by other disposal means. Particular problems noted include: hydrocarbons, sulfur compounds, nitric and hydrofluoric acids, and organic overloads. Possible solutions are suggested. (Pfeifer-FIRL)
W77-10337

ULTRAFILTRATION--THE CURRENT STATE OF THE ART,
Abcor Environmental Systems, Ltd., Surbiton (England).
P. A. Bailey.
Filtration and Separation, Vol. 14, No. 3, p 213-219, May/June 1977. 6 fig, 2 tab.

Descriptors: *Effluents, *Filtration, *Membrane processes, *Waste water treatment, Industrial wastes, Food processing industry, Chemical industry, Chemical wastes, Reviews.
Identifiers: *Ultrafiltration, Recovery.

Ultrafiltration has become an important waste treatment technique, applied in a large variety of industries with potential for expansion into still others. A feed liquid is passed across the surface of a semipermeable membrane with the water or other liquid carrier permeating through the membrane, concentrating the waste particles as the liquid passes over more membrane surface. This technique is effective in filtering submicron particles and large dissolved molecules. Not only can effluent be treated by this technique, but a valuable component may also be recovered. A variety of membrane materials and configurations has been developed to be chosen according to the specific needs of the user. Characteristics of these various configurations and materials are discussed. Major industrial applications of ultrafiltration are: recovery of electrophoretic paint; cleaning of effluents from pulp mill, food processing, and textile waste waters; latex concentration from wash water of synthetic rubber manufacturers; recovery of oil from oil/water emulsions used in metal-forming operations; and recovery of alkaline cleansing baths. (Pfeifer-FIRL)
W77-10338

REMOVING CARBOXYLIC ACIDS FROM AQUEOUS WASTES,
Hydroscience Environmental Systems, Knoxville, Tenn.
R. W. Helsel.
Chemical Engineering Progress, Vol. 73, No. 5, p 55-59, May, 1977. 5 fig, 2 tab.

Descriptors: *Acids, *Chemical wastes, *Reclamation, *Separation techniques, *Distillation, Solvent extractions, Industrial wastes, *Waste water treatment.
Identifiers: *Carboxylic acids.

The disposal of waste waters containing acetic acid, one of the most widely-used industrial organic acids, has been recognized as a significant expense. For that reason the recovery of carboxylic acids, in particular acetic acid, is economically advantageous. A review of existing methods of physical separation of acetic acid from waste water is presented. Available techniques include: fractionation distillation, solvent extraction using low- and high-boiling solvents, extraction distillation, carbon adsorption, and combination processes. A new method for extracting carboxylic acids from dilute aqueous solutions using trioctylphosphine oxide (TOPO) as a chemical extractant is described. TOPO has also been used in metal extraction. Extraction by TOPO is a four part process, involving conventional solvent extraction; removal of water by solvent stripping distillation; distillation of the partially dehydrated extract to remove the majority of the acid and the remainder of the water; and distillation to separate the concentrated glacial acetic acid from the second stripping column distillate. Advantages of the TOPO system include the need for relatively small volumes of solvent; low water miscibility in the system; high degree of phase separation in the system, which allows for smaller extraction equipment; and stability and high boiling point of solvent. Total recovery costs for a 2% acid stream of 200 gal/min from which 90% of the acid is recovered are given as 6.3cent/lb. The recovery of other low molecular weight acids is suggested to make the TOPO method more economically attractive. (Schulz-FIRL)
W77-10339

REDUCING PHOTOPROCESSING WASTES THROUGH REUSE AND RECYCLING,
Weston Environmental Consultants-Designers, New York, N.Y.
P. A. Haderer, and J. A. DeFilippi.
Industrial Photography, Vol. 26, No. 6, p 22-23, 42-45, June, 1977. 1 fig, 3 tab, 6 ref.

Descriptors: *Chemical wastes, *Silver, *Cyanide, *Bleaching wastes, *Photography, Industrial wastes, Reclamation, Metals, Treatment facilities, Electrochemistry, *Waste water treatment, *Recycling.
Identifiers: *Photoprocessing wastes, Ferrocyanide.

BPCTCA (Best practicable control technology currently available) limitations for 1977 have necessitated the reduction of silver, cyanide, and bleach in waste waters discharged by photoprocessors. Based on present practices, it is suggested that photoprocessors can best meet these federal guidelines for Ag and Cn concentrations by in-house processing. Methods for desilvering waste waters generated during various phases of photoprocessing include metallic replacement and electrolyte recovery. Metallic replacement, used by small or average size photoprocessors, involves the solid displacement of a less active metal such as iron or zinc by silver in a solution containing silver thiosulfate complexes. An in-line electrolyte recirculation system is considered for silver recovery from fix bath overflow. Electrolyte recovery involves electroplating of silver in a solution onto a cathode for later stripping to recover pure silver plate. Methods of bleach regeneration, to convert ferrocyanide back to ferricyanide for the bleaches used in color processing, include ozonation, oxidation, and reaction with potassium persulfate. Total costs for silver recovery and bleach regeneration facilities for an average size plant with a flow of 12,000 gal/day are estimated at $11,750. (Schulz-FIRL)
W77-10340

RECYCLING BISULFITE BRINES USED IN SWEET CHERRY PROCESSING,
Eastern Regional Research Center, Philadelphia, Pa.
O. Panasiuk, G. M. Sapers, and L. R. Ross.
Journal of Food Science, Vol. 42, No. 4, p 953-957, July-August, 1977. 3 fig, 7 tab.

Descriptors: *Sulfite liquors, *Brine disposal, *Food processing industry, *Sulfur compounds, *Canneries, Activated carbon, Liquid wastes, Industrial wastes, Fruit crops, Reclamation, *Waste water treatment, *Recycling, Water reuse.
Identifiers: Cherries, Sulfur dioxide.

Problems associated with the disposal of strong calcium bisulfite brines used in the cherry processing industry have led to an evaluation of recycling as a means of alleviating pollution caused by residual SO2 in the brines. Preliminary experiments using activated carbon treatment, sand filtration, and addition of SO2 and lime have produced a product similar in composition, color, and firmness to that of fresh brines. Iron contamination of the recycled brine and resulting discoloration are attributed to corrosion of the steel drums in which the brine was stored. Discoloration caused by iron contamination was not apparent in brines which had been adjusted to 15,000 ppm SO2 or had been stored for 21 weeks at room temperature. To minimize loss of SO2, it is suggested that brines which are to be recycled be prepared immediately before the harvest. Brined cherries which had been repacked in water for shipping to finishers showed oxidation and softening after long term storage. It is suggested that an engineering study and cost analysis being conducted at Michigan State University will provide data on the economic feasibility of brine reclamation. (Schulz-FIRL)
W77-10341

ENERGY RECOVERY IN BREWERY INDUSTRY,
Abshoor Engineers, Tehran (Iran).
I. Kormi, and J. D. Keenan.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE3, p 445-458, June, 1977. 8 tab, 14 ref, 3 append.

Descriptors: *Anaerobic digestion, *Methane, *Industrial wastes, Fixed costs, *Waste water treatment, Energy, Water pollution control, Energy conversion.
Identifiers: Breweries, *Brewery wastes, *Energy recovery(Industrial).

Anaerobic digestion of organic refuse from breweries can provide a clean source of energy, methane gas, in amounts that would account for 17% of the industry's needs. This operation would beneficia environmentally as well: reducing BOD levels o discharged waste waters; recovering heat conten of liquid wastes and cooling water for the main tenance of anaerobic treatment temperatures (3 C), thus eliminating thermal pollution problems and conserving limited energy reserves. Microbia biomass generated by digestion could be sold as high-protein animal feed just as brewery grai wastes, the substrate for this digestion, are cu rently being marketed, though at lower prices du to their lesser protein content. Two types of fac tors affect costs of the methane produced. Fixe costs, which vary with time and locality, includ construction, maintenance, and operation cost Fixed costs are a function of quantity of organi material available for digestion, loading rate, an detention time. Input costs refer to costs o residual grain waste currently sold as feed an credit gained through sale of the more valuab biomass generated by the digestion. When th market price for the biomass reaches $220/to methane production is shown to be advantageou to the large brewery. At $265/ton methane is beir provided free. Fixed costs can be manipulated f optimum gain. A loading rate of 6 g/liter per da and a 10-day detention time were found most a vantageous. Methane production under these co ditions is 4.8 liters/gram of substrate adde (Pfeifer-FIRL)
W77-10342

MEETING EFFLUENT DISCHARGE REQUIR MENTS AND WATER REUSE,
Eutek Inc., Sacramento, Calif.
G. E. Wilson, and J. Y. C. Huang.
Food Technology, Vol. 31, No. 6, p 26-31, Jun 1977. 8 fig, 3 tab.

Descriptors: *Food processing, *Carrots, Filte Water pollution control, *Waste water treatme Industrial wastes, *Water reuse, *Water quali standards.

dentifiers: Waste water management, Pilot stu-
ies.

he Federal Water Pollution Control Act Amend-
nents of 1972 comprise far-reaching legislation
equiring major responses from industry. With any
ndustry waste water management program, the
oal must be the development of performance-
uaranteed waste water treatment at best costs.
lternatives in formulating a program are exem-
lified in the development of a phased program by
carrot processor. The three-phased program in-
luded: evaluation of soil solids removal and water
euse systems; pilot evaluation of the system for
uspended and colloidal solids rinse; and design,
stallation, and startup of full-scale solids
emoval and water reuse. The system used con-
sted of a 500 gpm teacup solids separator which
roduced dense settled solids and discharged
ater containing primarily colloidal particles.
hese could be removed by a decayed gradient
occulating/gravity clarifier and a coarse media
ntact filter. A cationic polymer coagulant was
jected immediately upstream of the filter. Tests
ere conducted to determine the optimum filter
edium. Reductions of all parameters was noted
each step of the process and water was suitable
r reuse and discharge. The operation demon-
rates the effectiveness and economy of a phased
pproach for developing waste management pro-
ams. (Pfeifer-FIRL)
77-10343

ROCESSING OF FACTORY WASTE BY EVERSE OSMOSIS,
malgamated Sugar Co., Ogden, Utah.
H. Henscheid, A. Matheson, and K.
hoenrock.
e Sugar Journal, Vol. 39, No. 12, p 20-24, May,
77. 10 fig, 4 tab, 4 ref.

escriptors: *Reverse osmosis, *Filtration, *Food
ocessing industry, *Ion exchange, *Membranes,
smosis, Chemical wastes, *Waste water treat-
nt, Sugar beets.
entifiers: *Steffen filtrate, *Ultrafiltration,
ugar processing wastes.

method for the treatment of ion exchange waste
d Steffen filtrate using reverse osmosis and ul-
filtration has been devised in studies at the
malgamated Sugar Company. Various types of
mbranes and the Dow hollow fiber cartridge
re tested for their ability to concentrate Steffen
rate, which contains roughly 75% organic
tter and 25% inorganic ash constituents.
rameters considered were BOD, color, K, Na,
, conductivity, ash, organics, RDS, and oven
. The Dow cartridge attained a greater than
% rejection rate for all parameters. Various
rameters which affect reverse osmosis include
ssure, feed concentration, pH, temperature,
d contact time. Most efficient reverse osmosis is
orted at low osmotic pressures which are a
ult of very dilute solutions. A multi-stage opera-
n combining reverse osmosis with additional
mbrane filtration seems necessary to attain
mplete fractionation of waste. (Schulz-FIRL)
7-10344

TIONAL EFFLUENT REQUIREMENTS FOR E MEAT AND POULTRY INDUSTRY,
vironmental Protection Service, Ottawa
tario). Water Pollution Control Directorate.
. Haskill.
d in Canada, Vol. 37, No. 5, p 29-31, May,
7. 1 tab.

criptors: *Food processing industry,
dustrial plants, *Industrial wastes, Waste treat-
t, Waste water treatment, Water quality con-
, Effluents, Water utilization, Water reuse,
nada, *Water quality standards.
ntifiers: *Meat products industry.

Canadian government regulations for control of water disposal by the meat products industry are discussed by Environment Canada. These regulations were developed to meet the need for control of an industry with heavy water use (12.1 million gal/day) combined with the potential for high strength discharge. Federal regulations exist for new and expanded plants, while current plants and environmental agencies together formulate guidelines for the upgrading of their water discharge and use. This legislation was the result of careful consideration of the current industry situation and of the best available technology, both in efficiency and economic viability. The following are recommended as the best possible technology for the meat products industry: blood recovery, low temperature rendering, extensive dry cleanup prior to washing, recycling of water, and good housekeeping practices. The major analytical parameters which industry must report are: BOD, suspended solids, grease, pH, and ammonia nitrogen. Implementation of this legislation is the responsibility of the provincial government with oversight by the Regional Offices of Environmental Protection Services. Periodic industry and government tests are required and frank exchange between industry and government is encouraged. (Pfeifer-FIRL)
W77-10345

TREATING METAL FORGING AND PROCESSING WASTEWATER,
Engineering-Science, Inc., Atlanta, Ga.
M. R. Hockenbury, and A. W. Loven.
Industrial Wastes, Vol. 23, No. 3, p 45-49, May/June, 1977. 5 fig, 4 tab, 6 ref.

Descriptors: *Oily water, *Acids, *Heavy metals, *Industrial wastes, *Waste water treatment, Waste treatment, Chemical precipitation.
Identifiers: Forge wastes, *Metal processing wastes.

Four types of waste water with widely varying characteristics and treatment requirements are produced by a large metal forging and processing facility: forge shop waste water containing varying quantities of suspended solids, oil, and grease; emulsified oily waste water from a hydraulic power system; chemical rinse water with heavy metal ions and other inorganic ions from acid and caustic; and spent acids and caustic. Simple gravity separation of pollutants from forge shop waste water was not effective. Alum or ferric sulfate (20 mg/liter) can be most effective in furthering solid sedimentation, although suspended solids containing oil droplets continued to show no settling. Final treatment involved use of an API-type oil/water separator for removal of free, floatable oil and grease; treatment with the coagulants; and dissolved air flotation. Emulsified oily waste waters were treated using ferric sulfate at low pH as a reliable method for splitting emulsified oily wastes. Treatment of chemical rinse water involved a series of processes: equalization, lime addition, coagulation, pH adjustment, and clarification. Lime (500 mg/liter) raised the pH and provided calcium for precipitation of fluoride ions. Addition of 1 mg/liter of an anionic polymer with 2 minutes of rapid mixing and 5 of flocculation provided for effective coagulation. Solids separation at an overflow rate of 1200 gpd/sq ft was accomplished in a standard circular clarifier. Readjustment of pH was necessary for precipitation of aluminum. Spent acids were neutralized on a batch basis with lime and caustic as efficient precipitation of heavy metals was accomplished. (Pfeifer-FIRL)
W77-10346

SODIUM BICARBONATE TREATS ACIDIC INDUSTRIAL WASTES,
South Carolina Univ., Columbia. Environmental Engineering Program.
K. Y. Chen, and N. R. Barber.
Industrial Wastes, Vol. 23, No. 3, p 30-31, May/June, 1977. 1 fig, 1 tab.

Descriptors: *Sodium compounds, *Bicarbonates, *Acidity, *Cost comparisons, *Industrial wastes, Metals, Sludge digestion, *Waste water treatment, Alkalinity.
Identifiers: Sodium bicarbonate, Buffering.

Because of its reserve buffering capacity, sodium bicarbonate is an excellent base for reducing acidity of industrial waste waters to acceptable levels. Unlike stronger bases, sodium bicarbonate can hold the pH within a range (6-9) required for precipitation of toxic metals and the flourishing of sludge digestion organisms. Its buffering capacity can eliminate the need for elaborate pH monitoring and chemical metering systems needed to deal with changes in pH from inflow of new acidic wastes or from the processes of treatment itself (e.g., chlorination and oxidation). This is a particularly important factor for industrial waste water treatment plants lacking the self-stabilizing mechanisms of municipal plants. Above the 4.3 pH level sodium bicarbonate, currently $160/ton, is as economical as any other base and capital costs of usage are much lower. The pH level of 100 ml of acidic industrial waste waters was raised to an acceptable level of 6.0 or above using 1.2 g sodium bicarbonate. For a plant with 0.1 MGD of acidic wastes, this amounts to a daily required dosage of 4545 kg or $800 of chemical, with no mechanical components except a dosing device and mixer required. (Pfeifer-FIRL)
W77-10347

METAL FINISHING PLANT WASTE WATER PURIFICN.--BY TREATMENT WITH COPPER SULPHATE AND SODIUM SULPHITE TO REMOVE CYANIDE AND COPPER IONS.
Soviet Patent SU-528-265. Issued September 2, 1976. Soviet Inventions Illustrated, Vol. Y, No. 15, p 3, May, 1977.

Descriptors: *Patents, *Metals, *Waste water treatment, Industrial wastes, Water purification, Chemical precipitation, *Copper sulfate, *Sulfates.
Identifiers: Sodium sulfite, *Cyanide, Copper ions.

A patent was issued for a process to remove cyanide and copper ions from waste waters by treatment with CuSO4 and Na2SO3. CuSO4 is added in an amount equivalent to the CN(-) concentration, while enough Na2SO3 is added to reduce Cu(2+) to Cu(+). Cu(CN)2 precipitates rapidly. Such treatment can be used in the treatment of metal manufacturing waste waters. (Pfeifer-FIRL)
W77-10348

SOME ASPECTS OF HIGH GRADIENT MAGNETIC SEPARATION,
International Research and Development Co., Newcastle-upon-Tyne (England).
A. D. Appleton, and P. P. Dobbing.
Filtration and Separation, Vol. 14, No. 3, p 238-240, May/June, 1977. 4 fig, 2 tab, 3 ref.

Descriptors: Magnetic studies, *Filtration, *Separation techniques, Industrial wastes, *Waste water treatment, Water treatment, Water purification.
Identifiers: *Magnetic separation(Wastes).

The development of the high gradient magnetic separator (HGMS) has opened up possibilities for the use of magnetic filtration in water treatment. Design of the HGMS device is relatively simple: a chamber with a filamentary ferromagnetic material--stainless steel wool--in a saturating magnetic field. A large surface area is thus provided and magnetic tractive forces can be produced sufficient to permit separations of very weakly paramagnetic particles with diameters on the order of 1 micron. With water treatment, solids to be removed are generally non-magnetic so that seeding (e.g. 1000 ppm Fe304) and addition to a flocculating agent are required. Even bacteria and dis-

solved viruses can be separated. Analyses are presented on requirements for HGMS devices for water treatment at 1.75 and 7.5 MGPD levels. Further study is needed on cost-effectiveness of the HGMS, including the possible use of superconducting magnets. (Pfeifer-FIRL)
W77-10349

USE OF A MODIFIED TENAX GC COLUMN PACKING FOR THE DIRECT GAS CHROMATOGRAPHIC ANALYSIS OF PHENOLS IN WATER AT THE PPM LEVEL,
Leeds Univ. (England). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 5A.
W77-10350

OPERATING EXPERIENCES ON PETROCHEMICALS WASTE WATER TREATMENT PLANT OF GUJARAT AROMATICS PROJECT AT JAWAHARNAGAR,
Indian Petrochemicals Corp. Ltd. Jawaharnagar (India).
P. R. Gharekhan, and M. K. Prabhudesai.
Journal of the Institution of Engineers (India), Vol. 57, Part EN 2, p 58-64, February, 1977. 4 fig, 5 tab.

Descriptors: *Activated sludge, *Aromatic compounds, *Model studies, *Oil wastes, *Sludge disposal, Effluents, Industrial wastes, Design standards, Hydraulic standards, Organic wastes, Sludge treatment, Biological treatment.
Identifiers: Jawaharnagar(India), Gujarat Aromatics Project.

An overview for design efficiency and production problems during two years of operation of a petrochemicals waste water treatment plant in Jawaharnagar, India has led to the conclusion that hydraulic control of sludge return rate is an effective and simple method. Initial findings on simulated wastes suggested that a two-stage biological system using an aerated lagoon and an oxidation ditch would provide sufficient treatment for waste water from the Gujarat Aromatics Project. Control of the operation included regular measurement of BOD, pH, COD, dissolved 02, return sludge, sludge wasting volume, suspended solids, nitrogen, phosphorus, and various other compounds. The major disadvantage in hydraulic control of sludge return rate is that some of the return sludge or aeration tank effluents may be wasted. Design criteria and operating suggestions are presented for activated sludge treatment plants were sludge flow rates and characteristics may vary. (Schulz-FIRL)
W77-10351

REFINERY OIL/WATER SEPARATION EQUIPMENT AND ITS APPLICATIONS,
W. M. Kirkup.
Filtration and Separation, Vol. 14, No. 3, p 259-266, May-June, 1977. 5 fig, 5 tab.

Descriptors: *Oil-water interfaces, *Oily water, *Oil pollution, Oil industry, *Separation techniques, Filtration, *Oil wastes, Effluents, Equipment, Organic wastes, Chemical wastes, Liquid wastes, Water purification, Industrial wastes, Design criteria, *Waste water treatment.

Petroleum refinery waste water systems are designed to handle various types of contaminated water, including: oil-free water, cooling water, process water, and sanitary and other waste water. Equipment and processes for the removal of oil from waste water are described here. Size and shaped criteria for the widely used gravity-type oil-water separator are presented. Operating data for parallel plate separators are examined. After primary separation, secondary separation or filtering is required. Secondary equipment described includes: sand filters, rapid sand filters, automatic backwash sand filters, rotary vacuum precoat filters, hay filters, and gravity differential separators. Dissolved air flotation may be used for removal of oil emulsions and suspended solids. An equalization basin is necessary to eliminate drastic changes in pH or temperature. Treatment of contaminated ballast water from oil tankers and barges is discussed. (Schulz-FIRL)
W77-10352

PREPARATION OF STAINED ALGINATE BEADS FOR PHOTOSENSITIZED OXIDATION OF ORGANIC POLLUTANTS,
Charles F. Kettering Research Lab., Yellow Springs, Ohio.
G. R. Seely, and R. L. Hart.
Environmental Science and Technology, Vol. 11, No. 6, p 623-625, June, 1977. 13 ref.

Descriptors: *Phenols, *Organic wastes, *Oxidation, *Chemical wastes, *Separation techniques, Ion exchange, Petroleum wastes, Industrial wastes, *Waste water treatment, Water purification, Organic compounds, Waste disposal.
Identifiers: Alginate, Photosensitized oxidation.

A method for the disposal of phenols and other toxic organic pollutants, including amines, olefins, and mercaptans, has been developed. In this process, gelled beads of the natural polysaccharide, alginic acid, are stained with photosensitizing cationic dyes. The stained beads are then capable of acting as a photochemical catalyst, oxidizing organic substrates in sunlight or artificial light. Alkaline conditions can be created within the beads by incorporation of slightly soluble basic minerals such as CaCO3, SrCO3, BaCO3, MgCO3, or dolomite when necessary to facilitate ionization or neutralization of acids formed during the oxidation of phenols. Incorporation of dye into the porous beads allow separation of the treated water from the beads by draining. Large-scale applications of this method of phenol detoxification using inustrial lagoons open to sunlight may be possible. (Schulz-FIRL)
W77-10353

INDUSTRIAL WASTE WATER PURIFICATION - USING BROWN COAL SEMICOKE AT ELEVATED TEMP. AS ADSORBENT FOR PHENOLIC AND OTHER ORGANIC IMPURITIES,
L. A. Kogan, I. B. Evzel'man, and V. M. Kagasov.
Soviet Patent SU-521-232. Issued September 10, 1976. Soviet Inventions Illustrated, Vol. Y, No. 18, p D15, June, 1977.

Descriptors: *Patents, *Absorption, *Phenols, *Coals, *Organic wastes, *Chemical wastes, *Waste water treatment, Water purification, Industrial wastes, Effluents, Liquid wastes.
Identifiers: Brown coal, Coke, Chlorophenol.

A patent for a process to remove organic compounds for aqueous effluents produced by coke-chemicals manufacturing has been issued. Adsorption at 60-90 C using brown-coal semicoke removes 90% of the phenol and 82% of the chlorophenol present in the aqueous effluent. compared with 10% and 24%, respectively, with conventional brown coal processing. (Schulz-FIRL)
W77-10354

EXPERIENCE WITH THE DESIGN AND OPERATION OF SMALL EXTENDED OPERATION AERATION WASTEWATER TREATMENT PLANTS,
Gutteridge, Haskins and Davey Pty Ltd., Melbourne (Australia).
J. A. Crockett, and R. M. Olliff.
In: Environmental Engineering Conference, Canberra, Australia, 1977. The Institution of Engineers Australia, Preprints of Papers, p. 98-102. (The Institution of Engineers Australia National Conference Publication No. 77/4).

Descriptors: *Waste water treatment, *Treatment facilities, *Design criteria, *Aeration, Water treatment, Performance, Water quality standards, Aerobic treatment.

An analysis of operating results from a number of small extended aeration wastewater treatment plants leads to the conclusion that many such plants do not meet current more stringent statutory effluent quality requirements as nearly as they might. Experience with three plants is described in detail and then general reasons for unsatisfactory plant performance are presented. The main reasons are a need for some design improvements and a need for improving operating procedures. Standardization of the design of small plants is seen as the best means of providing small treatment plants at optimum cost. A checklist for use in the design of small plants is included. (CSIRO)
W77-10368

APPROACH TO LIQUID EFFLUENT CONTROL IN A NITROGENOUS FERTILIZER PLANT,
Consolidated Fertilizers Ltd., Newcastle (Australia).
For primary bibliographic entry see Field 5G.
W77-10370

BACTERIAL DENITRIFICATION - A REVIEW,
Melbourne Univ., Parkville (Australia). Dept. o Microbiology.
N. F. Millis.
Water (Journal of the Australian Water and Waste water Association), Vol. 4, No. 1, p 15-18, Marc 1977. 7 fig, 1 tab, 12 ref.

Descriptors: *Denitrification, *Bacteri *Nitrates, Waste water treatment, Sewage trea ment, Nutrient removal, Anaerobic condition Biological treatment, *Reviews.

In treating waste water, the oxidation of organ nitrogen to nitrate is a desirable objective; hov ever, if the treated water is to be reclaimed f drinking water or discharged into inland fres waters, a high nitrate content is likely to b deleterious. One method of reducing nitrate co tent is to utilize bacteria with the ability to redu nitrate to nitrogen or gaseous oxides of nitroge The necessary conditions for the encouragemc of this process are: the presence of species wi denitrifying ability; the presence of nitrat anaerobic conditions; and the presence of a sour of reducing power (usually a carbon compoun Provision of these conditions may be made eith separately from the oxidative nitrification stage treatment, or in the same reactor, using sludge settled sewage to accomplish the reductio Methods employing each strategy are reviewe (CSIRO)
W77-10373

LET'S TALK RUBBISH; PART 2: RECYCLI SYMPOSIUM,
P. B. Publico.
Municipal Engineer, Vol. 7, No. 1, p 13-15, 1976

Descriptors: *Recycling, Solid wastes, Wa disposal, Environmental pollution, Research a development, Wastes, Feeds, Separat techniques, Waste treatment.
Identifiers: South Africa, Sandton, Witwa srand.

A short summary is presented of the lectures a discussions held at the symposium on 'Recycl of Waste Materials' at Sandton, South Africa, 16 and 17 October 1975. The economic and ecol ic aspects, separation techniques and pract problems were among the subjects discussed. African Water Info Center)
W77-10381

AN EVALUATION OF WATER REUSE FOR MUNICIPAL SUPPLY,
Southern Illinois Univ. at Carbondale.
D. Dworkin, and D. D. Baumann.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-005 053, Price codes: A08 in paper copy, A01 in microfiche. December 1974. Corps of Engineers IWR-Contract Report 74-11, 266 p, 31 fig, 33 tab, 4 append.

Descriptors: *Water reuse, *Colorado, *Water supply development, *Waste water treatment, *Water allocation(Policy), Water storage, Water, Water delivery, Water control, Water management(Applied), Water quality, Effluents, Prior appropriation, Social impact, Social adjustment.

Effective reuse of renovated water can be beneficial because it allows for mobilization, rather than waste of excess water supplies. Present water reuse practices in Colorado Springs were compared to simulated results of a model plan in an effort of determine which plan was most efficient. The results indicated that present reuse practices were inefficient because they provided reuse for many years when abundant water was available. Consequently, water reuse should be viewed as a management alternative to water supply planners and not as a parallel source of water supply. Furthermore, implementation of water reuse plans will be dependant upon social acceptability of using renovated water. Finally, the authors point out that states following the doctrine of prior appropriation might be reluctant to adopt an efficient reuse system because their present appropriation, based on need, might be decreased resulting in a loss of future rights to water. (Josepher-Florida).
W77-10444

DEMONSTRATION OF VOID SPACE STORAGE WITH TREATMENT AND FLOW REGULATION.
For primary bibliographic entry see Field 5F.
W77-10532

WASTEWATER MANAGEMENT PROGRAM, JAMAICA BAY, NEW YORK, VOLUME I: SUMMARY REPORT,
Ludwig (H. F.) and Associates Engineering-Science, Inc., Arcadia, Calif.
L. L. Feuerstein, and W. O. Maddaus.
1976. 182 p, 85 fig, 37 tab, 14 ref, 3 append. EPA Technical Report EPA-600/2-76-222a.

Descriptors: *Water treatment(Applied), *Water pollution control, *Water quality, *Combined sewers, *Treatment facilities, Overflows, Oxygen demand, Suspended solids, Organic matter, Aeration, Nutrients, Costs, Waste water treatment.
Identifiers: Jamaica Bay(NY), New York Bight.

A three-year study was conducted to develop management criteria and procedures for the Jamaica Bay, New York, ecosystem. Management of combined sewer overflow was important to water contact recreation in the bay. Four municipal treatment facilities discharged their organic and nutrient materials into the bay. Significant quantities of solids and coliforms resulted from combined sewer overflows. The treatment facilities were being upgraded for better removals of suspended solids and organic, oxygen-demanding materials. A construction plan was instituted to build treatment facilities for the eight major combined sewer overflows to reduce bacterial densities. Three facilities were upgraded to full step-aeration processes. An auxiliary plant was built to treat combined sewer overflows from two basins. Reduction of oxygen-demanding materials to near natural background levels could be accomplished by routing most of the dry- and wet-weather treated effluents and combined sewer overflows from the bay to the New York Bight. The planned dredging program was expected to produce levels of these materials which would not be detrimental to the ecosystem. Cost-effectiveness studies were implemented to determine the most reasonable development of a waste water management program for the bay. (Collins-FIRL)
W77-10533

PHYSICAL - CHEMICAL TREATMENT PLANT DESIGN,
CH2M Hill, Reston, Va.
G. L. Culp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 957, Price codes: A03 in paper copy, A01 in microfiche. 1972. 33 p, 7 fig, 3 tab, 1 ref.

Descriptors: *Design criteria, *Efficiencies, *Treatment facilities, Chemical treatment, Physical properties, Coagulation, Filtration, Sedimentation, Dewatering, Flocculation, Flows, Adsorption, Carbon, Phosphorus, Suspended solids, Sludge treatment, Waste disposal, Economics, Evaluation, Organic matter, Separation techniques, Water purification, Waste water treatment.

Techniques for determining the efficiency of physical-chemical treatment processes for waste water, and the parameters of treatment plant design, were discussed. All processes utilize coagulation and sedimentation for the removal of suspended solids, and of phosphorus in some instances. Some processes also use filtration for such removal. Soluble organics are removed in all processes by the use of activated carbon. Pilot studies should be done when possible to aid in determining design parameters. Laboratory studies on representative water samples can generate suitable data. Tests were presented to aid in the selection of coagulants--polymers, lime, iron salts, or aluminum salts. Design criteria considered include: flow; chemical feed, rapid mix, and flocculation; clarifier sizing; recarbonation; filtration; granular carbon adsorption; and carbon regeneration. Other considerations include sludge dewaterability, disposal costs, and quantities. (Collins-FIRL)
W77-10534

COST-EFFECTIVE COMPARISON OF LAND APPLICATION AND ADVANCED WASTE WATER TREATMENT,
Environmental Protection Agency, Washington, D.C. Office of Water Programs Operations.
C. E. Pound, R. W. Crites, and R. G. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 448, Price codes: A04 in paper copy, A01 in microfiche. 1975. 25 p, 4 fig, 13 tab, 4 ref.

Descriptors: *Design criteria, *Cost comparisons, *Tertiary treatment, *Irrigation, *Infiltration, *Percolation, *Flow, Economies of scale, Variable costs, Cost analysis, Water conveyance, Land appraisals, Sites, Storage, Overland flow, Waste water treatment.
Identifiers: Land application systems, Advanced waste water treatment.

A cost-effective comparison was made of land application and advanced waste water treatment (AWT) systems. Important factors for comparison included: pretreatment, conveyance, storage, application, and local land assessment. The sensitivity of land application systems to design criteria variations was illustrated with cost curves. Several general conclusions were drawn from these curves. Land application systems presented less economy of scale than AWT systems. At low flow capacities land application systems could remain economically competitive, even with higher land costs, but were more sensitive to conveyance distance costs. Site conditions could create cost variations of 300 plus % for irrigation, overland flow, and infiltration-percolation systems. Irrigation cost variations were more extreme due to a greater number of cost component variables. The federal share is a higher percentage of total costs for land application systems than for AWT systems since for land application systems capital costs (75% federal) are higher and operating and maintenance costs (100% local) are lower. The data provided were for general comparisons of the two systems, and should not be used to determine costs of specific alternatives in the planning process. (Collins-FIRL)
W77-10535

ENVIRONMENTAL IMPACTS OF ADVANCED WASTEWATER TREATMENT AT ELY, MINNESOTA,
Corvallis Environmental Research Lab., Oreg.
H. Kibby, and D. J. Hernandez.
1976. 30 p, 1 fig, 17 tab, 19 ref. Technical Report EPA-600/3-76-092.

Descriptors: *Tertiary treatment, *Resources, *Pollutants, Pollutant identification, Water pollution, Air pollution, Soil contamination, Chemicals, Lime, Chlorine, Electricity, Fuels, Polymers, Chemical analysis, Waste water treatment.
Identifiers: Resource utilization, Pollutant generation.

Resource utilization and pollutant generation were assessed at an AWT facility in Ely, Minnesota. The plant used a conventional secondary treatment system followed by tertiary treatment. The latter treatment consisted of two solids-contact clarifiers, a flow-splitter box, and dual media filtration for phosphorus removal. Backwash water was returned to the secondary plant influent line. Filter effluent was either chlorinated and discharged, or recycled as process water. Annual direct use sources were: lime (538 tons), CO2 (168 tons), chlorine (5.2 tons), electricity (780,000 kwh), fuel oil (63,000 gallons), FeCl3 (44 tons), sulfuric acid (82 tons), and polymers (670 pounds). Data were also provided on the production of these resources. Resultant pollutants were grouped as discharges to air, land, or water. The collected data indicated resources needed and pollutants to be expected at any similar facility. (Collins-FIRL)
W77-10536

EVALUATION AND UPGRADING OF A MULTI-STAGE TRICKLING FILTER FACILITY,
AWARE, Inc., Nashville, Tenn.
J. H. Koon, R. F. Curran, C. E. Adams, Jr., and W. W. Eckenfelder, Jr.
1976. 138 p, 56 fig, 21 tab, 21 ref. EPA Technical Report EPA-600/2-76-195.

Descriptors: *Trickling filters, *Biological treatment, *Adsorption, *Activated sludge, *Activated carbon, *Biological oxygen demand, Microorganisms, Organic compounds, Recycling, Industrial wastes, Monitoring, Oxygen, Separation techniques, Waste water treatment.
Identifiers: Air stripping, Organic chemical industry.

Treatment of wastes from a multiproduct organic chemical plant by trickling filter was investigated. The trickling filter was a full-scale, six-stage operation. Pretreatment processes included solvent separation, flow measurement, neutralization, equalization, and nutrient addition. The trickling filter system consisted of six 20-feet deep filters which operated in series. This was followed by a final clarification. Tests indicated that serial operation did not cause microorganisms acclimation or enhance BOD removals. Air stripping and biological mechanisms significantly contributed to total BOD reduction. Filter performance was greatly improved by effluent recycle. A 90% BOD reduction, at a hydraulic loading of 2 gpm/square foot, required a 600% recycle. Bench scale activated sludge investigations supported the use of this process for system improvement. Determinations were made of kinetic parameters necessary for the design of activated sludge systems. Results

of air and oxygen aeration studies suggested that treatment of wastes with volatile substances would be difficult in a closed oxygen system. Activated carbon adsorption, following activated sludge treatment, was very effective in upgrading performance. Adsorption could remove some refractory organics and color-producing substances. A significant nonadsorbable organic fraction remained. (Collins-FIRL)
W77-10537

RENOVATED WASTEWATER AS A SUPPLEMENTARY SOURCE FOR MUNICIPAL WATER SUPPLY: AN ECONOMIC EVALUATION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 3C.
W77-10540

INSPECTION AND REPAIR OF MAIN-SEWERS (L'INSPECTION ET LA REPARATION DES COLLECTEURS D'EGOUTS),
J. Sion.
Techniques et Sciences Municipales - L'Eau, Vol. 67, No. 11, p 441-444, November, 1972. 6 fig.

Descriptors: *Sewers, *Inspection, *Repairing, Pipes, Flow rates.
Identifiers: France, Closed-circuit television.

The use of closed-circuit television is being considered in France for the inspection and repair especially of old sewers. Old sewer pipes are rigid making them susceptible to breakage and joint defects and roots cause partial obstruction of the flow cross-section. Flow obstacles result in low flow rates and in increased concrete corrosion hazards due to the formation, from hydrogen sulfide, of sulfuric acid. These problems can be detected and localized in inaccessible sewer pipes through the use of closed-circuit television when the camera is pulled along inside sections between inlets. (Sandoski-FIRL)
W77-10541

TREATMENT OF COMBINED SEWER OVERFLOWS,
Rexnord, Inc., Milwaukee, Wis.
D. G. Mason.
Journal Water Pollution Control Federation, Vol 44, No 12, p 2239-2244, December, 1972. 3 fig, 6 tab, 6 ref.

Descriptors: *Combined sewers, *Overflow, Waste water treatment, Storm water, Effluent, Polyelectrolytes, Disinfection, Chlorine, Capital costs, Operating costs.
Identifiers: *Dissolved air flotation, Ferric chloride, Chemical treatment.

A screening/dissolved air flotation system is shown as an effective method of reducing pollution caused by combined sewer overlows. Operation data over a two-year period of time indicate the following results. Effluent quality generally comparable to secondary effluent was obtained from the operation of a 5 mgd pilot unit. Ferric chloride (20 mg/liter) and a cationic polyelectrolyte (4 mg/liter) provided effective chemical treatment. The screening flotation system provided sufficient detention time for adequate disinfection with chlorine. Capital costs for a 90 mgd facility were estimated at $21,000/mgd of capacity. Operating costs were estimated at $0.0309/thousand gallons or $0.0082/thousand liters. (Sandoski-FIRL)
W77-10542

COMBINED SEWER OVERFLOWS,
Municipal Environmental Research Lab., Edison, N. J. Storm and Combined Sewer Section.
Civil Engineering, ASCE, Vol 43, No 2, p 57-60, February, 1973. 1 fig.

Descriptors: *Combined sewers, *Overflow, Financing, Water pollution control, Cities, Population, Costs, Research and development, Plastics, Flow rates, Sewage, Computers, Pipes, Construction materials, Monitoring, Polymers.
Identifiers: Pollution control research.

To date 116 grants and contracts totaling about 82 million dollars have been awarded in storm and combined sewer pollution control research, development, and demonstration by federal agencies. More than 1300 municipalities with a population of 54 million are served by 55,000 miles of combined sewers with untreated storm-generated combined sewer overflows occurring 3 to 6 percent of the time annually. The need for capital spending to storm and/or treat combined sewer overflows can be relieved by reducing or attenuating flow to be treated and/or increasing the effective flow capacity of existing facilites. Some recent EPA-supported projects include: heat shrinkable plastic tubing made of polyolefin-polymeric base hot melt adhesive used in coupling durable, wateright, joints to conventional sewer pipes; anti-corrosion coatings of vinyl-vinylidene chloride, vinyl acetate-acrylic, nitrile rubber latex, and various rubbers which may reduce costs by 90 percent over epoxy and plastic liners; refinement of the swirl flow regulator/solids-liquid separator to function efficiently over a wide range of combined sewer overflow rates; a network for remote monitoring of rainfall, flow levels, and quality at selected locations together with a centrally computerized control console for positive regulation of the overflow structures through utilization of storage capacities within the existing sewers to reduce the frequency and volume of overflows; and, certain polymers added to increase the rate of flow of sewage thus increasing the sewer capacity. (Sandoski-FIRL)
W77-10543

NEW INTERCEPTOR SEWER IS A 'PRIME TIME' PROJECT,
Burns and McDonnell, Kansas City, Mo.
N. Kuehl, and R. Lucas.
Public Works, Vol. 104, No. 3, p 71, March, 1973. 1 fig.

Descriptors: *Waste water treatment, *Interceptor sewers, *Treatment facilities, Missouri, Missouri River, Construction, Sewers, Concrete, Flow.

A $100 million Little Blue Valley interceptor and waste water treatment facility will service 225 square miles draining the eastern slopes of Independence, portions of Kansas City, six other towns, and two federal installations in Missouri. With construction already underway on a 9-foot, 7-inch concrete arch sewer, pump station, and interim treatment plant, improved waste water treatment will be available by 1974 to a major portion of Independence. The projected date of completion for the interceptor and treatment facilities in 1980. The interceptor system ranges in size from 132 inches, or the hydraulic equivalent, at the downstream end to small collectors at the farthest point upstream. Peak flow capacity at the downstream location will be 315.8 mgd with future increase possible through construction of peak-flow pumping stations. Eventually, all wastewater generated in the watershed will flow to a plant located near the Missouri River. (Sandoski-FIRL)
W77-10546

SEWERS UNDER ATTACK: THE HYDROGEN SULPHIDE PROBLEM,
J. Pullin.
Surveyor, Vol. 149, No. 4433, p 12, May 27, 1977.

Descriptors: *Hydrogen sulfide, *Sulfur compounds, *Pipes, *Anaerobic conditions, *Corrosion, Corrosion control, Chemical degradation, Sewers, Pipe flow, Waste water treatment.

Hydrogen sulfide can be produced in sewage under anaerobic conditions by the reduction of sulfate, or in sewers containing dissolved oxygen but having a layer of biological slime coating the sewer pipe wall. The hydrogen can be then oxidized in the presence of Thiobacillus concretivorus to sulfuric acid which can cause considerable damage to sewer pipes. Factors influencing the rate of H_2S build-up include oxygen concentration, temperature, and concentrations of sulfate and organic matter in the sewage. Increased temperatures and decreased oxygen concentrations increase sulfide production. The resistance of various pipe materials to attack by sulfuric acid is examined. Although vitrified clay pipes are resistant to corrosion, cast iron, steel, and concrete pipes will deteriorate unless other preventive measures are taken. Use of plastic liners for sewer pipes, periodic treatment with caustic soda or lime, and application of chlorine are suggested as methods for reducing corrosion. (Schulz-FIRL)
W77-10548

WASTEWATER COLLECTION,
Nottingham (H. D.) and Associates, Inc., McLean, Va.
T. Singh, and J. S. Bhutani.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1074-1078, June, 1977. 55 ref.

Descriptors: *Combined sewers, *Infiltration, *Inflow, *Plastics, *Maintenance, Storm drains, Sewerage, Sanitary engineering, Municipal wastes, Urban runoff, Storm runoff, Maintenance costs, Waste water treatment, Rehabilitation, Replacement costs, Construction, Construction materials, New York.
Identifiers: Tampa(FL), Grand Rapids(MI), Bossier City(LA), Montclair(NJ).

Various methods developed during 1976 for the collection of waste water are reviewed. An evaluation of general sewage problems and future waste water treatment needs for New York City is given. Design criteria are described for the construction of storm retention basins, combined sewer systems, and other waste water collection and storage systems. The use of plastic pipes for highly corrosive and abrasive waste water flows is evaluated. Inspection, monitoring, and maintenance are considered for the safer, more efficient operation of waste water systems. Recent monitoring techniques for characterizing infiltration/inflow in a continuing program of sewer maintenance are evaluated. Experiences of various municipalities in the use of polyethylene pipe insertion for the correction and prevention of infiltration/inflow problems by sewer rehabilitation or new construction are related. Maintenance techniques and applications presented include television monitoring of newly installed sewer lines, chemical treatment to retard the growth of tree roots in sewers, and standardization of inflow/infiltration measurement using hydrographic analysis. A design for a waste water lift pump designed to handle large flows is described. Sewer system rehabilitation and maintenance is mentioned as a cost-effective method of increasing treatment plant capacity. (Schulz-FIRL)
W77-10549

TREATMENT OF EFFLUENTS: MODERN METHODS OF SEWAGE DISPOSAL,
University Coll. of Swansea (Wales). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5E.
W77-10550

TRACE ELEMENTS IN WASTEWATER,
California Univ., Riverside. Dept. of Agricultural Engineering.
A. C. Chang, and A. L. Page.
California Agriculture, Vol 31, No 5, p 32-33, May, 1977. 4 tab.

Descriptors: *Trace elements, *Metals, *Water reuse, Phytotoxicity, Effluents, Waste disposal, Sludge disposal, Fertilizers, Industrial wastes, Food chains, Waste water treatment.

A study was done on the effects of trace element concentrations on the reuse of waste water effluents and sewage sludge for agricultural and municipal purposes. Elements studied included B, Cd, Cr, Cu, Pb, Hg, Ni, and Zn. Most waste effluents could meet criteria for trace element concentrations established by the National Academy of Science and National Academy of Engineering Joint Committee in 1972. Because the actual concentrations of trace elements may vary considerably with the nature of the community, its related industries, and its treatment system, direct reuse of waste water for public water supply is not recommended by regulatory agencies at the present time. Agricultural use of sludge with nominal trace element concentrations is not generally detrimental to plants, but it does present a potential danger to human consumers if accumulation in edible plant tissues is significant. Proper selection of crop species, soil type, and sludge composition may minimize accumulation of trace elements in plant tissue. Use of sludge that is unusually high in trace element concentrations is discouraged. (Schulz-FIRL)
W77-10577

885 MILLION-PLUS PLAN IS RECOMMENDED FOR BOSTON AREA,
Massachusetts Metropolitan District Commission, Boston.
M. Weiss, and J. P. Vittands.
Water and Wastes Engineering, Vol 14, No 6, p 30-34, June, 1977. 2 fig, 1 tab.

Descriptors: *Sludge disposal, *Sludge treatment, Municipal wastes, *Regional development, Comprehensive planning, Overflow, Feasibility studies, Waste water treatment, Waste water disposal.
Identifiers: Boston(MA).

A study was done on possibilities for improving municipal waste water treatment capacity for the Boston Metropolitan Sewerage District. Five concepts for waste water management were considered, including various degrees of expansion of service, decentralization, and waste water disposal through land application. Capital costs for the various concepts, with the exception of land application, were approximately equal. After evaluation of the five plans presented, moderate decentralization was recommended. The recommended plan includes upgrading existing facilities and constructing two new AWT satellite plants. Costs will be apportioned among member municipalities. (Schulz-FIRL)
W77-10578

MARYLAND RESEARCH FINDING GUIDELINES FOR SLUDGE USE.
For primary bibliographic entry see Field 5E.
W77-10580

THE PERSISTENCE OF POLIOVIRUS IN ACTIVATED SLUDGE TREATMENT,
Surrey Univ., Guildford (England).
A. Balluz, H. H. Jones, and M. Butler.
Journal of Hygiene, Cambridge, Vol. 78, No. 2, p 165-173, 1977. 4 fig, 1 tab, 15 ref.

Descriptors: *Viruses, *Persistence, *Activated sludge, Temperature, Suspended solids, Operations, Performance, Separation, Model studies, Treatment facilities, Waste water treatment.

Poliovirus persistence during activated sludge treatment was studied in a model activated sludge treatment facility. Poliovirus was inoculated either continuously or by single dose. Viral distribution in influent, mixed liquor, and effluent was regularly monitored. Observations of viral decline during sewage treatment were confirmed. It was concluded that virus removal efficiencies were related to suspended solids content would likely contain low viral counts. Careless disposal of untreated sludge may be the cause of pathogenic virus transmission in sewage whose effluent was apparently virus-free. It was not possible to determine reasons for differences in viral decline rates after cessation of inoculation of the two experimental systems. It was suspected that a relationship existed with solids loading. The viral inactivation mechanism was not understood, although direct or indirect biological activity was considered the most important factor. (Collins-FIRL)
W77-10583

A MODEL FOR ALUMINUM PHOSPHATE PRECIPITATION,
Washington Univ., Seattle. Dept. of Civil Engineering.
J. F. Ferguson, and T. King.
Journal Water Pollution Control Federal, Vol. 49, No. 4, p 646-568, April 1977. 11 fig, 1 tab, 20 ref, 1 append.

Descriptors: *Model studies, *Separation techniques, Phosphate, Aluminum, Hydrogen ion concentration, Sewage effluents, Physical properties, Chemical properties, Design criteria, Waste water treatment.

A conceptual and numerical model for orthophosphate precipitation was described. The model accounted for many experimental and field studies on aluminum addition. The process was modeled as an equilibrium precipitation process. Phosphate removal was approximately stoichiometric at an Al:P mole ratio of 1.4 until a residual of nearly 1 mg/liter at a final pH of 5.2-6.9. Aluminum and phosphate mass balances could be used to compute residuals from aluminum phosphate solubility at doses near the stoichiometric requirement. Overdosing above 60 mg/liter only changes the final pH. Intense initial mixing and uniform chemical addition are necessary for efficient use of alum in the stoichiometric zone. Phosphate reduction usually causes a reduction in chemical costs if done in the stoichiometric zone, except when alkalinity is high or low. Qualitative reproductions of the effects of alum dosage and pH seen in experimental studies can help estimation of the potential applicability of alum for a particular waste water and the needed chemical dosages. (Collins-FIRL)
W77-10584

WATER HYACINTH CULTURE FOR WASTEWATER TREATMENT,
Texas Dept. of Health Resources, Austin. Div. of Wastewater Technology and Surveillance.
R. Dinges.
1976. 143 p, 30 fig, 60 tab, 32 ref, 1 append.

Descriptors: *Water hyacinth, *Aquatic plants, *Stabilization, *Waste water treatment, *Water quality, Heavy metals, Biochemical oxygen demand, Soil-water-plant relationships, Plant physiology, Biological treatment, Waste treatment.
Identifiers: *Eichornia crassipes.

Water hyacinths, Eichornia crassipes, have been considered as a means of improving effluent quality. In a study conducted in Austin, Texas, stabilization pond effluent was passed through shallow earthen basins which were covered with water hyacinths. Water hyacinths were effective in removing algae, other suspended particles, and dissolved impurities from the effluent. They also reduced nitrogen, fecal coliform bacteria, BOD5, COD, and suspended solids in the stabilization ponds. Various heavy metals and other elements accumulate in plant tissue, including: Cl, P, As, Fe, Cu, Cr, Hg, Pb, Ni, Zn, Mg, Mn, and K. A one acre crop of mature plants was estimated to contain more than 2,500 pounds of minerals. Cultivation of hyacinths can be used to purify waste waters in climatically favorable zones, while sources of heat for hyacinth beds during colder winter periods might include use of raw sewage, incineration of garbage, anaerobic digester gas, cooling waters of power stations, and solar panels. (Schulz-FIRL)
W77-10586

SUBMERSIBLE PUMPS SPEED SEWAGE FLOW,
J. E. Ransom.
The American City and County, Vol. 92, No. 6, p 70, June, 1977.

Descriptors: *Pumping plants, *Pumps, Equipment, Sewers, Treatment facilities, Sewage effluents, Regulation, Planning, Cities, Urban areas, Performance, Maintenance, Inspection, Waste water treatment.
Identifiers: Florence(KY).

Rapid community and area growth and overloaded pumping stations created sewage handling problems in Florence, Kentucky. A modified activated sludge process package plant was constructed to support the original facility. In the mid-1960s, the three original pumping stations suffered from frequent breakdowns and flooding. These were converted to electrical submersible pumps, which were also used in the nine stations subsequently constructed. Station capacity can be increased by changing impellers or adding another pump. Equipment failure due to flooding has been eliminated because the pumps operated submerged normally. No major problems have since occurred, and maintenance and inspection have been simplified. City regulation of pumping station construction has standardized equipment and contributed to the simplification of inspection and maintenance. (Collins-FIRL)
W77-10587

EXTENSIVE COLLECTION SYSTEM HIGHLIGHTS $30 MILLION POLLUTION CONTROL PROGRAM.
Water and Wastes Engineering, Vol. 14, No. 5, p 35-38, May, 1977.

Descriptors: *Waste water treatment, *Municipal wastes, Sewers, Sewage systems, Industrial wastes, Interceptor sewers, Planning, Design, Costs.
Identifiers: Haverhill(MA), Merrimack River.

A $30-million waste water collection and treatment project is nearing completion in Haverhill, Massachusetts. The project selected, one developed by Camp Dresser and McKee, follows an intermediate plan and will be able to handle treatment of all dry weather waste water flows. Excess flows during rainfall and snowmelt will be diverted to the Merrimack River. Other collection approaches--separation of storm water and waste water or treatment of all collected water--were rejected as too costly and disruptive. The 18 mgd capacity of the activated sludge facility will meet the needs of the city's estimated 1985 population (48,500) and also those of nearby Groveland. The plant is designed to treat wastes of paper, tannery, and textile manufacturing as well. Construction has also included two major intercepting sewers on either side of the dividing river, and three inverted river crossings conveying waste water to the south bank where a 30 mgd peak capacity pumping station is being built. Treatment processes will include screening, primary sedimentation, aeration, final sedimentation, and chlorination. (Pfeifer-FIRL)
W77-10588

EPA INDEXES SHOW COSTS RISING AT QUICKER PACE.
Engineering News Record, Vol. 198, No. 25, p 120, June, 1977. 1 tab.

Descriptors: *Cost analysis, *Cost comparisons, *Construction costs, *Sewage treatment, *Waste water treatment, Sewers, Cost trends, Water costs.

Compilations made by the Environmental Protection Agency (EPA) on municipal waste water treatment plants and urban sewer system construction costs have shown that costs have risen from about 1% to over 2% during the first part of 1977. Sewer construction costs were 105% higher during the first quarter of 1977 than during the five-month total for 1976, with the rate of increase for the complete urban sewer system being the greatest. Comparisons of sewage treatment plant and sewer construction cost indexes for 5 mgd municipal waste water treatment facilities in 25 cities, 50 mgd treatment facilities in 25 cities, and complete urban sewer systems are presented. (Schulz-FIRL)
W77-10589

GROUT ROUTS SEWER PROBLEMS,
Metropolitan Sewer District, St. Louis, Mo.
C. G. Sweeney.
Water and Wastes Engineering, Vol. 14, No. 5, p 59-60, May, 1977.

Descriptors: *Municipal wastes, *Grouting, *Pipes, *Repairing, *Maintenance, Municipal wastes, Waste water treatment, Sewers, Sewer systems, Costs.
Identifiers: Television inspection, St. Louis(MO).

The St. Louis Metropolitan Sewer District, established in 1954, was an early experimenter with TV inspection and grouting for sewer line maintenance. The district, a consolidation of 90 municipalities, towns, and unincorporated areas, continues to show great success in the use of these techniques. The district requires efficient use of funds, equipment, and manpower for upkeep of its complex system. Two TV inspection/grouting units are now on daily operation. While they are a direct and effective approach for handling emergenices, they are largely deployed for preventive maintenance. Areas of heavy infiltration/inflow are identified for inspection by the units. Sources of inflow are pinpointed by TV inspection and dye testing. A 'pump until no acceptance' formula is used, restricting t 5 or 6 gallons the maximum amount of grout--a viscous acrylamide gel--that is generally required. Costs of chemical grouting are estimated to be 1% that of repair by other methods. Inspections carried out six months after every grouting have never revealed any evidence of breakdown or deterioration. (Pfeifer-FIRL)
W77-10590

COLLECTION, TREATMENT AND REUTILIZATION OF WASTE WATERS IN ARID ZONES OF THE MIDDLE EAST,
Taylor (John) and Sons, London (England).
D. G. M. Roberts, and P. A. Banks.
Proceedings of the Institution of Civil Engineers, Part 1, Vol. 62, p 209-219, May, 1977. 3 tab, 5 ref.

Descriptors: *Sewers, *Design criteria, *Environment, *Corrosion control, *Linings, Pipes, Corrosion, Pumps, Conveyance structures, Treatment facilities, Waste disposal, Precipitation(Atmospheric), Water reuse, Waste water treatment.
Identifiers: Middle East.

Local influences on the design and operation of Middle Eastern sewer systems were examined. Waste treatment and water reuse were also discussed. Major problems result from high temperature, low rainfall, and the predominantly sandy ground surface. The temperature in sewers can reach 35 C which quickly produces septicity, especially in rising mains. The resultant H2S can cause severe corrosion. Design features which may ease the problems were: good gradients, small capacity pumps, restricted sump sizes, and short rising mains. Highly technological solutions were avoided. Linings and coatings which have been used successfully include coal tar epoxy, pure epoxy resins, and glass reinforced plastic. The use of expensive, non-corrosive pipes was frequently justified. Provisions should be made for heavy rainfall as most areas do not have storm sewers. Ingress of groundwater into house connections should be avoided to prevent sewer system overloading. The effectiveness of various treatment systems was evaluated and recommendations made as to their applicability. Careful handling and treatment were suggested for water reuse schemes. Use as industrial process water or orchard and agricultural irrigation water was recommended to prevent public health problems. Waste disposal and the economics of sewer systems and treatment facilities were briefly reviewed. (Collins-FIRL)
W77-10591

PVC SEWER PIPE SURVIVES DEEP BURIAL.
For primary bibliographic entry see Field 8G.
W77-10592

A NOTE ON SEWER DESIGN,
Roorkee Univ., India. Dept. of Civil Engineering.
P. K. Swamee, and N. S. Grewal.
Indian Journal of Environmental Health, Vol 19, No 1, p 69-72, January, 1977. 1 fig, 2 ref.

Descriptors: *Sewers, *Design criteria, Hydraulic design, Conveyance structures, Structural design, Flow, Mathematical studies, Equations, Conduits, Waste water treatment.

A method has been devised for the design of circular sewers to handle partially full flow conditions. Determinations are made for design parameters without any trial and error procedure. Parameters of known value, such as discharge, bed slope, and Manning's roughness coefficient n, are used to determine sewer radius, average flow velocity, and flow depth. Equations and a sample solution are provided to illustrate the process. (Collins-FIRL)
W77-10599

BIOLOGICAL REGENERATION OF POWERED ACTIVATED CARBON ADDED TO ACTIVATED SLUDGE UNITS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
F. B. DeWalle, and E. S. K. Chian.
Water Research, Vol. 11, No. 5, p 439-446, 1977. 9 fig, 2 tab, 33 ref.

Descriptors: *Activated carbon, *Activated sludge, *Model studies, Separation techniques, Organic matter, Bacteria, Adsorption, Biological treatment, Physical properties, Equations, Chemical oxygen demand, Sludge treatment, Waste water treatment.
Identifiers: Powdered activated carbon(PAC), Freundlich equation.

The effect of powdered activated carbon (PAC) on adsorption and biological regeneration in activated sludge units was investigated. PAC equilibrium concentrations of 0, 15, 300, and 1,000 mg/liter were introduced into plug-flow activated sludge units with sludge ages of 3, 5, 10, and 15 days. Average COD removals were independent of sludge age. A mathematical model was developed for the prediction of organic matter concentration reductions resulting from PAC addition. The Freundlich equation was used to describe the adsorptive behavior. The daily regenerated capacity as affected by the ratio of biological solids to activated carbon was also included. An apparent increase of maximum adsorptive capacity was observed with increased cell residence time in the units. The removal of slowly degradable organics could be caused by biological processes. This would free or regenerate some adsorption sites and increase PAC apparent adsorptive capacity. An important parameter could be the relationship of activated sludge concentrations to activated carbon concentrations. A higher relative magnitude of biomass produced easier PAC regeneration. It was concluded that the relative ratio of biological solids to carbon solids would determine the magnitude of daily regeneration. Daily regeneration increased approximately with the square root of the influent concentration. Further research was begun to confirm the model. (Collins-FIRL)
W77-10601

PHOSPHATE REMOVAL STUDIES AT BARRIE WATER POLLUTION CONTROL CENTRE,
J. Seldon.
Water and Pollution Control, Vol. 115, No. 5, p 30-32, May, 1977. 4 fig, 2 tab.

Descriptors: *Phosphates, *Chemical treatment, *Sulfates, Separation techniques, Treatment facilities, Effluents, Waste water treatment, Costs.
Identifiers: Aluminum sulfate, Barrie Water Pollution Control Center(Ontario Canada).

A study of phosphate removal was conducted at Barrie Water Pollution control Centre, Ontario, Canada. Required removal was 80% of the total incoming phosphate, but the plant's goal was an environmentally more beneficial level of less than 1 mg/liter final effluent phosphate. The plant was adding approximately 115 mg/liter of aluminum sulfate at eh discharge of the aeration tanks at the beginning of the study. The dosage was reduced to approximately 50 mg/liter over a 12-month period. Final effluent phosphate levels were found to increase in direct proportion to the decrease in aluminum sulfate dosage. Under normal conditions the addition of 55 mh/liter of aluminum slfate consistently produced a total phosphate level of less than 1 mg/liter in the final effluent. This dosage appeared to be the minimum for acceptable phosphate removal. Reducing the dosage fom 11 to 55 mg/liter resulted in a $40,000 annual saving in chemical costs. (Collins-FIRL)
W77-10602

BRAZIL--A MARKET FOR BRITISH EFFLUENT AND WATER TREATMENT PLANT MANUFACTURERS,
R. M. Bradley.
Effluent and Water Treatment Journal, Vol. 17, No. 4, p 169-174, April, 1977. 2 fig, 3 tab, 9 ref.

Descriptors: *Water pollution, *Regional development, *Sewage treatment, Sewers, Industrial wastes, Waste water treatment, Cities, Public health, Regional economics, Oxidation lagoons, Outfall sewers, Sanitary engineering, Municipal wastes.
Identifiers: National Sanitation Plan(Brazil).

The water treatment problem in Brazil is discussed. Brazil is one of the largest, fastest developing, and resource-richest nations in the world. Rapid population growth, heavy industrialization, and urbanization have caused increased water pollution problems. Sanitation facilities have not kept pace with population, and industrial treatment facilities are inadequate. Even sewage which is collected is often disposed of in its raw state. Recently steps have been taken to balance industrial needs against health and environmental concerns. Through the 1971 National Sanitation Plan (PLANASA), instituted to finance public health engineering works, piped water connections have increased 38%. Simple treatments such as stabilization lagoons and long sea outfalls are stressed. Efforts to spur the economy have resulted in restrictions which favor the development of local manufacturing plants for water treatment equipment.
W77-10603

STERILIZATION OF PURIFICATION PLANT SLUDGE BY MEANS OF ELECTRON RADIATION (HYGIENISIERUNG VON KLAERSCHLAMM DURCH ELEKTRONENBESTRAHLUNG),
K. Tofaute.
Brown Boveri Mitteilungen, Vol 64, No 3, p 164-170, 1977. 11 ref.

Descriptors: *Irradiation, *Sludge treatment, Microorganisms, Equipment, Performance, Design criteria, Fertilizers, Waste treatment, Energy, Costs, Waste water treatment.

A process for the electron radiation sterilization of purification plant sludge, with subsequent use as agricultural fertilizer, is described. A minimum dose of 300 krad was adequate to rid the sludge of microorganisms. The size of the electron accelerator, with indicators: accelerator voltage in kV or mV, beam current in mA, and beam efficiency as the product of the former and the latter in kW, depended on various operational parameters. Accelerator voltage (kV or mV) determined measurement for depth of beam penetration in mm and therefore magnitude for the thickness of the sludge layer to be formed. Beam efficiency (kW) was converted into energy dose performance (mrad x kg/hr) as magnitude for quantity of processed sludge at a certain dose involving beam efficiency utilization. Energy dose performance in (krad x kg/hr could be calculated from the beam efficiency based on the formula: 1 kW = 360 mrad kg/hr. The power dose performance transmitted to the purified sludge was determined by the beam efficiency level for the latter, set at 35-45%. The operation was subdivided into pre-treatment, radiation, storage, and discharge of sludge. Radiation screening for a 750 kV accelerator was considered sufficient when walls and ceiling were constructed of standard concrete, 1.10 m in thickness. No radiation protection for personnel was required. Depending on size of installation, treated sludge cost 1.0-1.5 Swiss Francs/cu m including power, which ranged from 0.4-0.6 SF/cu m depending on energy cost. (Takacs-FIRL)
W77-10604

HYGIENIC EFFECTIVENESS OF DISINFECTION OF SEWAGE AFTER ITS MECHANICAL TREATMENT (GIGIENICHESKAIA EFFEKTIVNOST' OBEZZARAZHIVANIIA BYTOVYKH SOCHNYKH VOD, PROSHEDSHIKH MEKANICHESKUIU OCHISTKU),
I. N. Cherkinskii, A. V. Kulikov, and G. P. Kovleva.
Gigiena i Sanitariia, No. 3, p 18-22, March, 1977. 3 ref.

Descriptors: *Disinfection, *Pathogenic bacteria, Chlorination, Sewage treatment, Coliforms, Bacteria, Microorganisms, Public health, Performance, Evaluation, Waste water treatment.

The effectiveness of disinfection of mechanically treated sewage by chlorination as required under epidemic conditions was studied. Counts of Escherichia coli and Salmonella paratyphi B were correlated with residual chlorine content after chlorination of sewage artificially infected with S. paratyphi B. This pathogenic germ was no longer detectable when the residual coli index was 3,000 or less and the residual chlorine content was at least 4.5 mg/liter. These values can be used as criteria for the routine check-up of the effectiveness of disinfection of sewage by chlorination. Disinfection can be considered effective and safe when the coli index does not exceed 3,000 at a minimal residual chlorine level of 4.5 mg/liter. (Takacs-FIRL)
W77-10605

WASTEWATER PHOSPHORUS REMOVAL USING LAND APPLICATION,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
J. Enfield.
Civil Engineering-ASCE, Vol 47, No 6, p 58-60, June, 1977. 4 fig.

Descriptors: *Phosphorus, *Design criteria, *Sorption, Chemical properties, Soils, Performance, Analytical techniques, Temperature, Chemical reactions, Waste water treatment.

A graphical approach for determining phosphorus removal, as a design parameter of a soil waste water treatment system, was presented. This approach was based on phosphorus concentrations of a given waste water. System failure could be caused by exceeding the soil phosphorus sorption capacity. Investigations have shown that finer textured soils have a greater capacity for phosphorus sorption. The recommended procedure involved a laboratory study of each major soil series on the proposed site. Forty duplicated analyses of each sample were made to determine phosphorus sorption capacity. During equilibrium time, samples should be agitated and maintained at a constant temperature. This temperature should be the mean annual temperature of the site since reactions are temperature-dependent. The resultant sorption isotherm data should be extrapolated to estimate results of additional equilibrating time. (Collins-FIRL)
W77-10606

SODIUM BICARBONATE PROVIDES PH RELIEF FOR DIGESTER.
Water and Wastes Engineering, Vol 14, No 5, p 57, May, 1977.

Descriptors: *Anaerobic digestion, *Hydrogen ion concentration, *Alkalinity, Treatment facilities, Methane, Fuels, Gases, Performance, Equipment, Waste water treatment.
Identifiers: Sodium bicarbonate, Chatham Township(NJ).

Sodium bicarbonate was used to solve several digester problems in Chatham Township, New Jersey. The major problems were pH and alkalinity. The addition of sodium bicarbonate raised these indicators to a neutral range, and maintained those levels. A 5-6 foot scum blanket and 6-9 foot grit accumulation had been cleaned out of the plant's only anaerobic digester. Soon after, a drop in methane production indicated the beginning of a souring problem. A two-month treatment of 200-400 pounds/day of sodium bicarbonate increased the pH from 5.6 to 6.5 at the end of the first month. The pH finally stabilized at 7.1. Alkalinity rose to 3900 mg/liter and methane gas production rose as high as 8,000 cubic feet/day. The high level of methane produced which could be used as fuel resulted in reduced fuel costs. (Collins-FIRL)
W77-10607

OXYGENATION OF AQUEOUS WASTES: THE PROST SYSTEM,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemical Engineering.
D. F. Othmer.
Chemical Engineering, Vol 84, No 13, p 117-120, June, 1977. 2 fig, 8 ref.

Descriptors: *Oxygenation, *Waste treatment, *Oxygen, *Aqueous solutions, *Pressure, Air, Adsorption, Biochemical oxygen demand, Turbidity, Oxidation, Organic carbon, Dissolved oxygen, Equipment, Waste water treatment.
Identifiers: Pressure-Recycling Oxidation Sewage Treatment(PROST).

The PROST (Pressure-Recycling Oxidation Sewage Treatment) system was described. This system provided the advantages of pressure digestion with air and/or oxygen as well as several improvements. Pressure digestion increased the speed of oxygen adsorption and the extent of digestion. Unit size and land requirements were reduced, and the character of the final effluent liquid and sludge was improved. This system's predissolved oxygen produces such calm oxidation that the unit may be concurrently used as a clarifier. Waste waters were depressurized after depletion of the dissolved oxygen. Other gases dissolved at the elevated pressure were then released. Process repetition dissolved the oxygen necessary to supply practically all of the BOD. The influent sewage entered a centrifugal pump and was mixed with air and/or oxygen. The liquid passed to the pressure vessel which acted as an organics digester. Most of the organic material was oxidized or digested by chemical, enzymatic, or aerobic bacterial action. The liquid overflowed the top of the pressure tank. There was an 80-90% BOD reduction and minimal turbidity. Sludge was discharged as the conventional underflow. Added BOD and turbidity reduction was possible by retreatment. Sludge recycling oxidized some of the organic carbon. A compact version was described which used a single vessel for BOD supply and clarification involving solid-liquid contacting. (Collins-FIRL)
W77-10608

SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5E.
W77-10609

STANDARDIZATION FOR WATER POLLUTION CONTROL WORKS,
D. O. Lloyd.
Water Pollution Control, Vol 76, p 173-181, 1977. 2 fig, 4 tab, 14 ref, 3 append.

Descriptors: *Water pollution control, *Treatment facilities, *Design standards, Equipment, Filters, Sludge treatment, Mechanical equipment, Performance, Construction, Waste water treatment.

Factors involved in the standardization of treatment facilities were considered. The goals for water pollution control facilities were: use of standard design procedures; use of standard equipment and machinery; construction of standard treatment units; improved performance appraisal; and avoidance of cosmetic additions while encouraging innovation. It was considered most important to avoid weak standards which would impair performance and confidence in the standardized forms. Standardized preliminary treatment processes, sedimentation units, biological filters, sludge digestion, and mechanical equipment were expected to produce significant benefits. More effective standards could be determined by cooperation between designers, manufacturers, and users. (Collins-FIRL)
W77-10610

CHEMISORPTION OF PHOSPHORUS FROM PRECLEANED MUNICIPAL SEWAGE (VERFAHREN ZUR ABSORPTIVEN PHOSPHORELIMINATION AUS VORGEREINIGTEM KOMMUNALEM ABWASSER),
N. Klaentschi.
Gas-Wasser-Abwasser, Vol. 57, No. 5, p 379-384, 1977. 6 fig, 5 tab, 12 ref.

Descriptors: *Phosphorus, *Absorption, Separation techniques, Municipal wastes, Economics, Treatment facilities, Organic carbon, Water purification, Turbidity, Waste water treatment.

A treatment process for phosphorus removal was presented. This process based on chemisorption, can produce sewage effluents with phosphorus concentrations of 0.1 mg P/liter. A pilot plant operation indicated that the process was technically and economically feasible for municipal effluent treatment. The process also reduced organic carbon and turbidity. A significant improvement was projected for treatment plants already using phosphate precipitation. (Collins-FIRL)
W77-10611

CLEANSING THE RIVER TYNE,
Northumbrian Water Authority, Gosforth (England).
W. B. Norgrove.
Chemistry and Industry, No. 9, p 344-348, May 1977. 3 fig, 1 tab, 4 ref.

Descriptors: *Water pollution control, *Rivers, Sewage disposal, Treatment facilities, Sludge, Overflow, Design criteria, Sewers, Waste water treatment, Planning.
Identifiers: Tyne River(England).

Efforts to reverse the effects of pollution in the River Tyne, England, were reviewed. The river has received wastes from the coal and iron industries since the 19th century. Its self-purification and re-oxygenation capacities have been negated. Crude sewage from 88% of the population is directly discharged to the river; sewage from 7% is discharged through outfalls; 5% receives some treatment. Sea water and fresh water in the river produce an upstream bottom flow which traps much of the organic solid pollution. A long sea outfall was determined to be economically unfeasible. A two-site treatment system with interceptor sewers was chosen. Liquid crude sludge will be disposed at sea by tankers. New interceptor sewers are being constructed and designed to accommodate a population of 1.3 million and associated industrial influents. A vortex type overflow will be used, in areas where steep gradients and super critical flow velocities exist, to separate the initial combined flow. A progress report on construction, which began in 1973, was provided. The projected cost for this effort was expected to be about 142 million pounds. (Collins-FIRL)
W77-10613

PRELIMINARY INVESTIGATIONS IN WATER TREATMENT WITH HIGH ENERGY ELECTRON BEAMS,
Paris-5 Univ. (France).
C. Gallien, P. Icre, C. Levaillant, and A. Montiel.
Radiation Physics and Chemistry, Vol. 9, No. 4-6, p 775-787, 1977. 2 fig, 5 tab, 17 ref.

Descriptors: *Irradiation, *Chemical reactions, *Genetics, *Radioactivity effects, Pathogenic bacteria, Coliforms, Streptococcus, Amphibians, Hydrogen ion concentration, Nitrites, Chemical analysis, Waste water treatment, Ionization.
Identifiers: P. waltlii, K. pneumoniae.

An investigation of high energy electron beam waste water treatment was presented. The aspects of this treatment were considered. The effects of treated water on biological processes were tested. Studies were conducted to determine chemical changes in the treated water. The question of adequate pathogen reduction, as well as optimum doses for this purpose, was investigated. An industrial irradiator was used which uniformly scanned a width of 400 millimeters with a maximum energy of 6 MeV and passage speeds of 0.12-12 meters/mn. Radiation was adjustable from 100 drads to 5 Mrads. Biological tests were conducted on embryonic development of the amphibian Pleurodeles waltlii (Michahelles). No perturbations in embryo development resulted from water treated with doses of 100 krads to 2 Mrads. There were no caryotype aberrations or mutagenic effects noted in the embryos grown in treated water samples. A 'tanning' effect on the egg chorion may have resulted from chemical modification. Chemical analysis revealed no significant pH changes and minor chemical changes such as an increase in the nitrite ion concentration. Bacterial studies were conducted with E. coli, K. pneumoniae, and S. faecalis. The doses used were 200 krads and 1 Mrad. A dose of 200 krads completely destroyed the enterobacteria and produced a 99.93% reduction of S. faecalis. Data suggested that dose selection was only dependent upon the sterilization threshold objectives for a particular application and upon economic considerations. Irradiation was judged more satisfactory, from a biological standpoint, than chemical treatment. (Collins-FIRL)
W77-10614

SLUDGE PASTEURIZATION BY HEAT AND IONIZING RADIATION. RESULTS OF A STUDY FOR THE EFFLUENTS PURIFICATION PLANT, BERN-NEUBRUECK (SCHLAMMHYGIENISIERUNG DURCH WAERME UND IONISIERENDE STRAHLEN: ERGEBNISSE EINER VERFAHRENSSTUDIE FUER DIE ARA BERN-NEUBRUECK),
J. Huber, and M. Meyer.
Gas-Wasser-Abwasser, Vol 57, No 5, p 385-394, 1977. 8 fig, 1 tab, 22 ref.

Descriptors: *Irradiation, Gamma rays, Filtration, Sedimentation, Physical properties, Economics, Sludge treatment, Evaluation, Costs, Waste water treatment.
Identifiers: Pasteurization, Electron irradiation.

The Bern-Neubrueck waste water treatment plant was designed to provide sludge for agricultural applications. Three sterilization processes were evaluated for a flow of 313 cu m/day. One option was pasteurization at 70C for 30 minutes. Another was radiation with high energy electrons with an energy of 1 MeV at a dose of 300-400 krad. The third alternative was gamma irradiation with cobalt -60, using the batch process, at 300-400 krad. Data were presented on filtration and sedimentation characteristics of the treated sludge. Gamma irradiation was eliminated on the basis of economics. Since pasteurization and electron irradiation had approximately the same costs, a final decision should be based on other parameters. Electron irradiation might be more suitable for the Bern area because irradiated sludge is less odoriforous than pasteurized sludge. (Collins-FIRL)
W77-10615

REMOVAL OF ORGANIC RESIDUAL MATTER FROM EFFLUENTS WITH THE AID OF MACROPOROUS ADSORPTION RESINS (ENTFERNUNG VON ORGANISCHEN RESTSTOFFEN AUS ABWAESSERN MIT HILFE VON MAKROPOROESEN ADSORBERHARZEN),
Technische Universitaet, Hanover (West Germany). Institut fuer Siedlungswasserwirtschaft.
H. Rueffer, and J. Schilling.
Vom Wasser, Vol. 47, p 155-177, 1977. 19 fig, 7 tab, 27 ref.

Descriptors: *Organic compounds, *Adsorption, *Ion exchange, *Resins, Industrial wastes, Domestic wastes, Equations, Separation techniques, Sewage effluents, Waste water treatment.

Pilot and laboratory studies were performed to investigate the use of macroporous ion exchange resins for the removal of organic compounds from domestic and industrial sewage. Organic matter reductions up to 90% were evident after a 30-60 minute contact period. Large surface concentrations were found through equilibrium adsorption tests, especially with high concentrations of industrial waste water. Freundlich isotherms indicated an increased adsorption capacity when waste water concentrations were increased. Further study of the regeneration process was suggested. (Collins-FIRL)
W77-10617

DESTRUCTION OF COLIFORMS IN WATER AND SEWAGE WATER BY DYE-SENSITIZED PHOTOOXIDATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soils and Water.
A. J. Acher, and B. J. Juven.
Applied and Environmental Microbiology, Vol. 33, No. 5, p 1019-1022, May, 1977. 3 tab, 4 ref.

Descriptors: *Coliforms, *E. coli, *Oxidation, *Photoactivation, *Dyes, Sewage bacteria, Enteric bacteria, Bactericides, Sewage treatment, Waste water treatment.
Identifiers: Methylene blue, Rose bengal.

A method for the reduction of virus and fecal coliform concentrations in sewage water by oxidation of organic matter by photosensitization was described. Samples of waste water containing Escherichia coli to which dye-sensitizers had been added were subjected to solar radiation. The effect of the presence of methylene blue on E. coli was measured over various concentrations, radiation times, and sunlight intensities. Increasing the methylane blue concentration up to 5.0 mg/liter increased the bactericidal effect on both potable water and sewage water. Rose bengal was not as effective at destruction of E. coli under similar conditions. For methylene blue, concentration and radiation time were more important than sunlight intensity in efficiency of photooxidation. The dye sensitizers can be removed from effluent by adsorption on bentonite. (Schulz-FIRL)
W77-10618

MIAMI PLANS INJECTION WELL FOR WASTEWATER DISPOSAL.
For primary bibliographic entry see Field 5E.
W77-10619

POLYMERS ARE PRECISELY MANAGED,
Cleveland Regional Sewer District, Ohio.
J. Donahue.
Water and Wastes Engineering, Vol. 14, No. 6, p 58-61, June, 1977. 1 fig.

Descriptors: *Phosphates, *Nutrient removal, *Polymers, *Flow measurement, *Flow control, Municipal wastes, Phosphorus compounds, Pumping, Control systems, Automatic control, Waste water treatment.
Identifiers: Cleveland(OH).

The Easterly Wastewater Treatment Plant in Cleveland, Ohio, uses an efficient and economical method for phosphate removal from waste water. Pumping of a polymer solution to primary sedimentation tanks and secondary tanks is precisely controlled by automatic comparisons of actual flow rate of raw sewage with polymer flow. (Schulz-FIRL)
W77-10620

ANGLIAN OPENS ITS LARGEST SEWAGE TREATMENT WORKS.
Surveyor, Vol. 149, No. 4431, p 6-7, May, 1977. fig.

Descriptors: *Activated sludge, *Biological treatment, *Tannery wastes, *Waste water treatment, *Filters, Industrial wastes, Sludge treatment, Sludge disposal.
Identifiers: England, East Anglia, Anglian Water Authority, Great Billing(UK).

Overloading of an existing activated sludge plant at Great Billing in East Anglia, England has led to the construction of additional sewage treatment facilities. An increasing proportion of industrial effluent from the area's tanning industries and fluctuations in load indicated the need for extension to existing facilities. A two-stage filtration system including high rate and biological filters was installed to produce effluent that complies with Royal Commission standards. The treatment facility includes provisions for storm flow and diurnal variations in flow. After primary settlement is completed, the settled sewage is then provided between the original activated sludge plant and the new biological filtration plant. Modifications to the original plant include cleaning of the diffusers in the aeration plant. The sludge treatment and disposal facilities at Great Billings are now the largest existing facilities in the Anglian Water Authority. (Schulz-FIRL)

/77-10621

ROWTH AND BENEFITS OF LOW SPEED ONFIGURATION,
. J. Guidi.
Vater and Sewage Works, Vol. 124, No. 6, p 66-, June, 1977. 3 fig, 7 tab.

escriptors: *Sewage disposal, *Centrifugation, Dewatering, *Sludge treatment, *Equipment, ost comparisons, Sewage sludge, Drying, Waste eatment, Waste water treatment, Solid wastes.

igh speed centrifuges have been used for the de-atering of raw and digested sludge. New velopments which indicate that low speed cen-fuging may be sufficient for dewatering pur-ses include: greater quantities of biological mes which resist compaction at high speeds, ore effective polymers for flocculation and de-atering of biological sludges, and a growing need r energy conservation. Advantages offered by e low speed design include less turbulence and suspension, longer residence time, greater solids mpaction, and better clarification and conveya-ity. Cost analyses for low and high speed cen-fuging yield a cost of $12.33/ton of sludge ocessed by the low speed unit as compared to a st of $27.93/ton for the high speed centrifuge. ise levels, polymer consumption, energy use, d maintenance expenditures were also reported be lower for the low speed unit. (Schulz-FIRL)
77-10622

RIGATION TRIAL WITH MORRO BAY ASTEWATER,
lifornia Univ., Davis. Cooperative Extension.
E. Wildman, R. L. Branson, J. M. Rible, and E. Cawelti.
lifornia Agriculture, Vol. 31, No. 5, p 36-37, y, 1977. 2 fig.

scriptors: *Irrigation practices, *Infiltration es, *Irrigation effects, *Sodium, *Water reuse, gation programs, Soil contamination, Agricul-e, Grasses, Soil chemical properties, Waste er disposal, Waste water treatment.
ntifiers: Morro Bay(CA).

ile upgrading its sewage treatment plant, the mmunity of Morro Bay considered reuse of ted waste water for irrigation of field and ge crops as an alternative to ocean disposal of uent. An irrigation trial was carried out using e types of treatment: (1) effluent, (2) effluent gypsum, and (3) city water comparable to nor-irrigation water. All plots were irrigated kly, receiving a total of 17 feet of water by the of the project. Soil samples were collected at ous stages during the irrigation and analyzed their sodium adsorption ratios to determine ther sodium added by the effluent posed an ir-tion hazard. Effluent water did raise the sodi-adsorption ratios, but the addition of gypsum led to lessen this effect. Infiltration tests wed no consistent differences between city effluent waters. It was suggested that elines for sodium contamination by irrigation ers be reevaluated for sewage effluents. ulz-FIRL)
-10623

IGATING WITH WASTEWATER IN OMA COUNTY,
fornia Univ., Davis. Cooperative Extension.
. Harwood.
fornia Agriculture, Vol. 31, No. 5, p 37-38, , 1977. 1 fig.

riptors: *Irrigation practices, *Irrigation ef-, *Water reuse, *Forage grasses, *Dairy in-y, Irrigation effects, Fertilizers, Nitrogen, phorus, Agriculture, Grasses, Waste water sal, Soil chemical properties, Soil physical erties, Waste water treatment.
ifiers: Sonoma County(CA).

Irrigation of forage crops with treated waste water in Sonoma County, California has been evaluated. Effluent supplied by the city of Santa Rosa for irrigation may have economic and other benefits for the area. Soil analyses over the three year test period indicated only minor changes, including slight increases in soil conductivity, phosphorus content, and pH. As nearly all soil types in Sonoma County are deficient in nitrogen and phosphorus, use of effluent for irrigation may significantly reduce fertilizer costs. Compaction of heavy clay soils could be alleviated by more frequent irrigations with smaller amounts of water. Concentrations of elements toxic to plant growth or animal health were not significant in the waste water used in Sonoma County. (Schulz-FIRL)
W77-10624

COMBINED PROCESSING OF WASTEWATER AND SOLID WASTE,
Brown and Caldwell, Walnut Creek, Calif.
R. B. Sieger, and B. D. Bracken.
AIChE Symposium Series, Vol. 73, No. 162, p 143-149, 1977. 4 fig, 1 tab, 5 ref.

Descriptors: *Energy, *Salvage value, *Fuels, *Recycling, *Sludge, *Sludge disposal, *Solid wastes, Waste treatment, Waste water treatment, Municipal wastes, Metals, Costs.
Identifiers: California, Refuse derived fuel, Sludge burning, Pyrolysis.

A design for a combined waste water and solid waste processing facility has been successfully tested and approved for the Central Contra Costa Sanitary District in northern California. This design puts an emphasis on energy recovery to reduce purchased energy requirements. Incoming solid wastes, 1089 mg/day at plant capacity, are sent to landfill sites or to the processing plant depending on their salvageability. At the process plant the wastes are salvaged for ferrus metals and aluminum. Air classifiers divide the initially shredded wastes into light and heavy fractions. The heavy fraction, primarily non-combustibles, is examined for metals. The light fraction, sent through a second hammermill-type shredder, yields RDF (refuse derived fuel) for use in sludge burning at the water treatment plant. The plant uses a physical-chemical-biological waste water treatment process including lime recalcination and sludge buring. The RDF, mixed with sludge in rations controlled for both optimal furnace operation and plant energy needs, is fed into the 11-hearth sludge burning furnaces. Pyrolysis rather than incineration is used, yielding a gas to be used as a fuel in the lime recalcination furnace. Exhausts from the furnace are passed to a waste heater boiler to generate steam for the plant's cooling and heating needs and for the driving of turbines for several mechanical devices. While laboratory testing of this system showed several problems, these were due to the small scale of the test. A full-scale test gave results exceeding expectations. (Pfeifer-FIRL)
W77-10625

BIOLOGICAL NITRIFICATION IN CONTACT AERATION SYSTEMS,
M. F. Abd-El-Bary, and M. J. Eways.
Water and Sewage Works, Vol. 124, No. 6, p 91-93, June, 1977. 3 fig, 2 tab, 11 ref.

Descriptors: *Aeration, *Nitrification, *Biological treatment, *Ammonia, *Sewage, Waste water treatment, Waste treatment, *Aerobic treatment, Sewage treatment, Effluents.

A contact aeration unit can achieve a high degree of biological nitrification. The system investigated was a fixed film type capable of biologically nitrifying ammonia at rates of up to 0.8 lb/day per 1000 square feet of surface area. This system, which provides a fixed surface area for attachment of the biological mass, is contrasted with a suspended growth system (an activated sludge type system). Advantages of the contact aeration system include: nitrification at pH levels of normal domestic sewage; flow by gravity, making the plant less power-consuming; automatic plant operation; and quick recovery by plants after shock loading. Data were collected over a three month period, with the temperature ranging from 71 F to 72 F and pH varying between 7.0 and 7.4. Portions of the final effluent of a 0.8 MGD capacity contact aeration plant were pumped to the first stage aeration unit of a 0.3 MGD plant. Analyses of grab samples taken along the length of the aeration tank showed the rate of nitrification to be a linear function of the tank length. Thus, the data indicate that the nitrification rate is a zero order reaction (using the Monod Model) and independent of ammonia concentration. (Pfeifer-FIRL)
W77-10626

PRETREATING AN ACID WHEY WASTE FOR SEWER DISCHARGE,
E. S. Hopkins, H. G. Angle, and H. C. Zigler.
Public Works, Vol. 108, No. 6, p 58-61, June, 1977. 1 fig, 2 tab, 4 ref.

Descriptors: *Industrial wastes, *Acidity, *Effluents, *Aeration, *Biological treatment, *Food processing wastes, *Microbial degradation, *Anaerobic conditions, Waste treatment, Waste water treatment, Sewer systems, Sewerage, Nitrogen, Oxygen, Absorption, Fermentation.
Identifiers: Frederick(MD), Cottage cheese wastes.

Treatment methods for converting acid cottage cheese manufacturing wastes to effluent acceptable for discharge into the Frederick, Maryland sewer system are discussed. Initial experiments with an industrial effluent consisting of equal parts whey and rinse water discharge after a six hour holding period showed BOD levels of 14,700 mg/liter, with 300 mg/liter being an acceptable level. Laboratory, field, and pilot plant studies were undertaken using air-microbiological procedures. Organisms from discharged raw sour milk were used as seed. Maintenance of proper nitrogen levels (7 mg/liter) and oxygen supplies was required for the organisms to destroy the whey wastes. Maintaining sufficient oxygen levels was the major practical difficulty, with absorptions per hour limited under procedure conditions. Anaerobic conditions induced fermentation with its consequent odor problems. Quantity of waste degraded was in direct proportion to quantity of oxygen absorbed, indicating the practicality of the air-microbiological approach. Air was supplied to the system both by a surface aerator and a diffuser ring at the bottom of the tank. (Pfeifer-FIRL)
W77-10627

SOILS INFILTRATION AND EVAPORATION OF WASTEWATER BY AEROBIC PROCESSES,
A. N. Young, Jr.
Institute of Environmental Sciences. Proceedings of the 23rd Annual Technical Meeting, p 115-117, April 25-27, 1977. 4 ref.

Descriptors: *Aerobic treatment, *Microorganisms, *Bacteria, *Septic tanks, *Transpiration, Sewage, Waste treatment, Waste water treatment, Water quality control.

The advantages of alternative disposal systems involving aerobic processing over those of conventional septic tank drainage field installations are discussed. Maintaining aerobic conditions allows the development of proper microorganisms which prey on anaerobic bacteria, the primary cause of soil clogging in on-site sewage treatment systems. Thus even in difficult soils porous conditions can be maintained and clogging prevented, while septic tank systems show a 50% failure rate within 2 years of installation. Alternate systems can a efficiently oxidize waste water nutrients, permitting their soil retention or uptake by vegetation and meeting EPA requirements for 1984 systems.

Alternate systems meet federal requirements for maintaining safe drinking water that septic tank systems cannot. the importance of proper construction and maintenance of the aerobic treatment equipment and the evapo/transpiration bed is stressed as critical to the success of the system. The ability of this type of absorption bed to hold water over long periods of rainfall is maintained by proper sizing of the bed. (Pfeifer-FIRL)
W77-10628

KRAKSTAD WASTE WATER FACILITY: THE FIRST TO BE EQUIPPED WITH CONTACT ROLLS FOR BIOLOGICAL PURIFICATION (KRAKSTAD RENSEANLEGG FORST MED KONTAKTVALSER TIL BIOLOGISK RENSING),
J. O. From.
Teknisk Ukeblad/Teknikk, Vol. 124, No. 16, p 21-22, April, 1977.

Descriptors: *Biological treatment, *Treatment facilities, *Bacteria, *Sludge treatment, Waste water treatment, Costs, Water purification, Sewage treatment.
Identifiers: Krakstad(Norway), Contact rolls.

A novel chemical and biological waste water treatment plant, designed for 1,500 persons in Krakstad, Norway, is described. After mechanical impurities are separated on sieves, biological purification is done by means of two cylinders measuring 3 m in diameter and about 5 m in length. These cylinders, partly immersed in the waste water horizontally, consist of 300 styropor/isopor discs, and have a surface of 4,200 sq m each for the bacterial cultures needed to purify the water. Consequently, there is no return sludge. The sludge obtained after biological purification and subsequent chemical flocculation is separated by plate separator. The waste water treatment cost amounts to the equivalent of 800 crowns per inhabitant. (Takacs-FIRL)
W77-10629

SANDVIKA WASTE WATER TREATMENT PLANT IN OPERATION. EXPERIENCE WITH DESIGN, CONSTRUCTION, AND OPERATION (SANDVIKA RENSEANLEGG I PRAKSIS. ERFARINGER FRA PLANLEGGING, BYGGING OG DRIFT),
A. Moen.
Teknisk Ukeblad/Teknikk, Vol. 124, No. 16, p 16, 18, 35, April, 1977. 5 fig, 1 tab, 1 ref.

Descriptors: *Treatment facilities, *Municipal wastes, Waste water treatment, Design, Construction, Waste treatment, Sea water.
Identifiers: Norway.

Experience with the operation of a Sandvika-type municipal waste water treatment plant at Baerum, Norway, is reported. After mechanical treatment and sand trapping, flocculation is done with lime (250 g/cu m). Sea-water is used as a source of magnesium (4-5% of the effluent). The sludge, thickened gravimetrically to a solids content of 5.3%, is dewatered by centrifugation. (Takacs-FIRL)
W77-10630

ONE PROCESS STEP CAN BE SKIPPED: BIOLOGICAL-CHEMICAL WASTE WATER TREATMENT PLANT BECOMING CHEAPER (ET PROSESSTRINN KAN SIOYFES: BIOLOGISK-KJEMISKE RENSEANLEGG BLIR BILLIGERE),
P. Nettli, and E. Hustad.
Kjemi, Vol. 37, No. 2, p 40-41, March, 1977. 3 fig, 1 tab.

Descriptors: *Biological treatment, *Iron compounds, *Lime, *Costs, Filtration, Water purification, Sludge treatment, Waste water treatment, Waste treatment.
Identifiers: Bio-Alwafloc.

The Bio-Alwafloc waste water treatment unit developed by Alwatech is described. Filtered waste water is first purified with activated sludge for about 40 minutes. It is then sent into a three-step aerated precipitation-flocculation-flotation unit without preliminary separation of the biological sludge. Trivalent iron salts, and possibly lime and an anionic polyelectrolyte, are added for chemical purification. The combination of biological and chemical separation in one step offers economic advantages without causing any marked reduction of the purification efficiency. (Takacs-FIRL)
W77-10631

ENERGY USAGE AND RECOVERY IN SLUDGE DISPOSAL PART 1,
Stanford Research Inst., Menlo Park
J. L. Jones, D. C. Bomberger, Jr., and F. M. Lewis.
Water and Sewage Works, Vol. 124, No. 7, p 44-47, July, 1977. 2 fig, 4 tab, 5 ref.

Descriptors: *Sludge disposal, *Sludge treatment, *Energy, *Incineration, *Heat treatment, Waste disposal, Waste water treatment.
Identifiers: Energy reuse.

Relative energy requirements and cost sensitivities to recovered energy value have been compared for various methods of sludge treatment and disposal Thermal processes such as incineration and pyrolysis are stressed. Trends in thermal processing and the status of existing types of thermal processing are outlined. The production of steam by a waste heat boiler is considered as a means of energy recovery from incineration. The quantity of steam produced was dependent on the sludge solids content and the treatment process used. Use of the recovered steam for the generation of electric power proved to be uneconomical and inefficient, while the use of steam by the sludge heat treatment unit was considered feasible. A comparison of total national per capita energy consumption with energy consumption for waste water treatment indicated that energy use for waste water treatment amounted to less than 0.1% of the total U.S. energy expenditure. (Schulz-FIRL)
W77-10632

ALBUQUERQUE CLOSES WATER-WASTE-WATER CYCLE.
American City and County, Vol. 92, No. 7, p 60, July, 1977.

Descriptors: *Water reuse, *Irrigation water, *Fertilizers, *Water management(Applied), *Water conservation, Water resources development, Water demand, Water supply, Waste water treatment, Waste water disposal, Waste treatment, Sludge treatment, Sludge disposal, Activated sludge.
Identifiers: Albuquerque(NM).

Since water supplies for the Albuquerque area are limited, high-level treatment of waste water for reuse in irrigation and soil conditioning is encouraged. Processing by Albuquerque's two waste treatment plants includes grit removal, primary sedimentation and screening, high-rate trickling filtration, clarification, activated sludge processing, and chlorination. The resultant effluent discharged into the Rio Grande contains less than 30 mg/liter of BOD and 30 mg/liter of suspended solids. Reuse of waste water also allows the city additional groundwater rights to the area's underground aquifer. Problems encountered in waste processing after the activated sludge process was added in 1976 include an increase in sludge volume. Also, as the treatment plant contains no sludge thickening facilities and all sludge is air dried on sand, beds, increased sludge volumes have presented storage problems during periods of unfavorable weather. Additional outlets for reuse and redistribution of dried sludge are currently being sought. (Schulz-FIRL)
W77-10633

WATER TREATMENT PLANT SLUDGES: AN UPDATE OF THE STATE-OF-THE-ART,
G. P. Westerhoff, J. T. Albert, P. W. Doe, H. W. Forster, and P. H. King.
Water and Sewage Works, Vol. 124, No. 7, p 63-66, July, 1977.

Descriptors: *Sludge disposal, *Sludge treatment, *Dewatering, *Waste disposal, *Centrifugation, *Sewage treatment, Waste water treatment.

Methods for the dewaterng of water treatment plant sludges and the ultimate disposal of dewatered sludge are discussed. Mechanical and non-mechanical methods of dewatering are mentioned, including lagoon thickening, sand bed drying, centrifugation, vaccum filtration, and pressure filtration. Recommendations for further research and development are given for the following areas: minimization o sludge volumes; recovery of resources present in sludge, such a alum, lime, magnesium, and iron; and ultimate disposal of sludge in a safe, economical manner. (Schulz-FIRL)
W77-10634

A METHODOLOGY FOR ASSESSING LAND APPLICATION OF SLUDGES AND WASTE WATERS,
For primary bibliographic entry see Field 5E.
W77-10635

EVALUATION OF THE EFFECTIVENESS O DEHELMINTIZATION OF WASTE WATE DURING MECHANICAL TREATMENT A SMOLENSK (OTSENKA EFFEKTIVNOST DEGEL' MINTIZATSKII STOCHNYKH VO PRI MEKHANICHESKOI OCHISTKE SMOLENSKE),
S. Y. Ashnin, and L. S. Lagutina.
Meditsinskaia Parazitologiia i Parazitarnye Bole ni, Vol. 45, No. 5, p 609-611, 1976. 1 tab.

Descriptors: *Chlorination, *Disinfectio *Worms, *Biocontrol, *Animal parasites, Was water treatment, Lagoons, Sludge.
Identifiers: Smolensk(USSR), Mechanical trea ment, Ascarids.

The effectiveness of mechanical waste wa treatment with chlorination in terms of dehelm tization was investigated at the Smolensk wa water treatment plant. Mechanical treatment w chlorination reduced the ascarid egg count by over 50%. Ascarid eggs were found in non-dis fected sludge in lagoons, both on the surface a at 40 cm depth, 2 years after discharge; 80% of t eggs were viable. The findings indicate the low ficiency of mechanical waste water treatment terms of the removal of helminths. (Takacs-FIR
W77-10636

MULTIFUNCTIONAL APPROACH TO POLL TION PREVENTION,
Yorkshire Water Authority (England).
For primary bibliographic entry see Field 5G.
W77-10638

A METHOD FOR STUDYING MICROFAU OF ACTIVATED SLUDGE (METODA BADA MIKROFAUNY OSADU CZYNNEGO),
Polish Academy of Sciences, Warsaw. Inst. Ecology.
H. Klimowicz.
Gaz. Woda i Technica Sanitarna, Vol. 51, No. 46-48, 1977.

Descriptors: *Microorganisms, *Activated slu *Aeration, *Analytical techniques, Sewage t ment, Sludge treatment, Physical proper Chemical properties, Performance, Waste w treatment.
Identifiers: Microfauna.

procedure for the evaluation of sewage purifica-
on based on the microfauna in active sediment
om the aeration chamber is described. Depend-
g on the consistency of the purification process,
mples were taken daily to 2x/week. To arrive at
accurate average count of microfauna, 5 small
mples from different portions of the aeration
amber were taken and mixed in a 100 ml bottle
filled. The sample was aerated every 2-3 hrs
d kept in a moderately cool place. The qualita-
e observation of individual microorganisms was
rformed with a stereoscopic microscope and, if
particular interest, under a research
croscope. After a list of the species noticed was
epared, counting of the individuals was started
a plexiglass counting chamber of the Sedgwick-
fter type. For the correct interpretation of
croscopic analyses, a qualitative-quantitative
ing of the fauna observed over a longer period
time (e.g. 1 month) was made up in order to as-
ss changes occurring on sampling dates or of
vage purification levels. It was pointed out that
ysico-chemical analysis could only give exact
ues for a limited number of compounds. No
mple detection methods were available for nu-
rous chemical compounds able to poison the
ieous environment. Therefore, microscopic
alysis of live organisms in the active sediment
s essential, since most of the organisms would
ct to toxic compounds in the plant water which
l eventually reach the city's water supply. The
portance of the presence of live organisms in
active sediment as a reflection of the efficacy
the sewage purification process was
phasized. (Takacs-FIRL)
7-10643

YSICAL AND CHEMICAL METHODS,
stvaco Corp., North Charleston, S.C. Char-
on Research Center.
B. Scaramelli, and F. A. DiGiano.
rnal Water Pollution Control Federation, Vol.
No. 6, p 992-1001, June, 1977. 90 ref.

scriptors: *Waste treatment, *Ion exchange,
dsorption, *Membrane processes, *Oxidation,
nicipal wastes, Industrial wastes, Coagulation,
pended solids, Flocculation, Model studies,
one, Irradiation, Kinetics, Water Pollution
ntrol Federation, Waste water treatment.
ntifiers: Physical methods, Chemical methods.

terature review of current physical and chemi-
methods of waste treatment is presented.
cess applications and pilot studies for various
hods of waste treatment and disposal are
cribed. Procedures for clarifiction, coagula-
, solids separation, and flocculation are re-
ed. Adsorption capacities and kinetics are
ussed for various organic compounds used in
te treatment. Membrane processes such as
erse osmosis, ultrafiltration, and electrodialy-
are evaluated. Other topics discussed include
nation, and ion exchange for the selective
oval of heavy metals and organic compounds.
ulz-FIRL)
7-10645

TIVATED SLUDGE,
rgia Inst. of Tech., Atlanta.
I. Saunders.
nal Water Pollution Control Federation, Vol.
No. 6, p 1005-1016, June, 1977. 114 ref.

criptors: *Activated sludge, *Sludge treat-
t, *Nitrification, *Sedimentation, Industrial
es, Microorganisms, Flocculation, Model stu-
Biochemical oxygen demand, Phosphorus,
ogical treatment, Industrial wastes, Municipal
es, Organic compounds, Oxygen demand,
tics, Suspended solids, Waste water treat-
t.
tifiers: Process performance, Process design.

view of literature on activated sludge treat-
methods and processes is presented. Various models for achieving optimal efficiency and specific effluent standards are outlined. Topics discussed include process performance, process design, oxygen uptake and transfer, sedimentation, nitrification, industrial waste waters, and microbial studies. Among the processes described are: extended aeration, settling, phosphorus removal, biodegradation, oxidation, and denitrification. Methods for detoxification of activated sludge are reported. (Schulz-FIRL)
W77-10646

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark.
R. I. Dick.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1040-1067, June, 1977. 345 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Industrial wastes, *Chemical wastes, *Reclamation, Stabilization, Dewatering, Sedimentation, Water Pollution Control Federation, Microorganisms, Viruses, Incineration, Transportation, Fertilizers, Land reclamation, Landfills, Lagoons, Ultimate disposal, Municipal wastes, Activated sludge, Biodegradation, Waste water treatment.
Identifiers: Ocean disposal, Conditioning.

A review of literature on various methods of sludge treatment, utilization, and disposal is presented. Sludge management technology, operational costs, and energy costs are discussed for alternative sludge processing techniques. Topics discussed include quantity and quality of sludge, industrial and hazardous sludges, chemical sludges from phosphorus removal and water treatment, stabilization, conditioning, thickening, dewatering, inactivation of organisms and viruses, combustion, and pyrolysis. Various topics related to waste disposal are discussed, including reclamation, transportation of sludge, land application, land reclamation, landfills and lagoons, and ocean disposal. (Schulz-FIRL)
W77-10647

CURRENT TRENDS IN WATER RECLAMATION TECHNOLOGY,
Los Angeles County Sanitation Districts, Whittier, Calif.
W. E. Garrison, and R. P. Miele.
American Water Works Association Journal, Vol. 69, No. 7, p 364-369, July, 1977. 3 fig, 6 tab, 11 ref.

Descriptors: *Water reuse, *Water resources development, *Water management(Applied), *Groundwater recharge, Groundwater resources, Microorganisms, Organic compounds, Inorganic compounds, Suspended solids, Metals, Phosphorus, Demineralization, Phosphates, Heavy metals, Activated carbon, Ozone, California, Reclamation states, Nitrogen, Waste water treatment.
Identifiers: Los Angeles(CA).

Waste water reclamation and reuse is of particular interest for areas where water supplies are limited, such as in arid southern California. The Los Angeles Sanitation Districts have identified several potential uses for reclaimed waste water, including groundwater recharge, industrial reuses, irrigation, and recreation. Constitutents in waste water causing the most concern are inorganics (metals, nitrate, phosphorus, and TDS), organics (trace organics, pesticides, and color), microorganisms, suspended solids, and turbidity. Various methods for the removal of inorganic constitutents are described, including: demineralization by reverse osmosis, electrodialysis, and ion exchange; nitrogen removal by nitrification and denitrification; phosphate removal; and heavy metals removal. Activated carbon and ozonation are methods for the removal of organic material in waste water. Microorganism removal by disinfection and various tertiary treatment processes are described. The use of filtration and tertiary treatment processes is considered for the removal of suspended solids and turbidity. Cost estimates are presented for treatment processes necessary for the various modes of reuse. Groundwater recharge is indicated as the most economically feasible form of reuse by directly decreasing the amount of water which must be imported. The need for standard regulations governing water reuse is indicated. (Schulz-FIRL)
W77-10649

BIOLOGY AND BIOTECHNOLOGY OF WASTE WATER TREATMENT (BIOLOGIE UND BIOTECHNOLOGIE DER ABWASSERAUFBEREITUNG),
H. P. Hoffmann-Walbeck.
Zucker, Vol 30, No 4-5, p 204-209, April-May, 1977. 10 fig, 2 tab, 9 ref.

Descriptors: *Activated sludge, *Biochemical oxygen demand, *Sludge treatment, *Biodegradation, *Bacteria, Aerobic digestion, Anaerobic digestion, Fermentation, Filtration, Biological treatment, Carbohydrates, Waste water treatment.

Biological processes and requirements are described for various methods of waste water treatment. Methods for aerobic and anaerobic digestion are discussed. Factors affecting the efficiency of the activated sludge treatment for carbohydrate-rich waste waters are outlined. Biochemical oxygen demands are evaluated at various temperatures and flow rates. Various forms of bacteria found in activated sludge are described. (Schulz-FIRL)
W77-10650

DIRECT FILTRATION,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, Calif.
R. L. Culp.
American Water Works Association Journal, Vol 69, No 7, p 375-378, JUly, 1977. 5 fig, 1 tab, 13 ref.

Descriptors: *Filtration, *Coagulation, *Polymers, *Water quality, *Waste water treatment, Flocculation, Separation techniques, Filters, Cost comparisons, Turbidity, Equipment.
Identifiers: Direct filtration, Flow sheets.

Direct filtration may be a viable treatment process for raw waters that are free of paper fiber and low in turbidity, color, plankton, and coliform organisms. As defined, direct filtration is a process in which filtration is not preceded by sedimentation. Flow sheets are illustrated for several types of filtering arrangements. The mechanisms by which coagulation during direct filtration removes turbidity and color are described. Possible applications and criteria for the use of direct filtration processes in waste water treatment are presented. The use of direct filtration results in reductions in capital, operating, and maintenance costs as well as smaller sludge volumes. Disadvantages include the high levels of turbidity, color, plankton, or paper fiber and the need for greater operator surveillance to insure proper effluent quality. Process design and operations are discussed, including filter media and dimensions. Criteria for quality control are presented for the control of the coagulant dosage and the use of polymers as filtering aids. Municipalities currently employing direct filtration are listed, including a partial survey of designs and processes in operation. (Schulz-FIRL)
W77-10651

CHLORINATION SEEMS BEST FOR REMOVING SUSPENDED SOLIDS FROM LAGOON EFFLUENTS,
Gilbreath, Foster and Brooks, Inc., Tuscaloosa, Ala.
R. B. Harrison, and J. K. Haddock.
Water and Wastes Engineering, Vol 14, No 5, p 48-82, May, 1977. 4 fig, 4 tab.

Descriptors: *Suspended solids, *Algae, *Chlorination, *Coagulation, *Sedimentation, Lagoons, Oxidation lagoons, Biochemial oxygen demand, Coliforms, Waste water treatment, Model studies, Alabama, Flocculation, Effluents, Filtration.
Identifiers: Vernon(AL).

Among the problems encountered with the use of lagoons or holding ponds are the periodically high levels of BOD, algae, and fecal coliform bacteria found in lagoon effluents. In this study on the improvement of an existing 3-celled lagoon in Vernon, Alabama, four effluent treatment schemes were evaluated. The first method investigated was chlorination using a chlorine contact chamber (reactor). It appeared to be the best method for reduction of BOD, destruction and settling of algae, and elimination of fecal coliform bacteria. The effluent and chlorine were fed into a model reactor chamber by means of gravity flow and detained for 2 hours. The model system was effective at removing 68% of the BOD, 63% of the solids, and 100% of the fecal coliform from the lagoon effluent. Coagulation-precipitation with alum, the second method investigated, removed as much as 83% of the solids but did not appreciably reduce BOD or coliform levels. A major disadvantage of this method was the production of large volumes of sludge which would require additional processing. Plain sedimentation, the third method examined, did not prove satisfactory, resulting in a small percentage of removal of suspended solids and non reduction of BOD or fecal coliform levels in the effluent. The fourth method, sand filtration, was considered to be adequate from other source studies. (Schulz-FIRL)
W77-10652

EFFECT OF ALUM ADDITION ON AEROBIC DIGESTION OF ACTIVATED SLUDGE,
G. F. Mitchell, R. H. Seyfarth, and F. R. Wilson.
Water and Sewage Works, Vol 124, No 7, p 58-62, July, 1977. 10 fig, 4 ref.

Descriptors: *Phosphorus, *Activated sludge, *Aerobic digestion, *Biochemical oxygen demand, *Aeration, Stabilization, Sludge treatment, Chemical oxygen demand, Waste water treatment.

A study was conducted to determine if alum addition to the aeration tank for phosphorus removal affected the aerobic digestion process. Results indicated that the addition of 13 mg/liter of alum had no effect on the volatile suspended solids reduction rate and little effect on the metabolic processes. Increases in specific oxygen uptake rate and specific resistance were observed during the first two days of aeration, possibly due to an increase in external substrate through cell lysis. Levels decreased after the fifth day of aeration to those of the control system (without alum), suggesting that the addition of alum at the experimental concentration does not significantly affect the efficiency of the aerobic digestion process. (Schulz-FIRL)
W77-10653

OPTIMIZING GAS PRODUCTION, METHANE CONTENT, AND BUFFER CAPACITY IN DIGESTER OPERATION,
University of Southern California, Los Angeles. Environmental Engineering Program.
N. Brovko, K. Y. Chen, M. S. Weinberg, and N. R. Barber.
Water and Sewage Works, Vol 124, No 7, p 54-57, July, 1977. 4 fig, 4 ref.

Descriptors: *Methane, *Alkalis, *Bicarbonates, *Sludge digestion, *Anaerobic digestion, Sludge treatment, Hydrogen ion concentration, Chemcontrol, Waste water treatment.
Identifiers: Buffers.

Carbonate equilibria and buffering capacities are evaluated for the production of methane during anaerobic digestion, to determine whether increasing bicarbonate concentrations above levels required for pH control could increase gas production and/or the methane content of gas produced. Results suggested that bicarbonate, used for its buffering capacities, may also stabilize the biological system, promoting more complete digestion and increasing methane production according to a linear function. Sodium bicarbonate was indicated as the source of bicarbonate alkalinity least likely to disturb the biological community. Reestablishing proper carbonate alkalinity was essential in the recovery of a malfunctioning digester. Total alkalinity concentrations must be corrected for volatile acid alkalinity to obtain accurate values for bicarbonate alkalinity, as high values for volatile acid alkalinity can yield negative values for bicarbonate alkalinity. The use of somewhat higher levels of bicarbonate alkalinity in sludge digestion than those required for buffering (3500-5000 mg/liter instead of 2500 mg/liter) was recommended to provide additional safeguards and increase methane production. (Schulz-FIRL)
W77-10654

WASTEWATER MANAGEMENT IN THE SOLID WOOD AND BOARD PRODUCTS INDUSTRIES: A REVIEW,
Mississippi State Univ., Mississippi State. Forest Product Lab.
W. S. Thompson.
In: ACS (American Chemical Society) Symposium Series 43, American Chemical Society, Washington, D.C., p 348-363, 1977. 2 fig, 3 ref, 6 tab.

Descriptors: *Waste water treatment, *Reviews, *Water pollution, Waste treatment, Industrial wastes, Pulp wastes, Water pollution treatment, Water pollution sources, Saw mills, Pulp and paper industry, Wood preservatives(Pesticides), Flocculation, Filtration, Biological treatment, Waste treatment, Water quality standards, United States Legislation, Regulation, Pollution abatement, Water management(Applied).
Identifiers: *Wood products industry, Wood particle board, Insulation board, Veneer, Plywood.

Water pollution problems of the wood-using industries in the U.S.A. are reviewed, along with current effluent standards and technologies available to meet government regulations in various industry segments, including sawmills, particle board, insulation board, veneer, and plywood factories, pulp and paper mills, and wood impregnation (preservation) plants. Under present federal guidelines, industry must install the best practicable treatment and control technology currently available by July 1, 1977, and the best available treatment and control technology economically achievable by July 1, 1983. A zero discharge has been judged by the Environmental Protection Agency to be both practicable and economically attainable for most subcategories of the wood products industry. Those subcategories that are permitted some discharge under present standards include wet fiber processing and one segment of the wood preserving industry. Control of pollutant discharge is being accomplished by in-plant process modifications that reduce the volume of generated waste water and by effluent-purification including flocculation and filtration, followed by biological treatment. (Brown-IPC)
W77-10690

PREVENTION OF SCALE FORMATION IN EVAPORATOR CHAMBERS (USTRANYAT' OBRAZOVANIE NAKIPI V KAMERAKH VYPARNOI STANTSII),
Krasnodarskii Politekhnicheskii Institut (USSR).
L. I. Matskevich.
Bumazhnaya Promyshlennost, No 1, p 25, January, 1977. 1 fig, 1 tab.

Descriptors: *Pulp wastes, *Scaling, *Evaporators, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Pulp and paper industry, Corro
sion control.
Identifiers: *Black liquor, *Magnetic field
*Kraft mills.

The formation of difficulty removable compac
scale deposits on kraft mill evaporator tubes ca
be prevented by subjecting the entering blac
liquor to the action of a magnetic field. The liqu
is passed through a variable magnetic field perpe
dicularly to the magnetic lines at a rate of 0.12-0
m/sec, at a magnetic induction in the gap of 2.5-4
T and 25-75 pairs of alternating poles. Under the
conditions, a porous loose precipitate is formed i
stead of a compact scale, which can be easi
removed mechanically. (Stapinski-IPC)
W77-10691

**FOAM BREAKING--A KEY PROCESS I
DETOXIFICATION OF KRAFT MILL E
FLUENTS BY FOAM SEPARATION,**
British Columbia Research Council, Vancouver.
K. S. Ng, J. C. Mueller, and C. C. Walden
Canadian Society for Chemical Engineering Co
ference, October 4-6, 1976, Toronto, Canad
Preprint of Conference Paper, 30 p. 7 fig, 14 ref
tab.

Descriptors: *Toxicity, *Pulp wastes, *Fo
separation, *Waste water treatment, Wastes,
dustrial wastes, Pulp and paper industry, Wa
pollution treatment, Water pollution sources, T
bines, Separation techniques, Pilot plants, Cap
costs, Water pollution control, Waste treatme
Design criteria, Effluents.
Identifiers: *Kraft mills.

A study was made to demonstrate on a pilot-pl
scale the performance of a turbine foam breal
system for detoxifying kraft mill effluents and
develop the design parameters for large-scale
plication. Among various configurations, a 3-bl
vaned-disk turbine was found to be optimal
foam breaking. Major process variables c
trolling foam breaking were system design,
velocity, rotation speed, and foam load. A fo
breaking system with only restricted liquid dr
off performed 3-16 times better than a con
tional flow-through system. A 38-cm diameter
bine operating at 1800 rpm (3600 cm/sec
velocity) collapsed up to 1.2 cu m (42 cu ft
foam/min. Design equations developed for si
of foam breakers suggest that a 61-cm (2-ft) dia
ter, 21-kw turbine will collapse 4.7 cu m
foam/min. An effluent plant treating 25,000
gal/day of waste water from a 680 ton
bleached kraft mill would require approxima
12 foam breakers. Capital cost would be $108
(Witt-IPC)
W77-10693

**EXAMPLE OF PLANNING FOR ENVIR
MENTAL PROTECTION (PLANUNGSBEISP
ZUM UMWELTSCHUTZ).**
Der Papiermacher, Vol 27, No 1, p 11-13, Jan
15, 1977. 1 fig.

Descriptors: *Pulp wastes, *Waste water t
ment, *Planning, *Treatment facilities, Pulp
paper industry, Activated sludge, Water pur
tion, Water pollution control, Biological t
ment, Sewage treatment.
Identifiers: Board mills, Paper mills, Corrug
medium(Fluting paper), Waste paper.

After a brief introduction into the planning p
ples for effluent treatment installations, an e
ple is presented of the planning of a trea
system for the effluent from a paper mill ma
turing corrugating medium on a waste-paper
as well as for sewage. The system consists of
stage activated sludge treatment with che
mechanical preclarification as well as interm
and postclarification. (Speckhard-IPC)
W77-10694

PARATUS FOR TREATING A LIQUID ING A PERCOLATING LAYER (APPAREIL TRAITMENT DE LIQUIDE A COUCHE DE RCOLATION).
nch Patent No 2,277,615. February 6, 1976. 11 fig, 7 claims.

scriptors: *Patents, *Pulp wastes, *Filters, aste water treatment, Filtration, Wastes, Intrial wastes, Pulp and paper industry, Water lution treatment, Waste treatment, Water pucation, Design.

p and paper mill effluents and similar liquid tes are treated by passing them through a layer finely divided resin housed in a compartment ned by perforated partitions in a tower. In parlar, the tower incorporates an infrastructure gned to alleviate problems related to periodic kwashing of the finely divided layer. eckhard-IPC)
7-10696

TERMINATION OF THE DEGREE OF ACMULATION OF RESIDUAL LIQUOR COMNENTS DURING RECYCLING OF THE UOR (OPREDELENIE STEPENI KOPLENIYA KOMPONENTOV LEDROZHZHEVOI BRAZHKI PRI VOZTE EE V PROIZVODSTVENNYI TSIKL),
primary bibliographic entry see Field 3E.
7-10697

ALYSIS OF POLLUTANTS IN EFFLUENTS A PYROLYSIS FACTORY (ANALIZ RYAZNENII STOCHNYKH VOD PIROLIZO PREDPIYATIYA),
primary bibliographic entry see Field 5A.
-10698

NTRIBUTION OF THE PULP AND PAPER USTRY TO AGRICULTURE ELLYULOZNO-BUMAZHNAYA PROHLENNOST' -- SEL'SKOMU KHOZYAIST-

darstvennaya Planovaya Komissiya, cow (USSR).
primary bibliographic entry see Field 5E.
-10702

ICITY OF EFFLUENTS FROM THE PUCATION OF TALL OIL PRODUCTS AND DE TURPENTINE FOR THE ROFLORA OF TREATMENT FACILITIES REDELENIE TOKSICHNOSTI CHNYKH VOD OT USTANOVOK PO ISTKE TALLOVYKH PRODUKTOR I IDARA-SYRTSA PO OTNOSHENIYU K ROFLORE OCHISTNYKH SOORUZII),
primary bibliographic entry see Field 5C.
10703

OF INORGANIC SORBENTS FOR THE PUCATION OF KRAFT MILL EFFLUENTS MENENIE NEORGANICHESKIKH SORTOV DLYA GRUBOKOI OCHISTKI VOD FAT-TSELLYULOZNOGO PROIZVODST-

gradskii Tekhnologicheskii Institut Tsellyu-Bumazhnoi Promyshlennosti (USSR).
Dushina, A. A. Komissarenkov, A. V.
na, and S. V. Semenov.
vuzovskii Sbornik Statei Zakonchennykh hnoe-Issledovanie Rabotakh, No. 4, p 90-92, 4 tab.

iptors: *Pulp wastes, *Waste water treat- *Silica, *Gels, Wastes, Industrial wastes, treatment, Water pollution treatment, pollution sources, Foreign countries, Sulfur ounds, Phenols, Organic compounds, Sorp- Effluents, Pulp and paper industry, Evapora- Chemical oxygen demand.

Identifiers: Methanol, Kraft mills, USSR.

Copper-containing technical-grade silica gel preparations were used for the purification of evaporator condensate at the Kekhra kraft mill. The purification was conducted in a centrifugal apparatus containing 250 g of the sorbent. The sorbents used were KSK-Si, ShSK-Si, ASK-Si with a particle size of 2.7-7.0, 1.0-3.5, and 0.2-0.5 mm and a copper content of 1.20, 1.43, and 1.35 meq/g, respectively. Best results were obtained with the ASK-Si sorbent. This sorbent removed all sulfur compounds, 40% phenol, 21% methanol, and 52% organic substrates (a 52% reduction of COD). The sorbent could be easily regenerated by heating for 10 min at 200 C in a muffle furnace, and retaned its sorption capacity after 5 regeneration cycles. (Stapinski-IPC)
W77-10709

GREAT LAKES PAPER (CO.) LAUNCHES FIRST CLOSED-CYCLE KRAFT PULP MILL.
Paper Trade Journal, Vol. 161, No. 6, p 29-34, March 15, 1977.

Descriptors: *Water conservation, *Pulp and paper industry, *Water pollution control, *Pulp wastes, Industrial wastes, Water pollution sources, Foreign countries, *Canada, Operating costs, Industrial water, Pollution abatement, Economics, Water pollution treatment, Water consumption, *Recycling, *Water reuse.
Identifiers: *Kraft mills, Closed systems, Chemical recovery.

A description is given of the new 700 ton/day bleached kraft pulp mill at Great Lakes Paper Co., Thunder Bay, Ontario. The closed-cycle process, variously referred to as the effluent-free process for the Rapson-Reeve process, consists essentially of recycling bleach plant effluents through the standard black liquor recovery cycle and, from the resulting white liquor, separating out the salt (NaCl) which becomes the basic raw material for the manufacture of chlorine dioxide. Flow sheets of the closed-cycle recovery system, salt recovery process, and pulp screening, cleaning, and bleaching operations are included. Benefits of the closed-cycle mill are reduced steam consumption, decreased fiber losses, increased pulp yield, lower consumption of bleach chemicals, reduced saltcake and defoamer use, elimination of external waste water treatment, and reduced water consumption. Mill odor is also reduced. Savings in operating costs for the closed-cycle mill are detailed. (Witt-IPC)
W77-10710

DISCUSSION OF THE RAPSON CONCEPT FOR A CLOSED-SYSTEM BLEACHED KRAFT PULP MILL (BESEDA O RAPSONOVE PROJEKTU UZAVRENE VYROBY BELENE SULFATOVE BUNICINY).
Papir a celuloza, Vol 31, No. 12, p 276, December, 1976.

Descriptors: *Water conservation, *Pulp and paper industry, *Water pollution control, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Canada, Industrial water, Pollution abatement, Water pollution treatment, Effluents, Sodium chloride, Pulp and paper industry, *Recycling, *Water reuse.
Identifiers: *Kraft mills, Closed systems, Chemical recovery, Chlorine dioxide, White liquor(Kraft process).

During his visit in Czechoslovakia, Mr. W. H. Rapson discussed the Rapson-Reeve closed-cycle bleached kraft mill design, currently under construction by the Great Lakes Paper Co., Thunder Bay, Ontario. The process includes the application of chlorine dioxide in the first bleaching stage and a two-stage evaporation-crystallization of white liquor to remove NaCl introduced into the system by the countercurrent use of bleachery effluents in brown stock washing. The closed-loop arrangement should not result in the accumulation of inert chemicals in the system. The advantages of the closed circuit include the absence of effluents, higher pulp yield, and energy conservation. The concept is also applicable to sodium sulfite mills. (Trubacek-IPC)
W77-10711

DETERMINATION OF CONTAMINANTS IN KRAFT MILL CONDENSATES USING GAS CHROMATOGRAPHY (STANOVENI KONTAMINUJICICH LATEK V KONDENZATECH ZE SULFATOVE CELULOZKY POMOCI PLYNOVE CHROMATOGRAFIE),
IRAPA, Prague (Czechoslovakia). Vyvojovy a Racionalizacni.
For primary bibliographic entry see Field 5A.
W77-10712

SEPARATION OF FIBERS FROM PAPER MILL EFFLUENT WITH CONTINUOUSLY BACKWASHED, PRESSURIZED, LIQUID FILTER,
New York State Dept. of Environmental Conservation, Syracuse.
E. V. Turkki, and N. L. Nemerow.
In: Proceedings of the 30th Industrial Waste Conference, Purdue University, May 6-8, 1975, p 207-215. Ann Arbor Science Publishers Inc., Ann Arbor, Michigan. 3 fig, 3 ref, 1 tab.

Descriptors: *Pulp wastes, *Fibers(Plant), *Waste water treatment, *Filters, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Separation techniques, Water purification, Filtration.
Identifiers: Tissue paper mills.

Pilot-scale studies of paper fiber separation from a tissue mill effluent by means of a continuously backwashing pressurized liquid filter are reported. The filter unit consists of a perforated metal container 10.5 inches (26.7 cm) long and 9 inches (22.9 cm) in diameter. The outer perimeter of the cylinder is covered with a filter cloth. The feedwater is introduced under pressure into the filter from the top of the outer casing and filters through the cloth leaving the fibers on the outside of the cloth. Two washer arms, operating inside the filter at 530 rpm, clean the filter continuously by forcing part of the filtrate back through the filter. The flow rate of the filter is 0.5-1.0 gal/min/sq ft (20.4-40.7 liters/min/sq m) with a fiber removal rate of 90%. The filtration capability of this unit is dependent on the selection of the filter cloth. The filter is competitive and has its place among those already used for suspended solids removal. (Witt-IPC)
W77-10713

REMOVAL OF HEAVY METAL IONS FROM WASTE SOLUTIONS BY CONTACT WITH AGRICULTURAL BYPRODUCTS,
Western Regional Research Lab., Berkeley, Calif.
J. M. Randall, and E. Hautala.
In: Proceedings of the 30th Industrial Waste Conference, Purdue University, May 6-8, 1975, p 412-422. Ann Arbor Science Publishers Inc., Ann Arbor, Michigan. 8 fig, 13 ref, 6 tab.

Descriptors: *Bark, *Heavy metals, *Wood wastes, *Waste water treatment, Agriculture, Byproducts, Sorption, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Peanuts, Calcium carbonate, Lead, Iron, Metals, Separation techniques, Sodium sulfate, Flocculation, Chemical precipitation, Hardwood, Softwood.
Identifiers: Wood, Straw, Battery plant wastes, Walnut, Redwood, Western hemlock, Red oak, Douglas-fir, Sweetgum.

The authors discuss some of the experimental work carried out on the binding of heavy metal

ions, such as Pb, Cu, Hg, Cd, Zn, Ag, Co, Ni, Mg, Fe(II), Fe(III), and Mn to agricultural substrates (walnut meal, redwood, western hemlock, red oak, sweetgum, and Douglas-fir barks, peanut hulls, wood, and straw) and describe a demonstration project using calcium carbonate (flocculant), a Uniflow filter (closely woven tube of cotton, polypropylene, or other fiber, similar to a soaker hose, and closed at one end which has the capacity to pass water through its interstices while holding back particulate material), and a redwood bark column to remove lead and iron from the waste effluent of a lead battery plant. The bark column produced clean water for disposal to the sewer or for recycling. Sodium sulfate did not interfere with the removal of lead. (Witt-IPC)
W77-10714

RAW WASTE LOADING CHARACTERISTICS AND EFFLUENT QUALITY IN THE WET PROCESS HARDBOARD MANUFACTURING INDUSTRY,
Vanderbilt Univ., Nashville, Tenn. Center for Environmental Quality Management.
J. A. Roth, W. W. Eckenfelder, and J. A. Oleszkiewicz.
In: Proceedings of the 30th Industrial Waste Conference, Purdue University, May 6-8, 1975, p 540-547. Ann Arbor Science Publishers Inc., Ann Arbor, Michigan. 6 fig, 7 ref, 1 tab.

Descriptors: *Waste water(Pollution), *Waste water treatment, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Effluents, Biochemical oxygen demand, Biological treatment, Waste treatment, Water pollution treatment, Temperature, Operation and maintenance, Activated sludge.
Identifiers: *Hardboard mills.

After a brief description of the wet process for manufacturing hardboard, factors affecting the variability in the raw waste load (amount of pollutant discharged/unit of production/day) from hardboard mills are examined. Raw waste load variability is dependent on the fiber manufacturing process and type of wood used. Operational differences between wet-wet and wet-dry processes result in higher raw waste loads from the wet-dry process. BOD production is higher from the wet-dry than from the wet-wet process. Factors affecting the operation and performance of biological processes for treating hardboard mill wastes are discussed. It is shown that the biological processes are highly dependent on temperature. It is recommended that in northern areas a high-rate activated sludge treatment process with relatively short detention time be used to treat hardboard mill wastes. (Witt-IPC)
W77-10715

PURIFICATION OF PULP MILL EFFLUENTS BY THE ACTIVATED SLUDGE METHOD USING PURE OXYGEN (WYNIKI BADAN OCZYSZCZANIA SCIEKOW CELULOZOWYCH METODA OSADU CZYNNEGO Z UZYCIEM CZYSTEGO TLENU),
Technical Univ. of Warsaw (Poland). Instytut Zaopatrzenia w Wode i Budownictwa Wodnego.
M. Apolinarski, and M. Roman.
Przeglad Papierniczy, Vol. 33, No. 1, p 26-29, January, 1977. 3 fig, 12 ref, 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Oxygen, Air, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Biochemical oxygen demand, Chemical oxygen demand, Sludge, Sedimentation, Dewatering, Foaming, Effluents, Foreign countries, Pulp and paper industry.
Identifiers: *Poland.

Results are presented of experiments conducted at the Ostroleka pulp and paper mill (Poland) in which raw kraft mill effluent was parallelly purified in two installations consisting of an activated sludge tank and a secondary sedimentation tank, one supplied with air, the other with pure oxygen. A comparison of the effectiveness of the two processes showed that the use of oxygen instead of air gives a higher reduction of 5-day BOD, COD, and oxidizability at the same purification time and similar pollution load. The activated sludge in the oxygen tank was more resistant to unfavorable fluctuations of the effluent properties. The amount of excess sludge was reduced 35%, and the excess sludge had better sedimentation and dewatering properties. There was also less foaming than in the system using air. (Stapinski-IPC)
W77-10716

ROTATING BIOLOGICAL DISC SYSTEM,
MacMillan Bloedel Research Ltd., Port Alberni (British Columbia).
Pulp and Paper Canada, Vol. 78, No. 4, p 66-72 (T86-T92), April, 1977. 6 fig, 13 ref, 7 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Bleaching wastes, Wastes, Industrial wastes, Pulp wastes, Water pollution treatment, Water pollution sources, Effluents, Color, Biochemical oxygen demand, Toxicity, Sludge, Hydrogen ion concentration, Temperature, Sodium compounds, Pulp and paper industry.
Identifiers: Sodium dithionite, Zinc dithionite, Groundwood, Thermomechanical pulps.

A laboratory evaluation of the secondary treatment of groundwood washer effluents from zinc and sodium dithionite bleaching processes was investigated, using a rotating biological disk (RBD) system. The tests performed were to determine the effectiveness of the RBD unit in removing effluent BOD and toxicity at various retention times. The effects on effluent color were also studied. Results indicated that the RBD treatment system is efficient in BOD removal for both Na and Zn dithionite effluents. For all cases, effluent color increased moderately after treatment. In addition, sludge characteristics and the effects of pH and temperature shocks were investigated for Na dithionite effluents. Preliminary investigations on thermomechanical pulping effluents were also conducted. (Brown-IPC)
W77-10717

PULP MILL CONDENSATES CLEANED BIOLOGICALLY WITH THE AID OF BARK (MASSAFABRIKERNAS KONDENSATVATTEN RENAS BIOLOGISKT MED HJALP AV BARK).
Engl. transl. avail. from Inst. of Paper Chem., Appleton, WI 54911, for $8.00. Svensk Papperstidning, Vol. 80, No. 3, p 78, February 25, 1977. 1 fig.

Descriptors: *Biological treatment, *Pulp wastes, *Bark, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Wood wastes, Filters, Nutrients, Bacteria, Sulfur compounds, Oxidation, Catalysts, Construction costs, Operating costs, Costs, Odor.
Identifiers: *Kraft mills.

A brief description is presented of the Enso-Biox process for treating kraft pulp mill condensates. The two-stage process is based on the use of specially treated waste bark as a filter medium, the bark also acting as a nutrient for a strain of bacteria catalyzing the oxidation of the sulfur compounds in the condensates to an innocuous form. Over 90% of the malodorous sulfur compounds are converted (hydrogen sulfide and methyl mercaptan up to 100%). Construction costs for the plant are competitive, and operating costs are low. (Speckhard-IPC)
W77-10719

METHOD FOR ELIMINATING ORGANIC AND INORGANIC BOUND NITROGEN FROM DOMESTIC AND INDUSTRIAL WASTE WATER,
Cellulose Attisholz A. G. (Switzerland) (Assignee).
M. Dubach, and A. Scherler.
U.S. Patent No. 4,011,156. March 8, 1977. 7 p, 1 fig, 31 claims.

Descriptors: *Waste water treatment, *Patents, *Denitrification, *Industrial wastes, *Domestic wastes, Waste treatment, Water pollution treatment, Water pollution sources, Aeration, Settling basins, Ammonification, Effluents.

A process for eliminating organic and inorganic bound nitrogen from domestic and industrial waste waters involves treatment in two aeration/settling stages. In particular, the ammonium-containing oxygen-free effluent coming from the settling tank of the first stage is aerated in the aeration container of the second stage under conditions favorable for extensive nitrification of the ammonium. A portion of the nitrified effluent from the settling tank of the second stage is continuously recirculated to the first stage, and is denitrified in the settling tank of the first stage, where conditions favorable for the ammonification of organic bound nitrogen and for denitrification of effluent are maintained. (Lynch-IPC)
W77-10721

SOME THEORETICAL AND PRACTICAL ASPECTS OF BIOLOGICAL PURIFICATION OF EFFLUENTS FROM SULFITE PULPING (EINIGE THEORETISCHE UND PRAKTISCHE ASPEKTE DER BIOLOGISCHEN SULFITZELLSTOFFABWASSERREINIGUNG),
VEB Filmfabrik, Wolfen (East Germany).
G. Otto, H. Schmidt, and G. Weigt.
Zellstoff und Papier, Vol. 26, No. 2, p 34-36, February, 1977. 1 fig, 6 illus, 26 ref, 3 tab.

Descriptors: *Pulp wastes, *Biological treatment, *Theoretical analysis, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Biochemical oxygen demand, Bleaching wastes, Pulp and paper industry, Effluents, Sulfite liquors, Sludge.
Identifiers: Sulfite pulp mills, Spent sulfite liquor.

A modern sulfite pulp and paper mill with 90% recovery of waste liquor solids can limit the BOD to 45-50 kg/ton of pulp, concentrated mainly condensates and bleach plant effluents. At least 90% of this ca be eliminated by an intensified high efficiency activated sludge process. The relation of rate of degradation to actual 5-day BOD, described by the Michaelis-Menten equation for microheterogeneous enzymatic catalysis) has a correlation coefficient of only 0.78, and hence the kinetic constants so derived cannot be used for design purposes. The kinetic irregularities seem to depend, among other factors, on fluctuations in the composition of the biological population and the activity of the biomass. These fluctuations are probably also responsible for the varying oxygen consumption for acetic acid in the BOD determinations. A particularly critical form of change in the biological population is the formation of settling sludge, which is illustrated by several examples. (Ward-IPC)
W77-10722

CHARACTERIZATION OF SULFITE BLEACHING LIQUORS. PART 2. DIFFERENT SEQUENCES FROM PREBLEACHING OF SPRUCE AND BIRCH KRAFT PULP,
Swedish Forest Products Research Laboratory, Stockholm.
For primary bibliographic entry see Field 5A.
W77-10723

RETHINKING OUR APPROACH TO WATER SUPPLY PROVISION,
London School of Economics and Political Science (England).

r primary bibliographic entry see Field 6B.
7-10746

ONOMIC ANALYSIS OF EFFLUENT IDELINES: TEXTILES INDUSTRY,
tle (Arthur D.), Cambridge, Mass.
r primary bibliographic entry see Field 5G.
7-10749

UDIES ON COAGULATION TREATMENT SPENT WATER FROM PULPING PROCESS. RT 3). COAGULATION MECHANISM OF GNIN (IN JAPANESE),
kyo Univ. (Japan).
Jo, G. Meshitsuka, and J. Nakano.
an Tappi, Vol 31, No 3, p 166-172, March, 7. 10 fig, 18 ref.

criptors: *Pulp wastes, *Lignins, agulation, *Waste water treatment, Alu-um, Hydrogen ion concentration, Floccula-, Chemical precipitation, Zeta potential, Elec-horesis, Wastes, Industrial wastes, Waste tment, Water pollution treatment, Water pollu- sources, Pulp and paper industry, Effluents. ntifiers: Aluminum sulfate.

en lignin in pulp mill effluents is treated with minum sulfate, the aluminum ion combines the carboxylic and sulfonic acid groups of lig- Following pH adjustment (with alkali), nuclear aluminum complexes plus insoluble minum hydroxide are formed, and the ligninminum complex flocculates and coagulates into er flocs which ultimately precipitate. The zeta-ntial of flocs measured via microelectrophore-is generally considered to indicate the best gulation pH. For lignin pollutants, however, best pH for coagulation is not readily found via -potential determinations, because the potenchanges markedly with pH and relative lignin centration. Lignin flocs formed by coagulation excess alum show a minimum zeta-potential e at the best coagulation pH, whereas the zeta-ntial of flocs normally obtained with small unts of alum simply increases with increased (See also W76-10839 and W75-07636) (Brown-

-10761

Ultimate Disposal Of Wastes

NFECTION OF MUNICIPAL WASTE TER WITH GAMMA RADIATION,
nnesburg City Health Services (South Africa).
primary bibliographic entry see Field 5D.
-10210

S BALANCE MONITORING OF LAND AP-CATION SITES FOR WASTEWATER IDUALS,
rado State Univ., Fort Collins. Dept. of cultural Engineering.
primary bibliographic entry see Field 5B.
-10326

TREATMENT OF TOXIC EFFLUENTS: IN-TIGATIONS BY THE BCRA,
rimary bibliographic entry see Field 5D.
10336

CESSING OF INDUSTRIAL WASTE FOR AR EVAPORATION,
ic Disposal Systems, Inc., Martinez, Calif.
rimary bibliographic entry see Field 5D.
10337

YCLING BISULFITE BRINES USED IN ET CHERRY PROCESSING,
rn Regional Research Center, Philadelphia,

For primary bibliographic entry see Field 5D.
W77-10341

OPERATING EXPERIENCES ON PETROCHEMICALS WASTE WATER TREATMENT PLANT OF GUJARAT AROMATICS PROJECT AT JAWAHARNAGAR,
Indian Petrochemicals Corp. Ltd. Jawaharnagar (India).
For primary bibliographic entry see Field 5D.
W77-10351

PREPARATION OF STAINED ALGINATE BEADS FOR PHOTOSENSITIZED OXIDATION OF ORGANIC POLLUTANTS,
Charles F. Kettering Research Lab., Yellow Springs, Ohio.
For primary bibliographic entry see Field 5D.
W77-10353

LET'S TALK RUBBISH; PART 2: RECYCLING SYMPOSIUM,
For primary bibliographic entry see Field 5D.
W77-10381

AN ANALYSIS OF CRITERIA FOR DETERMINING THE EXTENT OF PERMISSIBLE RADIOACTIVE WASTE DISPOSAL FROM NUCLEAR POWER STATIONS INTO RIVER SYSTEMS,
Hydrometeorological Service of the USSR, Moscow. Inst. of Applied Geophysics.
For primary bibliographic entry see Field 5C.
W77-10413

INFLUENCE OF DOMESTIC WASTES ON THE STRUCTURE AND ENERGETICS OF INTERTIDAL COMMUNITIES NEAR WILSON COVE, SAN CLEMENTE ISLAND,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 5C.
W77-10512

DISPOSAL OF SALT WATER DURING WELL CONSTRUCTION, PROBLEMS AND SOLUTIONS,
Geological Survey, Miami, Fla. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-10519

PROTECTING GROUND WATER FROM DOMESTIC WASTEWATER EFFLUENT,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-10520

TREATMENT OF EFFLUENTS: MODERN METHODS OF SEWAGE DISPOSAL,
University Coll. of Swansea (Wales). Dept. of Chemical Engineering.
J. A. Howell.
Oceans, No. 3, p 63-67, May, 1977.

Descriptors: *Water pollution control, *Waste disposal, *Outfalls, *Industrial wastes, *Municipal wastes, *Heavy metals, *Chemicals, Toxicity, Sludge disposal, Incineration, Biological treatment, Activated sludge, Chemical treatment, Flocculation, Waste water treatment.
Identifiers: UNOX, Wet air oxidation, Ocean dumping.

Various treatments of sewage effluents and disposal methods were described. Major emphasis was placed on disposal involving the oceans. It was noted that the use of outfalls for raw sewage disposal was based on the assumption that there was no danger of bacteriological contamination of beaches. Most recent considerations of the matter suggest that outfalls can be used for partially treated sewage which contains no visible identifiable floating material or toxic compounds. The outfall should extend at least a kilometer beyond the low water level, far enough to avoid shoreline contamination. Ocean disposal of sludge was also considered as a major problem. Biological and physicochemical treatment processes were described. The activated sludge, UNOX, and ICI deep-shaft processes were valued for their production of low sludge volumes which could be disposed by such methods as incineration. Physicochemical treatment was suggested for three types of pollutants: heavy metals, exotic new chemicals, and bulk industrial effluents. Other treatment processes included settling, sand filtration, coagulation, and flocculation of colloids by polymers or aluminum hydroxide. These processes can be followed by disposal through chemical decomposition, incineration, or wet air oxidation. (Collins-FIRL)
W77-10550

TRACE ELEMENTS IN WASTEWATER,
California Univ., Riverside. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-10577

CAN IRRIGATION WITH MUNICIPAL WASTE WATER CONSERVE ENERGY,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
E. B. Roberts, and R. M. Hagan.
California Agriculture, Vol 31, No 5, p 45, May, 1977.

Descriptors: *Water reuse, *Irrigation water, *Irrigation efficiency, *Energy, *Water costs, Irrigation practices, Waste disposal, Water sources, Water distribution, Waste water disposal, Waste water treatment, California.

The State Water Resources Control Board of California has evaluated energy costs for the reuse of waste water for agricultural purposes in comparison to costs for alternative importation of fresh water and ocean dumping of waste water. Since waste water discharged to the Pacific requires secondary treatment and outfall pumping, while waste water reused for irrigation of fodder, fiber, and seed crops requires only primary treatment, reuse instead of ocean disposal would save about 200 KWH in direct energy requirements. Reuse for pasture irrigation and surface irrigation of food crops also requires secondary treatment, therefore saving only approximately 50 KWH over ocean disposal. Waste water used for sprinkler irrigation requires additional coagulation and filtration, using slightly more energy (10 KWH/AF) than ocean disposal. Energy savings produced by reuse of waste water, however, are often offset by water quality and geographic considerations. When additional treatment processes are already indicated, as for a 'water quality limited stream segment', reuse of waste water for fodder, fiber, and seed crops becomes advantageous. (Schulz-FIRL)
W77-10579

MARYLAND RESEARCH FINDING GUIDELINES FOR SLUDGE USE.
Water and Wastes Engineering, Vol 14, No 6, p 42, June, 1977.

Descriptors: *Sludge disposal, *Trace elements, *Fertilizers, *Crop production, *Soil chemical properties, Soil contamination effects, Diseases, Solid wastes, Soil science, Grasses, Turf grasses, Municipal wastes, Waste water treatment, Food chains, Lawns, Path of pollutants.

Researchers at the University of Maryland have been investigating the use of sewage sludge as fertilizer for home lawns and food crops. Until now, widespread use of municipal sewage sludge as fertilizer has been hindered by the possibility that heavy metals and disease-causing organisms may infiltrate the food chain and adversely affect human populations. A prepared compost mix which is acceptable under federal guidelines for nonfood crops has been developed. An examination of the effects of sewage sludge application on crop yields, soil nutrient status, and soil structure has yielded favorable results. Soil temperature and pH affect the rate of uptake by plants of heavy metals. Elevated temperatures can increase the rate of uptake, but maintenance of pH conditions of about 6.5 can lessen uptake. Leafy vegetables absorbed heavy metals at a much higher rate than grasses or grass-type crops such as corn. Use of composted sludge on turf grass is suggested. (Schulz-FIRL)
W77-10580

SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS,
Water Pollution Research Lab., Stevenage (England).
M. J. Burley, and R. W. Bayley.
Water PolluTion Control, Vol 76, p 205-215, 1977. 5 fig, 8 tab, 7 ref.

Descriptors: *Sludge disposal, *Costs, *Performance, Landfills, Oxidation lagoons, Incineration, Fertilizers, Heat treatment, Heavy metals, Waste water treatment, Pathogenic bacteria, Anaerobic digestion.

The minimization of sludge treatment and disposal costs was investigated. Disposal strategies included ocean dumping, landfilling, liquid disposal in lagoons, spreading on agricultural lands, and use as fertilizers. Incineration was considered as a form of treatment. Heavy metal and pathogen content must be considered in any choice. Options available for treatment to avoid risk of infection included: anaerobic digestion, heat treatment, and lagoons. Land application of untreated sludges was not generally accepted, but has sometimes been used without ill effects. Specific risks need to be further investigated. Capital and operating cost comparisons indicated that lagoon treatment with decanting could produce substantial savings. A procedure was presented for selecting appropriate methods of treatment. (Collins-FIRL)
W77-10609

SLUDGE PASTEURIZATION BY HEAT AND IONIZING RADIATION. RESULTS OF A STUDY FOR THE EFFLUENTS PURIFICATION PLANT, BERN-NEUBRUECK (SCHLAMMHYGIENISIERUNG DURCH WAERME UND IONISIERENDE STRAHLEN: ERGEBNISSE EINER VERFAHRENSSTUDIE FUER DIE ARA BERN-NEUBRUECK),
For primary bibliographic entry see Field 5D.
W77-10615

ALUM SLUDGE DISPOSAL - PROBLEMS AND SUCCESS,
East Bay Municipal Utility District, Oakland, Calif.
H. L. Nielsen.
American Water Works Association Journal, Vol. 69, No. 6, p 335-341, June, 1977. 1 fig, 6 tab.

Descriptors: *Treatment facilities, *Sludge treatment, *Water pollution control, Water purification, Dewatering, Waste disposal, Polymers, Turbidity, Color, Odor, Performance, Equipment, Waste water treatment.
Identifiers: Alum sludges.

Government regulations on the discharge of pollutants were the basis of the investigation of alum disposal at two California treatment plants. One plant discharged effluents into a creek which had negligible natural flow during the summer. Creek waters were discolored and a fan-shaped area of turbid water extended into the San Francisco Bay. A minimum year-round flow was needed to eliminate odor problems caused by stagnant waters. Three options were considered after the plant was ordered to meet creek-discharge standards. One was ponding sludges on site with sludge thickening, air evaporation, and offhaul of dried sludge. The second involved ponding, thickening and pumping to watershed lands for final ponding, and air-drying. Maximum sludge dewatering and truck offhaul was the last alternative. The latter was the most economical solution. The process consisted of wash-water-settling basins, sludge clarifiers, a reclaim pumping plant to recycle reclaimed water to raw water line, and a dewatering chamber with scroll centrifuges. Clarifier overflow discharged to the creek provided the flow needed to reduce odor problems. The second plant's discharge effects were similar, but less severe. A reclamation facility was constructed to include wash-water-settling basins, a reclaimed water and sludge transfer pumping plant, and a continuous belt-type dewatering unit. Supernatant was recycled to the raw water system after pressure filtration. Sludge, with polymer added, was passed to the dewatering unit. The process produced minimal turbidity in the filter-plant raw water. A sludge with the necessary solids content for continuous dewatering was produced. (Collins-FIRL)
W77-10616

MIAMI PLANS INJECTION WELL FOR WASTEWATER DISPOSAL.
Water and Wastes Engineering, Vol. 14, No. 6, p 70, June, 1977. 1 fig.

Descriptors: *Saline water-freshwater interfaces, *Saline water intrusion, *Injection, *Injection wells, *Underground waste disposal, Waste water disposal, Municipal wastes, Aquifers, Aquitards, Environmental engineering, Waste water treatment.
Identifiers: Miami(FL).

A pilot study is being conducted by the Miami-Dade Water and Sewer Authority to determine design criteria for a deep well injection system for disposal of treated waste water. The target injection zone for the test well is a highly permeable dolomite zone which is overlain by approximately 1000 feet of dense carbonates, protecting the Floridan aquifer from contamination by waste water. Geophysical logging and drilling data will be used to determine optimum depths for the steel casings surrounding the test well. (Schulz-FIRL)
W77-10619

IRRIGATION TRIAL WITH MORRO BAY WASTEWATER,
California Univ., Davis. Cooperative Extension.
For primary bibliographic entry see Field 5D.
W77-10623

IRRIGATING WITH WASTEWATER IN SONOMA COUNTY,
California Univ., Davis. Cooperative Extension.
For primary bibliographic entry see Field 5D.
W77-10624

COMBINED PROCESSING OF WASTEWATER AND SOLID WASTE,
Brown and Caldwell, Walnut Creek, Calif.
For primary bibliographic entry see Field 5D.
W77-10625

WATER TREATMENT PLANT SLUDGES: AN UPDATE OF THE STATE-OF-THE-ART,
For primary bibliographic entry see Field 5D.
W77-10634

A METHODOLOGY FOR ASSESSING LAN APPLICATION OF SLUDGES AND WASTE WATERS,
S. Chatterjee.
Proceedings - Institute of Environment Sciences, p 107-113, 1977. 5 tab, 14 ref.

Descriptors: *Waste disposal, *Evaluatio *Sludge disposal, *Irrigation, Environmental co trol, Soil properties, Analytical techniques, Wat table, Physical properties, Flooding, Waste wat treatment.
Identifiers: Application on Land Assessme System(ALAS), Miami(OH) Valley Region.

The Application on Land Assessment Syst (ALAS) was presented for the assessment of e vironmental impact of sludge and waste water la application. Land application of these substanc has become one of the most useful methods f meeting elimination or reduction goals for pol tant discharges. The ALAS method involves f steps. The suitability of the sludge/waste wate first established. Application rate criteria and la suitability are then determined. The appropri environmental parameters are identified and m areas classified. The collected data are th analyzed. Sludge application parameters incl land slopes, soil permeability and pH, flo frequency, and proximity to water sources. Ot factors include: depth to bedrock, perched, or p manent water tables; proximity to surface wa and ponding. The most important parameters waste water irrigation are drainage and soil typ The parameters for sludge application also ap to waste water applications. The approach con of identifying magnitudes of various environm tal parameters and relating them to vari degrees of potentially adverse impacts. A s plified interaction analysis is the basis of method. A study of the Miami Valley (Ohio) re was conducted with this method. Additi refinements may make ALAS an effective im mentation tool. (Collins-FIRL)
W77-10635

SLUDGE TREATMENT, UTILIZATION, A DISPOSAL,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5D.
W77-10647

CURRENT TRENDS IN WATER RECLA TION TECHNOLOGY,
Los Angeles County Sanitation Districts, Whi Calif.
For primary bibliographic entry see Field 5D.
W77-10649

CONTRIBUTION OF THE PULP AND PA INDUSTRY TO AGRICULT (TSELLYULOZNO-BUMAZHNAYA MYSHLENNOST' -- SEL'SKOMU KHOZYA VU),
Gosudarstvennaya Planovaya Komis Moscow (USSR).
V. I. Kropotov.
Gidroliznaya i Lesokhimicheskaya Promys nost, No. 8, p 26-27, 1976. 1 fig, 1 tab.

Descriptors: *Yeasts, *Pulp wastes, *Byproc *Fermentation, Wastes, Industrial wastes, pollution sources, Proteins, Pulp and paper try, Wood wastes, Water pollution control.
Identifiers: Ethanol, *USSR.

Statistical data are presented showing the pr tion of feed yeast at pulp and paper mills USSR. This production has been increasing s ly from about 10,000 tons in 1961 to nearly 1 tons in 1975. The estimated production s should be 158,000 tons. At 27 mills, yeas produced from spent sulfite liquor, at two (Bratsk and Baikal complexes) prehydrolyzates, and at two mills which

drolysis plants (Segezha and Syktyvkar) from od hydrolyzates. The construction of hydroly- plants at other mills is planned for the near fu- e. These plants will utilize wood waste. A table given showing, for 1975, the production of pulp l of yeast, the yields of yeast per ton of pulp, l the protein content of yeast at mills that oduce both ethanol and feed yeast from spent fite liquor, at mills that produce only yeast, and mills that produce yeast from prehydrolyzates l hydrolyzates. (Stapinski-IPC)
7-10702

'. Water Treatment and Quality Alteration

TE ON THE TRACE METAL CONTENT OF EMBRANE FILTERS,
tional Physical Research Lab., Pretoria (South ica). Applied Spectroscopy Div.
R. Watling, and R. J. Watling.
plied Spectroscopy Division. Pretoria, South ica, Water SA., Vol 1, No 1, p 28-29, April 5. 1 tab, 2 ref.

scriptors: *Filters, Trace elements, Analytical niques, Metals, *Filtration, *Water treatment. ntifiers: South Africa, *Ultrafilters, embrane filters.

preliminary preparation of natural water sam- for trace metal analysis frequently includes a ation step to remove the 'insoluble' particulate tion. The particulate fraction plus filter are dissolved in order to determine the trace ele- t content of the 'insoluble' phase. Trace als in the filters may contaminate samples dur- filtration and may also contribute significantly e trace element content of the particulate frac- . The object of this study is to determine not the trace element content of these filters, but the metal content variation between filters, in r to select that filter which might be expected ast contaminate the samples. The results ob- ed are not very encouraging. However, the fol- ng points may be made: When only a few cted elements are to be analysed it may be ible to select a filter containing low concentra- s of these metals. It is advisable to chose that r with the least coefficient of variation cent) in trace metal levels in order to deter- e a useful background level for a large number ements. (So African Water Info Center)
-10383

KING WATER SUPPLY NITRATE MOVAL PRACTICABLE,
len City Park Water District, N.Y.
heinker, and J. P. Codoluto.
ic Works, Vol 108, No 6, p 71-73, June, 1977.

criptors: *Groundwater, *Nitrates, nitrification, *Ion exchange, *Water supply, ter treatment, Resins, Pumping, *New York. tifiers: *Garden City Park(NY).

ough removal of nitrates from water has been n the reach of water works technology for some time, economic feasibility has been a nual problem. Faced with the dilemma of f abandoning a $300,000 well installation h began producing unacceptable nitrate con- ations or removing the nitrates from the well r, the Garden City Park Water District au County, New York) opted for the latter. ntinuous concurrent ion exchange system was osed, evaluated, and installed. Alternating een cyclical 'run' and 'pulse' modes, the m first passes raw well water over a synthetic exchange medium where denitrification place. A regeneration process then strips es from the contacted resin while 'fresh' is moed into the exchange area, after which ycle begins again. Liquid caustic is also added to the system to adjust the somewhat acidic well water to an acceptable pH; disinfection with liquid chlorine is practiced when deemed necessary. Overall, the system has proved effective and dependable, and may perhaps serve as a model for other water supply systems with excessive nitrate problems. (Eberle-NWWA)
W77-10525

DEMONSTRATION OF VOID SPACE STORAGE WITH TREATMENT AND FLOW REGULATION.
1976. 114 p, 30 fig, 11 tab, 22 ref, 4 append. EPA Technical Report EPA-600/2-76-272.

Descriptors: *Combined sewers, *Overflows, *Storage, Design, Performance, Operation, Construction, Treatment facilities, Storm water, Costs, Economics, Water pollution control, Waste water treatment, Flow control.
Identifiers: Void space storage.

Void space storage was presented as a means of regulation and containment for combined sewer overflows. The result was a reduction of pollution loads discharged to receiving streams. A two-year study considered system design, construction, and performance. The prototype system was built in Akron, Ohio. A combined sewer drainage area of 188.5 acres was provided. A one million gallon void space retention tank received excess flows. The excavated tank was lined with an impermeable membrane and filled with inert matter. The waste water was stored in the void space of the media. After the storm, stored water was gravity fed into interceptor sewers for further treatment. The facility's top could be used as a park or recreational grounds. Other functions of the tank include chlorination. The project cost $750,000 and projected costs for other facilities were $0.30 to $0.35 per gallon. No detectable fould odors or flammable gases were produced during the study period. Slime and algal growth in the media were non-existent and there was no evidence of rodent or insect infestations. The facility was not operated in an automatic mode. Some design changes were recommended, but the concept could provide a practical and economical solution to pollution problems associated with combined sewer overflows. (Collins-FIRL)
W77-10532

HIGH SERVICE WATER PUMPING STATION,
Wichita Water Dept., Kans.
J. A. Veon.
Public Works, Vol. 104, No. 3, p 94-95, March, 1973. 3 fig.

Descriptors: *Pumping, *Water distribution(Applied), Kansas, Utilities, Centrifugal pumps, Electric motors, Municipal water, Electric power, Pumping plants.
Identifiers: Wichita(Kansas), Pumping station.

A new high service pumping station for the municipally owned water utility of Wichita, Kansas has been designed by consulting engineers Black and Veatch, Inc. of Kansas City, Missouri to replace an 84-year old station now in use. The new facility will not only improve pumping operations, but will also improve the efficiency of the total water system and strengthen the foundation upon which other improvements will be planned and built in the future. Of the many work saving and reliability features designed into the new station, the auxiliary power system to supply energy to seven electrically driven pumps during periods of emergency is the most unusual. The primary source of power for conventional pumping will be two separate generating stations providing service through two 69 kv overhead transmission lines, one of which runs adjacent to and the other directly over the new pumping station site. An underground cable between the high service pumping station and the main cranking diesel generator at the electric company's central powerplant will be constructed for use in the event of a total blackout. Other improvements and refinements designed into the new pumping station include division of the facility into four independent cells to prevent flooding in case of a pipe leak. The centrifugal pumps to be installed will be of the bottom suction, side discharge type connected through a coupling to, and driven by, a constant speed synchronous electric motor. Above the operating floor, the station will have walkways around the top of each of the separate pump rooms. A crane will provide direct access to all pumping units through large open portions in the floor. Hatches and removable slabs will be provided to allow removal of valves and other equipment. Minimum facilities will be provided for maintenance and occasional manual operation of the station. (Sandoski-FIRL)
W77-10545

DIRECT DIGITAL CONTROL AT THE IOWA CITY WATER-TREATMENT PLANT,
EMA, Inc., St. Paul, Minn.
A. W. Manning.
American Water Works Association Journal, Vol. 69, No. 6, p 317-324, June, 1977. 10 fig.

Descriptors: *Computers, *Digital computers, *Municipal water, *Water quality control, Automatic control, Filtration, Costs, Waste water treatment, Data storage and retrieval, Pumps, Effluents.
Identifiers: Iowa City(IA).

A report was presented on computer control of the water treatment plant in Iowa City, Iowa. Because of plant expansion and the variability of conditions in the Iowa River, a digital system was chosen over the more expensive and complex analog system. Although the plant was designed to be run automatically, an operator could assume control of plant operations at any of five control panels, and could run the plant by computer or manually. Processes discussed included: skimming-gate control, low-lift-pump sequencing, flow split, sludge-blanket control, filter control and washing, chemical feed control, clear-well control, distribution, and high service control. Computerization of low-lift-pump sequencing saved on power, due to programming for minimum horsepower, and on equipment wear, due to more efficient and less frequent starts and stops. Filters could be washed automatically, thus increasing effluent quality. The devices were constantly monitored; an alarm would sound and be printed out if any device was operating in alarm condition, and must be acknowledged and shut off by the operator. A digital system provided data-handling capabilities which would be unavailable with an analog system. Data were supplied and managed by an operator control panel, a graphic panel, an alarm logger, and a report logger. Logs could be made up continuously and at any set time interval daily, monthly, and yearly. The digital control system proved to have increased quality of effluent and efficiency of operation; lowered costs in power and chemicals; and improved control of distribution. (Diggs-FIRL)
W77-10585

COLLECTION, TREATMENT AND REUTILIZATION OF WASTE WATERS IN ARID ZONES OF THE MIDDLE EAST,
Taylor (John) and Sons, London (England).
For primary bibliographic entry see Field 5D.
W77-10591

SOLVING STREAM POLLUTION CONTROL PROBLEMS WITH DIGITAL COMPUTER AND MODELLING TECHNIQUES,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-10596

BRAZIL--A MARKET FOR BRITISH EFFLUENT AND WATER TREATMENT PLANT MANUFACTURERS,
For primary bibliographic entry see Field 5D.
W77-10603

POLYMERS ARE PRECISELY MANAGED,
Cleveland Regional Sewer District, Ohio.
For primary bibliographic entry see Field 5D.
W77-10620

CONTAMINATION OF DRINKING WATER BY CORROSION OF COPPER TUBES,
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 5B.
W77-10735

WATER POLLUTION AND HUMAN HEALTH,
Ohio Univ., Athens. Dept. of Economics.
For primary bibliographic entry see Field 5C.
W77-10751

5G. Water Quality Control

EFFECT OF WIND AND RAIN ON SURFACE REAERATION,
Universidad Nacional Autonoma de Mexico Inst. of Engineering.
For primary bibliographic entry see Field 2H.
W77-10115

MODELING THE PERFORMANCE OF FEEDLOT-RUNOFF-CONTROL FACILITIES,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-10157

PROCEEDINGS: WORKSHOP ON NON-POINT SOURCES OF WATER POLLUTION.
Illinois Univ. at Urbana-Champaign. Coll. of Agriculture; and Illinois Inst. for Environmental Quality, Chicago.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 677, Price codes: A05 in paper copy, A01 in microfiche. March 20-21, 1975. Special Publication 37, IIEQ Document No. 75-16, August, 1975. 87 p., 9 fig., 5 tab., 59 ref. Edited by W. D. Seitz. OWRT A-999-ILL(4).

Descriptors: *Federal Water Pollution Control Act, Waste water treatment, *Water quality standards, Water quality, Social aspects, Legal aspects, Legislation, Water pollution sources, Pesticides, Nutrients, Land use, Leachate, Dissolved solids, Suspended solids, Erosion, Sedimentation, Mining construction, Agriculture.
Identifiers: *Non-point source pollution, *FWPCA 1972 Amendments.

Participants representing various state, federal, industrial, academic and citizen-action organizations met for a workshop to study and discuss the many ramifications of water pollution from diffuse sources. Discussion was aimed at providing participants with an overview of the subject focused on both the technical and federal legislative perspectives of non-point source water pollution. Problems and policy alternatives were discussed for agriculture, mining, urban areas and the constructive industry. Interest group presentations were made by the Illinois Municipal League, Illinois Agricultural Association, Midwest Coal Producers Institute, Association of Soil and Water Conservation Destricts, Association of General Contractors, and Illinois League of Women Voters. Small group workshops covered agriculture, urban areas, mining, construction, water quality, public participation, expected problems, future research and policy development. Current research activities were described by the Illinois Natural History Survey, the Erosion-Sedimentation Task Group, Pesticides, Task Group, Plant Nutrients Task Group, EPA, Illinois State Water Survey, Illinois State Geological Survey, and Northern Illinois University's Department of Geology. (See W77-10160 thru W77-10164). (Harris-Wisconsin).
W77-10159

PROBLEMS AND POLICY ALTERNATIVES: URBAN AREAS,
Envirex, Milwaukee, Wis.
T. L. Meinholz, C. A. Hanson, and W. J. Katz.
In: Proceedings: Workshop on Non-Point Sources of Water Pollution, March 20-21, 1975, Illinois Univ. at Urbana-Champaign, Agricultural Experiment Station and Illinois Institute for Environmental Quality, p 20-24. 5 fig, 8 ref.

Descriptors: *Water pollution sources, *Storm water, *Storm runoff, *Urban runoff, Wisconsin, Sewage effluents, Sewerage, Waste water treatment, Sewers, Cities, Urban areas, Technology.
Identifiers: *Non-point source pollution.

Storm-generated flows and runoff, sewer overflows, and other aspects of urban non-point water pollution are discussed, using examples from case histories at Kenosha and Racine, Wisconsin. Stormwater often contains high fecal coliform counts (up to 76,000/100ml). Separation of sanitary sewage from stormwater does not necessarily provide a solution to the problem of stormwater disposal. Moreover, sewers are usually combined in a single system in the central city where all the land is totally developed. Reference is made to an investigation of combined sewage characteristics made of discharges in 15 cities, with data given for BOD values, COD, suspended solids, nitrogen, phosphorus, and coliform counts. Before further technology and dollars are expended in the areas of advanced and tertiary treatment of municipal wastewaters for the betterment of water quality, an in-depth analysis of the health hazards and water quality degradation resulting from the continued discharge of untreated stormwater should be performed. Areas of further development include better drainage area housekeeping practices such as street cleaning, construction site runoff control and prudent application of chemicals to land, as well as improvements in conveyance systems and the treatment of discharges emanating from these systems. (See also W77-10159) (Harris-Wisconsin)
W77-10160

PROBLEMS AND POLICY ALTERNATIVES: AGRICULTURE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
E. R. Swansonn.
In: Proceedings: Workshop on Non-Point Sources of Water Pollution, March 20-21, 1975, Illinois Univ. at Urbana-Champaign, Agricultural Experiment Station and Illinois Institute for Environmental Quality, p 14-19. 21 ref.

Descriptors: *Water quality standards, *Water pollution sources, *Agriculture, *Agricultural runoff, Sediments, Erosion, Pollution abatement, Costs, Law enforcement, Monitoring, Erosion control, Fertilizers, Nitrogen compounds, Economic impact.
Identifiers: *Effluent limitations, *Non-point source pollution.

Agricultural sources of potential non-point surface and ground water pollution are considered, including sedimentation, plant nutrients, animal wastes and pesticides. It is estimated that 85% of soil erosion occurs on cropland, and cropland provides half the sediment entering inland waterways. Precise contributions of fertilizer use to surface and ground water is accumulating. Information needed for public policy formulation about agricultural non-point source pollution are: (1) Costs to the firm of adjustments to production related to reduction of potential pollutants; (2) Physical relationships between levels of on-farm pollutant generation and the various parameters of water quality at the locations of interest; (3) The functional relationship between these parameters and damage to the environment, including human health; (4) Responses of individuals in the system (5) Policy implementation costs such as those for information programs, tax or subsidy administration, enforcement, monitoring to determine effectiveness, and litigation. Alternative policies for control of non-point source agricultural water pollution are also discussed, along with analyses of the economic impact of the erosion-sedimentation and nitrogen fertilizer problems. (See also W77-10159) (Harris-Wisconsin)
W77-10161

THE TECHNICAL PERSPECTIVE (WHAT I QUALITY WATER),
Texas Univ., Austin. Dept. of Environmental Engineering.
G. A. Rohlich.
In: Proceedings: Workshop on Non-Point Source of Water Pollution, March 20-21, 1975, Illino Univ. at Urbana-Champaign, Agricultural Experiment Station and Illinois Institute for Environmental Quality, p 5-9. 11 ref.

Descriptors: *Federal Water Pollution Contr Act, *Water quality standards, *Water pollutio sources, *Technology, Analytical techniques.
Identifiers: *Non-point source pollutio *FWPCA 1972 Amendments, Effluent limitation

Technological aspects of water pollution cont are discussed, including a brief review of t highlights of historical water quality developme from the British Chadwick Report (1842) to t Federal Water Pollution Control Act Amendme (FWPCAA) of 1972. A comprehensive approach needed in which the total environment affected water quality is considered, comprising pub health, standards of quality, biological effects a aesthetics. A conceptual framework is presen in which water quality standards called for FWPCAA are developed: (1) criteria based scientific determinations as to qualities of resource that must be identified are set up specific use in water resource systems; (2) ident cation of water quality characteristics is ma through analytical methods of chemistry, biolo engineering and other disciplines; (3) measuring struments are deployed to monitor criteria water quality information for assessment and c trol; (4) standards are then defined through first three steps as acceptable quality related unique local situational factors. Especially in c paring non-point water pollution sources to p sources, water quality standards must be f flexible and should be tailored to specific appl tions. (See also W77-10159) (Harris-Wisconsin) W77-10162

PROBLEMS AND POLICY ALTERNATIV MINING,
Environmental Protection Agency, Springfield
R. L. Schleuger.
In: Proceedings: Workshop on Non-Point Sou of Water Pollution, March 20-21, 1975, Illi Univ. at Urbana-Champaign, Agricultural Ex ment Station and Illinois Institute for Enviros tal Quality, p 20-24.

Descriptors: *Water quality standards, *W pollution sources, *Illinois, *Coal mines, * mine wastes, Mine acids, Pyrite, Sulfur c pounds, Water pollution control, Decision ma Land reclamation.

The operational characteristics of mining are sidered in relation to non-point source water p tion, especially in Illinois coal mining, whe

mated 400 miles of streams and rivers are af-
ed by mine drainage. Of this, 265 stream miles
outhern Illinois are affected to such a degree
they are either void of fish and aquatic life or
not support them. Polluting mine wastes in-
le refuse piles, slurry lagoons and polluting
micals such as iron, manganese, aluminum and
ates of calcium and magnesium. Mining-re-
d water pollution in Illinois comes predomi-
ly from surface drainage over and percolation
ugh mine refuse heaps and from drainage over
massive areas of spoil banks and exposed
eral seams. Coal mine refuse piles pose a par-
lar threat of water pollution because they con-
iron sulfide (pyrite) which upon oxidation and
act with water can produce drainage contain-
sulfuric acid and iron. Such oxidation can
luce 198 lbs. of acidity per acre of refuse per
Most of the contaminants come from about
0 abandoned mines in 69 Illinois counties.
sible effects of coal-gasification plans on water
ity also need to be considered. Overall goals
objectives of a coal mine wastes program in Il-
is are reviewed. (See also W77-10159) (Harris-
consin)
7-10163

**BLEMS AND POLICY ALTERNATIVES:
NSTRUCTION,**
man Associates, Inc., Columbia, Md.
. Mills, and H. T. Hopkins.
Proceedings: Workshop on Non-Point Sources
Water Pollution, March 20-21, 1975, Illinois
v. at Urbana-Champaign, Agricultural Experi-
t Station and Illinois Institute for Environmen-
uality, p 35-43. 11 ref.

criptors: *Water pollution sources,
nstruction, Land use, Planning, Sediment con-
Erosion control, Soil stabilization, Runoff,
m water, Water pollution control, Regulation.
tifiers: *Non-point source pollution.

-source water pollution problems attendant on
eases in American construction activity are
ewed, along with discussion of some of the
nological and institutional aspects of con-
ing it. Water pollution from construction is
ribed as sediment, chemical pollutants and
gical pollutants. Each calls for a separate kind
ontrol program. A comprehensive plan for
r pollution abatement emphasizes two interre-
l approaches: (1) control of non-point source
r pollution from construction by overall land
planning; (2) control of water pollution at the
truction sites themselves. Sediment control
be achieved through technology applied to
rol of erosion, sediment containment and
nwater management. The first two kinds of
rols are concerned with controlling sediment
source, the third with preventing generation
ediment downstream and outside the bounds
he construction site. Control of pollutants
r than sediment generally involves abatement
ch trace elements as lead, chromium, cobalt
manganese from concrete wash-water opera-
. Also discussed are institutional considera-
involving various state and federal control
, and education at the sub-professional level
e construction industry. (See also W77-10159)
ris-Wisconsin)
-10164

**EAM COMMUNITY RESPONSE TO ROAD
STRUCTION SEDIMENTS,**
nia Commonwealth Univ., Richmond. Dept.
ology.
rimary bibliographic entry see Field 4C.
-10182

**IMAL SYSTEMS OF STORM WATER DE-
TION BASINS IN URBAN AREAS,**
ucky Water Resources Research Inst., Lex-
n.
rimary bibliographic entry see Field 4D.
-10184

SIMULATION OF THE SEDIMENTOLOGY OF SEDIMENT DETENTION BASINS,
Kentucky Water Resources Research Inst., Lexington.
A. J. Ward, C. T. Haan, and B. J. Barfield.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 611, Price codes: A07 in paper copy, A01 in microfiche. Research Report No. 103, June 1977. 133 p, 30 fig, 6 tab, 77 ref. OWRT B-046-KY(1), 14-34-0001-6081.

Descriptors: *Detention reservoirs, Sediments, Urban hydrology, *Simulation analysis, Sedimentology, *Water pollution control, *Model studies, *Sediment transport, *Settling basins.
Identifiers: *Sediment detention basins.

Sediment detention basins are a widely used means of controlling downstream sediment pollution resulting from stripmining and construction activities. A mathematical model for describing the sedimentation characteristics of detention basins has been developed. This model requires as inputs the inflow hydrograph, inflow sediment graph, sediment particle size distribution, detention basin stage-area relationship and detention basin stage-discharge relationship. Based on this information the model routes the water amd sediment through the basin. In this routing process the outflow sediment concentration graph, the pattern of sediment deposition in the basin and the sediment trapping efficiency are estimated. Comparison of predicted results with measured sediment basin performance indicates the model accurately represents the sedimentation process in detention basins. This report presents details of the model, illustrates its use in design, explains how to process the model on a digital computer and presents a program listing of the model. (Huffsey-Kentucky)
W77-10185

FORECASTING: THE CHALLENGE TO THE AQUATIC SCIENCES,
Michigan Univ., Ann Arbor. Dept. of Natural Resources; and Michigan Univ., Ann Arbor. Dept. of Zoology.
For primary bibliographic entry see Field 6B.
W77-10190

HEAVY METAL ENRICHMENT IN MINE DRAINAGE: I. THE RUSTENBURG PLATINUM MINING AREA,
Pretoria Univ. (South Africa). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-10199

CONTROLLING WATER POLLUTION,
World Health Organization, Geneva (Switzerland).
R. Helmer.
Public Health, Vol. 76, No. 6, p 159-171, June 1976.

Descriptors: Water supply, *Water pollution control, Public health, Water quality control, Water resources, Management, Water quality standards, Water reuse, Environmental effects, Regional development.
Identifiers: *World Health Organization.

The World Health Organization (WHO) has since its inception been very active in the field of water pollution control and has continually assisted Member States in evaluating need and developing programs in this field. Problems involved and the types of technical assistance provided by WHO are described. Public health aspects of water pollution, sources and types of pollutants, and the problems related to different uses of water are discussed. A summary is made of water quality criteria and standards, the monitoring of water quality, and control action for preventing or reducing water pollution. (So African Water Info Center)
W77-10201

MALACOLOGICAL STUDIES IN THE LUFIRA (KATANGA) ARTIFICIAL LAKE AREA: DISTRIBUTION AND ECOLOGY OF AQUATIC MOLLUSCS: EPIDEMIOLOGICAL ROLE OF INTESTINAL AND URINARY BILHARZIOSIS VECTORS, (IN DANISH),
For primary bibliographic entry see Field 5C.
W77-10238

STUDIES ON THE NATURAL RELATIONSHIPS OF CYANOPHAGES AND THEIR HOSTS AND THE NATURE OF RESISTANCE,
Livingston Coll., New Brunswick, N. J. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-10266

CONTROL OF ALGAE IN LAKES, LAGOONS AND SMALL RESERVOIRS WITH BIOGROWTH PARTITIONS,
Missouri Univ.-Rolla. Dept. of Civil Engineering.
B. G. Wixson, and D. E. Modesitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 775, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, June 1977. 41 p, 15 fig, 5 tab, 28 ref. OWRT A-077-MO(2), 14-34-0001-5025 and 6026.

Descriptors: Suspended solids, Growth rates, *Biological treatment, *Algae, Lagoons, Reservoirs, Model studies, *Algal control, Lakes, *Oxidation lagoons, Design, *Eutrophication, Water pollution effects, Chemical oxygen demand, Dissolved oxygen, Carbon dioxide, Waste water treatment.
Identifiers: *Biogrowth partitions(Lagoons).

Research was carried out on the control of algae from small lagoons through laboratory and field studies of manmade biogrowth surfaces for removing or controlling algae. Three lab-scale stabilization lagoons were modified with the addition of biogrowth sheets and operated with 30-day and 15-day detention period. Principal parameters measured were COD, Suspended Solids (SS), Dissolved Oxygen (DO), pH, Carbon Dioxide, (CO2), and microbial populations. Experimental laboratory results indicated that the application of biogrowth sheets was effective for lagoon stabilization. The practicability and design characteristics of the lagoon modification were then evaluated in field investigations. Algal growths on the biogrowth panels were helpful in the control of algae. Problems were encountered with solids not reaching an equilibrium which was attributed to the use of a batch method. Tanks using the biogrowth partitions produced a low Biochemical Oxygen Demand (BOD) but experienced problems with the use of raw sewage as a feed. The efficiency of treatment by biogrowth panels, however, was not deemed to be of a significant increase over the traditional lagooning method.
W77-10268

EXPERIMENTAL STUDIES ON CHANGING ALGAL POPULATIONS FROM BLUE-GREENS TO GREENS,
Minnesota Univ., Minneapolis. Limnological Research Center.
J. Shapiro, G. Zoto, and V. Lamarra.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 779, Price codes: A03 in paper copy, A01 in microfiche. Contribution No. 168, June 1977. 27 p, 4 fig, 3 tab, 5 ref. OWRT B-087-MINN(1), 14-31-0001-4096.

Descriptors: Lakes, Algae circulation(Water), *Cyanophyta, *Chlorophyta, *Minnesota, Food chains, Food levels, Water pollution control.
Identifiers: *Lake restoration, *Lake Emily(Minn), Artificial circulation(Lakes).

This research involves shifting of algal populations for possible lake restoration work. The site was Lake Emily, a small, shallow lake north of St. Paul, Minnesota. The research supports the notion that as phosphate becomes available, those algae that are able to outcompete others for it will become predominant. The work may have great value in Lake restoration. It may be possible to manipulate small or moderate sized lakes to improve them. Part of the manipulation may involve converting the population of algae from forms inedible by zooplankton to forms that can be eaten by them. It may be possible to bring about a blue-green to green shift in algal populations in whole lakes. Continuing studies indicate that the same factors operating to cause the shifts are responsible for shifts brought about by artifical circulation. (Waelti-Minnesota)
W77-10269

A REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT MODEL: AN ASSESSMENT,
Resources for the Future, Inc., Washington, D. C.
C. S. Russell, and W. O. Spofford, Jr.
Journal of Environmental Economics and Management, Vol. 4, No. 2, p 89-110, June 1977. 3 fig, 6 tab, 23 ref.

Descriptors: *Environmental control, *Water quality, *Management, *Alternative planning, *Costs, *Linear programming, Regional analysis, Standards, Air pollution, Delaware River, Optimization, Constraints, Feasibility, Industries, Ecosystems, Mathematical models, Systems analysis.
Identifiers: Cost minimization, Residuals management, Distributional information.

A discussion is presented of the research and policy lessons learned from a large environmental quaity management model contructred for the Lower Delaware River Valley Region. The policy lessons involve estimates of the costs of meeting varying standards on air and water quality and the impact on those costs of certan region-wide management alternatives. The research lessons concern: (a) the desirability of considering air and water quality and solid waste disposal simultaneously in a single model; (b) the costs of and returns to including nonlinear models of natural systems in a regional optimization framework; and (c) the feasibility of working with constraints on the geographic distribution of the costs of environmental quality improvement within the regional, nonlinear model. The authors believe that it will generally be worthwhile to include intermedia linkages in regional management models because the potentially valuable information appears to come at a fairly low price, the additional work and expense involved in integrading three separate media models being small. Nonlinear ecosystem models to provide additional potentially useful information. Linear programming models are more useful than nonlinear models for the investigation of the distributional implications of various regional management strategies. (Bell-Cornell)
W77-10292

OPTIMAL DESIGN OF MECHANICAL AERATION SYSTEMS FOR THERMALLY AND ORGANICALLY POLLUTED STREAMS,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
S. H. Lin.
International Journal of Sytems Science, Vol. 8, No. 1, p 111-120, January 1977. 6 fig, 14 ref.

Descriptors: *Streams, *Water pollution control, *Simulation analysis, *Design, *Aeration, *Optimization, Effects, Economic efficiency, Water temperature, Biochemical oxygen demand, Dissolved oxygen, Organic wastes, Thermal pollution, Constraints, Capital costs, Maintenance costs, Operating costs, Pumps, Equations, Mathematical models, Operation research.
Identifiers: Cost minimization, Streeter-Phelps model.

The systems approach is used for synthesizing an optimal mechanical aeration system for a stream receiving multiple thermal and organic waste discharges. It is assumed that a modified version of the Streeter-Phelps model is adequate for describing the stream water quality as characterized by the variations of the temperature, biochemical oxygen demand (BOD) and sissolved oxygen concentration. the system cost function which comprises, the capital costs, the labor and maintenance cost, and the operating cost, is formulated using the available data in the literature. To minimize the total system cost, a maximum allowable end BOD constraint is used. It is found that the total system cost is very critical to the BOD costraint imposed at the end of the reach of stream under consideration. The effect of the waste discharge structure on the total system cost is vary significant. The system with thermal discharge prior to organic discharge is by far better than the opposite. (Bell-Cornell)
W77-10293

REDUCTION OF 2, 4-D LOAD IN SURFACE RUNOFF DOWN A GRASSED WATERWAY,
Agricultural Research Service, Tifton, Ga. Southern Region.
L. E. Asmussen, A. W. White, Jr., E. W. Hauser, and J. M. Sheridan.
Journal of Environmental Quality, Vol 6, No 2, p 159-162, April-June 1977. 4 fig, 3 tab, 8 ref.

Descriptors: *Herbicides, *Grassed waterways, *Water pollution, *Agricultural chemicals, *Watershed management, Pesticides, 2-4-D, Weed control, Surface drainage, Agricultural watersheds, Surface runoff, Coastal plains, Pesticide removal, Pollutants, Sediments, Surface runoff, Watersheds(Basins).
Identifiers: Environmental contamination, Simulated rainfall, Cowarts loamy sand.

The effectiveness of a grassed waterway in decreasing 2,4-D ((2,4-dichlorophenoxy) acetic acid) content in surface runoff was investigated. Corn plots were treated with 2,4-D (0.56 kg/ha) and runoff produced by applying simulated rain was directed through a 24.4-m-long grassed waterway. The 2,4-D concentrations were measured under wet and dry antecedent waterway and plot conditions. Reduction in 2,4-D load in waterways results from water loss by infiltration, sediment loss, and by attachment-absorption on vegetative and organic matter. Of the simulated rainfall applied 1 day after application of 2,4-D, 50% of the water ran off the plots under dry antecedent soil conditions, and 78% ran off under wet conditions. Infiltration reduced runoff flowing down the waterway an additional 25% under dry conditions and 2% under wet conditions. Suspended sediment reduction in the waterway was 98 and 94% of the total amount moving from the plot for the dry and wet waterway conditions, respectively. The total loss (on sediment and in solution) of the applied 2,4-D from the plot in the dry and wet states was 2.5 and 10.3%, respectively. (Henley-ISWS)
W77-10323

MEETING EFFLUENT DISCHARGE REQUIREMENTS AND WATER REUSE,
Eutek Inc., Sacramento, Calif.
For primary bibliographic entry see Field 5D.
W77-10343

NATIONAL EFFLUENT REQUIREMENTS FOR THE MEAT AND POULTRY INDUSTRY,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W77-10345

COAL AND COAL MINE DRAINAGE, (LITERATURE REVIEW),
Bituminous Coal Research Inc., Monroeville, Pa.
J. F. Boyer, and V. Gleason.
Journal Water Pollution Control Federation, Vol. 19, No. 6, p 1163-1172, June, 1977.

Descriptors: *Mine drainage, *Acid streams, *Strip mine wastes, *Coal mines, *Acid mine water, Mining, Mine water, Strip mines, Waste dumps, Geochemistry, Trace elements, Neutralization, Sedimentation, Suspended solids, Industrial wastes, Waste water treatment, Water quality, Bioassay, Pollutant identification, Reviews, *Bibliographies.

A review of acid mine drainage, its associated problems, and their causes is presented. Current methods for controlling acid mine drainage and processes under investigation are outlines, including lime neutralization and the less expensive limestone neutralization. Methods for removal of iron and other cations are also discussed. As coal preparation can result in water pollution through acids, metal ions, silt, or suspended solids, the development of various types of refuse embankments and the disposal of waste water and solids are discussed. Mine sealing, selective handling of overburden, stream diversion, and reclamation of surface-mined areas are described as abatement methods for acid mine drainage. Despite the growing number of successful reclamation and treatment operations, much attention is still being directed towards the effects of acid mine drainage on water quality and stream biology. A survey of ecologic studies is presented. The effects of trace elements, acidity, pH, and irion concentrations are considered with respect to prevention and control. As surface mine production has been steadily increasing, problems related to surface mining are also increasing. Recent literature and various methods for controlling erosion, sedimentation, siltation, and subsidence are discussed. (Schulz-FIRL)
W77-10355

RAPID ANALYSIS OF ACID MINE DRAINAGE
West Virginia Univ., Morgantown. Coal Research Bureau.
For primary bibliographic entry see Field 5A
W77-10356

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED STATES.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10357

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED KINGDOM.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10358

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN FINLAND.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10359

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN JAPAN.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10360

ECOSYSTEM APPROACH TO THE ANNING OF WATER POLLUTION CON-OL,
versity of New England, Armidale (Australia).
ool of Natural Resources.
. Fisher.
Environmental Engineering Conference, Can-a, Australia, 1977. The Institution of En-ers Australia, Preprints of Papers, p. 39-43. e Institution of Engineers Australia National ference Publication No. 77/4).

criptors: *Water pollution control, osystems, *Model studies, *Australia, En-nmental control, Water pollution effects, Ur-zation, Bays.
tifiers: Westernport Bay(Vic).

the purpose of planning control policies, two s of polluted water systems are distinguished he basis of the effect of proposed human ification on the interactions currently opera-within the system. If this effect is small, an en-ering systems analysis, which relies on data ected before the modification occurs, is a able set of techniques by which to obtain the rol policies. However, if the effect is large, a quantitative model is needed which incor-tes a representation of the processes govern-system behaviour, both before and after ification occurs. In general this will involve gical phenomena about which little is known, cularly under Australian conditions. Conduct-sensitivity analysis of these models is one of ew available methods of controlling pollution-rol policies which can account for the impor-often dynamic, influence of these omena on system behaviour. Industrial and ciated development of Westernport Bay, Vic-, Australia, is used to illustrate this second ap-ch. (CSIRO)
-10367

ERIENCE WITH THE DESIGN AND RATION OF SMALL EXTENDED OPERA-N AERATION WASTEWATER TREAT-T PLANTS,
eridge, Haskins and Davey Pty Ltd., Mel-ne (Australia).
rimary bibliographic entry see Field 5D.
-10368

EW CODE FOR REDUCING STREAM SIL-ION,
ronment Protection Authority, Melbourne tralia).
rimary bibliographic entry see Field 4D.
10369

ROACH TO LIQUID EFFLUENT CONTROL NITROGENOUS FERTILIZER PLANT,
olidated Fertilizers Ltd., Newcastle tralia).
cCallum.
nvironmental Engineering Conference, Can-, Australia, 1977. The Institution of En-rs Australia, Preprints of Papers, p 126-129. Institution of Engineers Australia National erence Publication No. 77/4).

riptors: *Effluents, *Industrial wastes, ogen compounds, *Water pollution control, tralia, Ammonium salts, Nitrates, Nutrient val, Waste water treatment, Pollutants, s, Streams.
fiers: Hunter River(N.S.W.), Newcas-S.W.).

uction in the quantities of nitrogenous com-ds entering the site effluent mains has been ved at a fertilizer plant in Newcastle, New Wales, Australia. The methods employed, n with particular attention to the safety of and personnel, are described. The use of an l diffuser together with additional means of further removing and recycling ammonium wastes are now being evaluated as ways of reducing the impact of effluents on the Hunter River. (CSIRO)
W77-10370

VARIATIONS IN EFFLUENT QUALITY AND THE IMPLICATIONS FOR SETTING EFFLUENT STANDARDS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
D. Barnes, and F. Wilson.
In: Environmental Engineering Conference, Canberra, Australia, 1977. The Institution of Engineers Australia, Preprints of Papers, p 130-134. (The Institution of Engineers Australia National Conference Publication No. 77/4).

Descriptors: *Water quality standards, *Legislation, Effluents, Water pollution control, Streams, Storm water, Sewage effluents, Regulation, *Australia.

Several criteria have been proposed for setting effluent standards, including exact effluent specifications, average values and water use. In practice criteria often become unworkable or inefficient because of a lack of analytical data. Particular problems are associated with the control and treatment of storm water flows, the variability of effluent from small sewage works including septic tanks, the methods employed to estimate river quality, and the implications of continuous monitoring devices. Effective discharge criteria must accommodate the demands of river quality, economic treatment processes, water usage and analytical methods. (CSIRO)
W77-10371

THE PUSH TO EASE WATER RULES.
For primary bibliographic entry see Field 6E.
W77-10446

CHICAGO CLEANUP: INDUSTRY OUTDOES THE CITY.
For primary bibliographic entry see Field 6E.
W77-10447

THE EFFLUENT LIMITATIONS CONTROVERSY: WILL CARELESS DRAFTMANSHIP FOIL THE OBJECTIVE OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
National Wildlife Federation, Washington, D.C.
P. A. Parenteau, and N. Tauman.
Ecology Law Quarterly, Vol 6, No 1, p 1-59, 1976.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, *Federal jurisdiction, *State jurisdiction, Water pollution, Effluents, Industrial wastes, Water pollution sources, Water policy, Judicial decisions, Legal review, Regulation, Administrative agencies, Legislation, Standards, Water quality standards, Political aspects.
Identifiers: *Administrative regulations, *Effluent limitations, *Environmental policy, *Federal Water Pollution Control Act Amendments of 1972, Point sources(Pollution), National Pollution Discharge Elimination System, Effluent guidelines, Environmental Protection Agency.

The Federal Water Pollution Control Act Amendments of 1972 (FWPCA Amendments of 1972) contain an important pollution abatement device called effluent limitation. By applying progressively stricter effluent limitations according to technological improvements in pollution control, the Act seeks to achieve its goal of elimination of pollutant discharges by 1985. The device has been seriously challenged on a variety of fronts by various industries which find it an unwarranted burden on legitimate enterprises. Seven courts of appeal have adopted conflicting interpretations of those sections of the Act dealing with effluent limitation. At issue is the power of the Environmental Protection Agency (EPA) administrator to set standards and whether they will be given uniform effect. This article examines in depth the litigation and the validity of the various court holdings. The authors conclude that Congress intended to adopt a uniform approach to standard-setting, but by using ambiguous language, failed to spell out the procedure by which standards were to be set. They urge that the EPA's uniform standards position ought to be adopted by the Supreme Court. Two cases in which the Court has granted certiorari may provide the means for resolution of the disputes. (Jones-Florida)
W77-10452

THE SUPREME COURT INTERPRETS THE ROLE OF THE ENVIRONMENTAL PROTECTION AGENCY IN REGULATING RADIOACTIVE MATERIALS,
For primary bibliographic entry see Field 6E.
W77-10455

DEEPWATER PORT ACT OF 1974: SOME INTERNATIONAL AND ENVIRONMENTAL IMPLICATIONS,
For primary bibliographic entry see Field 6E.
W77-10456

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS,
V. P. Wilson.
Environmental Affairs, Vol 5, No 3, p 545-66, Summer 1976.

Descriptors: *Federal Water Pollution Control Act, *Groundwater, *Water pollution control, *Pollution abatement, Water pollution, Legislation, Injection wells, Pollutants, Navigable waters, Surface waters, Groundwater movement, Flow, Surface-groundwater relationships, Water supply, Groundwater resources, Common law, Water law, Legal aspects.
Identifiers: *Groundwater management, *Territorial waters, Safe Water Drinking Act(SWDA).

Groundwater pollution is now controlled by three legal mechanisms. The least effective of these is an action at common law because such actions are only available to persons who have a possessory interest in land damaged by the pollution. The second method, the Safe Water Drinking Act (SWDA), protects underground sources of drinking water. However, the protection of the SWDA is limited to sources which supply public systems and which the Administrator determines are endangered by underground injection. The most effective tool available to control groundwater pollution is the Federal Water Pollution Control Act (FWPCA). The FWPCA's objective is to eliminate the discharge of pollutants into navigable water by 1985. At issue is whether the term 'navigable water' includes groundwater. The Act defines 'navigable water' as the waters of the United States. No attempt is made to limit or exclude groundwater from this definition. Despite this definition, a recent case held only certain groundwaters are protected by the Act. This interpretation limits the effectiveness of the FWPCA as an effective tool in abating groundwater pollution. The commentator feels that the case is wrong and that groundwater is protected by the Act. (Petruff-Florida)
W77-10458

WATERS OF THE UNITED STATES: DOES FEDERAL CONTROL INUNDATE THE WETLAND (COMMENT ON US V HOLLAND),
For primary bibliographic entry see Field 6E.
W77-10463

USE OF THE COMMERCE CLAUSE TO INVALIDATE ANTI-PHOSPHATE LEGISLATION: WILL IT WASH. (SOAP AND DETERGENT ASSOCIATION V CHICAGO).
For primary bibliographic entry see Field 6E.
W77-10464

FEDERAL AND FLORIDA LAW CONCERNING OIL POLLUTION,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-10467

WASTE HEAT UTILIZATION FROM THERMAL POWER PLANT IN NEW YORK STATE,
For primary bibliographic entry see Field 6E.
W77-10468

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY, PROPOSED EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 2, p 914-28, January 5, 1976.

Descriptors: *Standards, *Organic wastes, Federal Water Pollution Control Act, *Chemical industry, *Chemical wastes, Chemicals, Chemical degradation, Regulation, Technology, Pollutants, Political aspects, Organic compounds, Organic matter, Effluents, Federal government, Pollution abatement, Pollutant identification, Treatment, Treatment facilities, Wastes, Waste treatment, Waste disposal.
Identifiers: *Federal Water Pollution Control Act(FWPCA) Amendments of 1972.

Section 301 of the Federal Water Pollution Control Act requires the achievement by not later than July 1, 1977 of effluent limitations for point sources, other than publicly owned treatment works, which require the application of the best practicable control technology currently available, as defined by the Administrator of the Environmental Protection Agency (EPA). Guidelines for effluent limitations within the organic chemical manufacturing point source category include the following subcategories: (1) nonaqueous processes; (2) processes with process water contact only as steam dilvent, or quench or vent gas absorbents; (3) aqueous liquid-phase reaction systems; and (4) the latch and semi-continuous processes. The EPA hereby proposes guidelines and standards applicable to the above-stated subcategories. They include: effluent limitations for existing sources, standards of performance for new sources, and pretreatment standards for existing sources. (Josepher-Florida)
W77-10472

APPLICATION OF PERMIT PROGRAM TO SEPARATE STORM SEWERS.
Federal Register, Vol 41, No 54, p 11303-07, March 18, 1976.

Descriptors: *Permits, *Storm drains, *Storm runoff, *Surface runoff, *Drainage systems, Federal Water Pollution Control Act, Regulation, Cities, Urban drainage, Urbanization, Water pollution sources, Federal government, Administrative agencies, Legal aspects, Water pollution, Control, Water pollution control, Legislation, Waste water(Pollution), Sewers.
Identifiers: *Administrative regulations, National Pollutant Discharge Elimination System (NPDES), Certification.

The Environmental Protection Agency (EPA) has promulgated regulations for applying the National Pollutant Discharge Elimination System (NPDES) permit program to separate storm sewers. The term 'separate storm sewer' is defined as a conveyance or system of conveyances located in an urbanized area and primarily operated for the purpose of collecting and conveying storm water runoff. The permit issuing authority may designate a rural storm sewer system as being a significant contributor of pollution and thus subject to these regulations. Discharges of pollutants from separate point sources not part of the separate storm sewer system are not subject to these provisions but rather the general provisions concerning point sources. The EPA has summarized the comments made on the regulations by interested members of the general public and has responded thereto. The EPA has emphasized that the separate storm sewer regulations were issued in accordance with a court order in NRDC v. Train. The EPA has taken an appeal of this case and therefore the final status of the promulgated regulations is as yet unknown. (Moorhouse-Florida)
W77-10473

PLASTICS AND SYNTHETICS MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 40, No 97, p 21740-41, May 19, 1975.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Plastics, Effluents, Standards, Federal government, Legal aspects, Legal review, Governments, Administration, Regulation, Classification.

The Environmental Protection Agency (EPA) has proposed amendments to the COD parameter in the Polypropylene Subcategory. The EPA is therefore amending the 1983 and new source regulation to reflect an effluent concentration of 75 mg per litre rather than 100 mg per litre, a decrease in the new source standard and the 1983 limitation for COD for Polypropylene of 25%. The recommended treatment technology was discussed in the final 'Development Document'. The proposed amendment does not involve any changes which would affect any environmental or non-environmental impact. (Hadoulias-Florida)
W77-10474

WARD V COLEMAN (CONSTITUTIONALITY, AND THE CRIMINAL OR CIVIL NATURE OF FINES UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W77-10479

VANDERVELDE V CITY OF GREEN LAKE (AUTHORITY OF CITY TO REQUIRE USE OF CITY WATER AND SEWER MAINS).
For primary bibliographic entry see Field 6E.
W77-10480

UNITED STATES V ALLIED CHEMICAL CORPORATION (MULTIPLE-COUNT INDICTMENTS FOR WASTE DISCHARGE VIOLATIONS OF THE RIVERS AND HARBORS ACT).
For primary bibliographic entry see Field 6E.
W77-10481

UNITED STATES V ATLANTIC RICHFIELD COMPANY (ABSOLUTE LIABILITY FOR OIL SPILLS UNDER FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W77-10484

NATIONAL RENDERERS ASSOCIATION V ENVIRONMENTAL PROTECTION AGENCY (REVIEW OF EPA EFFLUENT LIMITATIONS FOR RENDERERS).
For primary bibliographic entry see Field 6E.
W77-10498

UNITED STATES V RESERVE MINING COMPANY (DISCHARGE OF TACONITE TAILING INTO LAKE SUPERIOR CAUSING DISCOLORATION OF SURFACE WATER).
For primary bibliographic entry see Field 6E.
W77-10499

RELEASING DEAD ANIMALS, ETC., INTO O NEAR WATERS.
For primary bibliographic entry see Field 6E.
W77-10501

LIVING WITH THE LAKE. A GUIDE TO I LINOIS LAKESHORE MANAGEMENT.
Illinois State Dept. of Transportation, Chica Div. of Water Resources.
Illinois Coastal Zone Management Program Pub cation, (1976), 24 p.

Descriptors: *Coasts, *Management, *Shore p tection, *Water quality control, *Illinois, *La Michigan, Land use, Recreation, Economics, E sion.
Identifiers: *Coastal zone manageme *Resource management.

The Illinois Coastal Zone Management Progr recommends four basic goals with specific obj tives for each. The goals are: Protect, enhance restore Lake Michigan waters and Illinois sho lands to the extent practicable; Minimize prope damage from shore erosion and flooding along Illinois shoreline of Lake Michigan; Enhance portunities for recreational activity along the linois shore of Lake Michigan; and Enhance La related commercial and industrial activities to c tribute to the economic well-being of Illin (NOAA)
W77-10504

ILLINOIS COASTAL ZONE MANAGEME PROGRAM: COMPONENT STUDY BIOLOGICAL COMMUNITIES.
Illinois Natural History Survey, Urbana.
For primary bibliographic entry see Field 2H.
W77-10505

DISPOSAL OF SALT WATER DURING WE CONSTRUCTION, PROBLEMS AND SO TIONS,
Geological Survey, Miami, Fla. Water Resou Div.
W. A. J. Pitt, Jr., F. W. Meyer, and J. E. Hull.
Ground Water, Vol. 15, No. 4, p 276-283, July-gust, 1977. 6 fig, 1 tab.

Descriptors: *Injection wells, *Drilling, *W pollution sources, *Saline water, Aquif Drilling fluids, Sewage disposal, Monitor Pumping, Groundwater, *Florida.
Identifiers: Miami(Florida), West P Beach(Florida).

Recent interest in disposal of treated sewage fluent by deep-well injection into saline aqu has increased the need for proper disposal of water as more wells are drilled annually. T cases of contamination of an unconfined aquif Florida by salt water spilled or discharged wells trapping the underlying saline aquifer ar amined in this study. In two cases, near Mi contamination resulted from disposal of salt w into unlined surface bits during injection well struction. At the third site near West Palm Be minor contamination was caused by accid spills during construction. Precautions taken a latter site included the use of a brine injection for disposal of saline water and a closed cir tion drilling system to minimize spillage. A cor rent monitoring program facilitated early dete of salt spill effects, thus, mapping of the cont nant and restoration efforts were effective relatively inexpensive. Suggestions for furthe creasing the safety of drilling into saline aqu

lude the construction of impermeable drilling ds with gutters and employing special ocedures for handling drilling muds. (Eberle-WA)
7-10519

OTECTING GROUND WATER FROM OMESTIC WASTEWATER EFFLUENT,
tional Water Well Association, Worthington, io.
E. Gass.
ter Well Journal, Vol. 31, No. 6, p 34-35, June, 7. 2 fig.

scriptors: *Domestic wastes, *Waste water posal, *Water wells, *Water pollution sources, ter supply, Septic tanks, Nitrates, Viruses, ter purification.

mestic wastewater effluent goes through a se- of treatment processes as it moves through an site disposal system. Nevertheless, as this ef- nt seeps out of the leaching beds and into the , it often contains biological and chemical com- ents that represent a hazard to the quality of und water. Most pollutants are reduced to in- ificant quantities at a depth of eight feet; ap- ximately 40 feet of silty clay, however, is ded to eliminate viruses and nitrates from infil- ing wastewater. The minimum protective tance between the intake of a water supply well the discharge of wastewater effluent has a ver- l well depth component (d) plus a horizontal tance component (h) such that the diagonal tance is sufficient to remove all potential pollu- ts. The following distance formula is frequently d by sanitarians: h = (165,000/d) times the are foot of (Si/d), where Si is a coefficient of ification capacity of all strata penetrated when ling a well. This formula can be referred to in junction with state and local regulations for cing a well safely away from the influence of rby wastewater disposal sytems. (Eberle-WA)
7-10520

BRASKA ISSUES REGULATIONS UNDER E DRINKING WATER ACT OF 1976.
nson Drillers Journal, Vol. 49, No. 3, p 13, y-June, 1977.

scriptors: *Water law, *Potable water, Ground- er, Water quality control, Regulation, braska, *Water quality standards.

ulations governing public water supply tems in Nebraska have been adopted by that e's Board of Health. 1974 federal legislation set dards for water safety. In 1976, the state slature passed the Safe Drinking Water Act ng for development of a program to test water ply systems and regulate water safety stan- ds. Few severe problems with water in raska are expected in the near future, how- r, presence of organic chemicals in ground- er and nitrates in the water supplies of 45 cities causing some concern among state officials. erle-NWWA)
7-10523

STEWATER MANAGEMENT PROGRAM, AMAICA BAY, NEW YORK, VOLUME I: MMARY REPORT,
wig (H. F.) and Associates Engineering- nce, Inc., Arcadia, Calif.
primary bibliographic entry see Field 5D.
7-10533

ST-EFFECTIVE COMPARISON OF LAND PLICATION AND ADVANCED WASTE TER TREATMENT,
ironmental Protection Agency, Washington, Office of Water Programs Operations.
primary bibliographic entry see Field 5D.
-10535

METHODOLOGY FOR RIVER-QUALITY ASSESSMENT WITH APPLICATION TO THE WILLAMETTE RIVER BASIN, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 7A.
W77-10565

CAN IRRIGATION WITH MUNICIPAL WASTE WATER CONSERVE ENERGY,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 5E.
W77-10579

WASTEWATER PHOSPHORUS REMOVAL USING LAND APPLICATION,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5D.
W77-10606

MANAGEMENT ALTERNATIVES FOR LAND TREATMENT SYSTEMS,
Culp/Wesner/Culp-Clean Water Consultants, El Dorado Hills, Calif.
G. L. Culp, and D. J. Hinrichs.
Public Works, Vol. 108, No. 6, p 78-79, June, 1977.

Descriptors: *Waste water management(Applied), *Irrigation, Waste disposal, Equipment, Maintenance, Costs, Crops, Administration, Waste water treatment.

Alternative solutions were suggested for management problems related to land treatment systems. The problems considered were operation of the irrigation system; planting, cultivating, and harvesting of crops; and ownership of the land. One method involved ownership of the land and operation of the irrigated-agriculture project by one agency. Its main advantage was complete agency control of the treatment and irrigation systems. Problems included staffing, equipment costs, and maintenance costs. Maximized crop revenues could offset operating costs. A perennial crop would require less tillage and save equipment and personnel costs. A solid-set or a center pivot type system requires less labor. The crop should be compatible with local crops to utilize local knowledge and markets. Agency ownership of the land and contracted farming activities was another choice. This relieves some equipment and labor costs, but creates problems or priority. Its waste water treatment or maximization of crop revenues more important. A compromise solution would be agency ownership and irrigation operation, with only crop planting and harvesting activities contracted. This provides complete control of the entire system and avoidance of farm labor and equipment charges. Timing harvest to maximize crop yield may become a problem. There was also the option of leasing the lands for irrigation operations. Another prospect was the provision of water to a farmer or group of farmers who need water and may already possess irrigation equipment. The choice of management approach should depend upon local agency constraints and concerns. (Collins-FIRL)
W77-10637

MULTIFUNCTIONAL APPROACH TO POLLUTION PREVENTION,
Yorkshire Water Authority (England).
T. W. Raven.
Water Pollution Control, Vol. 76, p 222-231, 1977.

Descriptors: *Water pollution control, *Water districts, *Administration, Analysis, Inspection, Monitoring, Planning, Treatment facilities, Standards, Waste water treatment.

The reorganization of the Yorkshire Water Authority, with an emphasis on pollution prevention, was described. The major concern was to reconcile the Authority's position as pollution control overseer with is creation of pollution as a byproduct of water treatment. Emphasis was placed on making the scientific services multifunctional. The objective was to combine responsibility for analysis of water, trade effluents sewage treatment and river samples. This would effectively eliminate large scientific staffs at individual facilities. Pollution prevention was divided into the areas of inspection, monitoring, examining waste treatment planning applications, developing procedures for emergency pollutions, keeping the public informed, and establishing effluent standards. (Collins-FIRL)
W77-10638

THE (WEST GERMAN) WASTE WATER DISCHARGE TAX LAW (DAS ABWASSERABGABENGESETZ),
Technische Universitaet, Darmstadt (West Germany).
H.-L. Dalpke.
Der Papiermacher, Vol 27, No 2, p 20-23, 28-29, February 12, 1977. 7 ref, 2 tab.

Descriptors: *Pollution taxes(Charges), *Water law, *Waste water disposal, *Foreign countries, Legislation, Water pollution control, Discharge measurement, Pulp and paper industry, Effluents, Europe, Waste water treatment, Discharge(Water), Permits, Regulation, Water permits, Industrial wastes, Taxes, Organic loading.
Identifiers: *West Germany.

In an update of a previous article (cf. Selected Water Resources Abstracts, Vol 9, No 12, p 89, Section 5G, abstracts W76-05712, June 15, 1976) the development of the West German industrial effluent discharge tax law is discussed, especially with respect to pollution load evaluation principles prescribed. Data are also reviewed concerning the specific effluent loads of model paper mills with various assumed levels of effluent treatment, and measures for reducing pollution loads in accordance with the law are outlined. (Speckhard-IPC)
W77-10695

A LONG-RANGE PROGRAM FOR MEETING THE PAPER INDUSTRY'S ENVIRONMENTAL PROTECTION TECHNICAL INFORMATION NEEDS,
National Council of the Paper Inustry for Air and Stream Improvement, Inc., New York.
I. Gellman.
Tappi, Vol. 60, No. 4, p 72-74, April, 1977.

Descriptors: *Pollution abatement, *Pulp and paper industry, *Air pollution control, Ecology, Environment, Waste disposal, Planning, Information exchange, Public health, Aesthetics, Land use, Regulation.

A plan to guide the U.S. pulp and paper industry in environmental problem studies has been designed by NCASI (National Council of the Paper Industry for Air and Stream Improvement). Principal areas of public concern include the impact of pollutants on human health and the aesthetic effects of these pollutants. There will be pressure on the industry to develop new technology to reduce mill discharge pollutants in an efficient and cost effective manner. Land-use regulation and public scrutiny of industry activities will be important in future industry planning and growth. Public and private capital and energy resources are inadequate to meet short-term regulatory program requirements. The plan covers specific problems in these general areas and will be updated regularly as new information becomes available. (Sykes-IPC)
W77-10720

A GROWTH AND DEVELOPMENT MODEL FOR WATER RESOURCE POLICY,
Florida Atlantic Univ., Boca Raton.
For primary bibliographic entry see Field 6B.
W77-10747

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: TEXTILES INDUSTRY,
Little (Arthur D.), Cambridge, Mass.
D. Hefler.
Available from the National Technical Information Service as PB-243 906, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-230-2-75-028, June 1975. 181 p, 10 fig, 95 tab, 1 tab. EPA 68-01-1541.

Descriptors: *Textiles, *Pollution abatement, *Economic impact, Industrial plants, Employment, Prices, Industries, Waste treatment, Cost analysis.
Identifiers: *Effluent guidelines, Best available technology, Best practicable technology, Wool, Fabrics, Dyeing.

The economic impact on the wool scouring, wool dyeing and finishing, woven fabrics dyeing and finishing, knit fabric dyeing and finishing, and stock and yarn dyeing and finishing categories of the textile industry of effluent guidelines for the best practicable technology (BPT), the best available technology (BAT), and new source performance standards (NPS) is examined. Emphasis is on estimating mill closings rather than total industry costs. It is concluded that added costs resulting from meeting BPT guidelines would primarily affect smaller, independent companies, and could not be readily passed on to mill customers, since the price structure is determined by the larger corporations which already meet BPT standards. There would be no mill closings in the woven or knit fabric dyeing and finishing categories due to compliance with BPT and BAT guidelines. Two wool scouring and two wool dyeing and finishing mills would close because of BPT compliance, and 3 additional wool dyeing and finishing mills would close because of BAT requirements. One stock and yarn dyeing mill would also be affected by BAT standards. Though the estimated employment and production curtailment would be minimal in terms of the total industry, local community impact could be substantial for small communities when they account for up to 30% of a town's direct employment. (Luedtke-Wisconsin)
W77-10749

EFFECTS OF INCREASED FERTILIZER RATES ON NITROGEN CONTENT OF RUNOFF AND PERCOLATE FROM MONOLITH LYSIMETERS,
Agricultural Research Service, Temple, Tex.
F. W. Chichester.
Journal of Environmental Quality, Vol. 6, No. 2, p 211-217, April-June 1977. 4 fig, 6 tab, 9 ref.

Descriptors: *Nitrogen compounds, *Fertilizers, *Nitrates, *Leaching, *Agricultural chemicals, Water quality, Nutrients, Pollutants, Water chemistry, Nitrogen, Water pollution sources, Percolation, Runoff, Hydrology, Soil chemistry, Agricultural runoff, Fertilization.
Identifiers: *Nitrate leaching, *Crop management, Meadows, Monolith lysimeters, Percolate water, Nitrogen transport.

Nitrogen (N) fertilizer was applied to meadow and corn cropped lysimeters at rates up to 322 and 672 kg/ha per year, respectively, to determine the effects on chemical quality of surface water. Runoff and percolate samples collected from May 1971 through April 1975 were analyzed for inorganic and total N content. Results were evaluated from crop and soil cover treatment differences and were compared with data from a similar, earlier study on the same lysimeters in which very low rates of N fertilizer were used. Nitrogen losses in runoff were greatest in the summer when intense rainfall events occurred shortly after the date of fertilizer application. Nitrogen loss by leaching was greatest during the winter when percolation rates increased because of low evapotranspirational demand. Results of the study demonstrated that improved fertilizer management, involving application rates in balance with crop nutrient requirements, soil incorporation of fertilizer materials, and adequate soil cover, will minimize runoff and leaching losses which reduce fertilizer efficiency and adversely affect water quality. (Henley-ISWS)
W77-10773

HYDRAULIC MODELING OF MIXING IN STRATIFIED LAKES.
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W77-10798

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

NATIONAL AND INTERREGIONAL MODELS OF LAND USE, WATER ALLOCATION, SOIL LOSS CONTROL, AND AGRICULTURAL POLICY,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
K. J. Nicol, E. O. Heady, and J. C. Wade.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 90-96, Special Edition 1976. 3 fig, 6 tab, 5 ref.

Descriptors: *Model studies, Crop production, Agriculture, *Simulation analysis, Economics, *Regional analysis, *Water policy, Land use, Water allocation(Policy), Soil erosion.
Identifiers: National models.

National models of agriculture are useful tools to evaluate policy alternatives affecting the agricultural sector and other sectors of the economy that interact with agriculture. This model allows for the analysis of environmental policy and its impacts on agriculture. Regional shifts in production result as the maximum allowable level of gross field loss of soil is reduced to 11,200 kg/ha. Shifts in farming method, inputs, and machinery compliments are needed to facilitate this reduction in soil loss. Different stages of research and analysis being built on a given family of models are presented. The progress reported does not represent a terminal point in this model development. Additional stages are being developed, and the general model will be extended to include further specifications of land and water use, agricultural technology, environmental impacts, export potential, and farm policies as these relate to farm income, rural employment, consumer food costs, environmental quality, and other social and physical variables. (Skogerboe-Colorado State)
W77-10171

OPTIMAL EXPANSION OF FLOOD CONTROL SYSTEMS, (FINAL REPORT: VOLUME I),
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 6F.
W77-10263

COMPUTER APPLICATIONS TO ACHIEVE OPTIMUM ECONOMIC LOADING OF GENERATING PLANTS,
Tennessee Valley Authority, Knoxville.
W. Zumwalt.
In: The Tennessee Valley Authority Experience, Proceedings of the First Conference on Case Studies of Large Scale Planning Projects, October 28-November 1, 1974. Hans Knop (Ed.), CP-76-2, Volume 1, International Institute for Applied Systems Anaylsis, Laxenburg, Austria, 1976. p 395-415. 12 fig.

Descriptors: *Computers, *Electric powerplants, Optimum development plans, Economic efficiency, Water costs, Simulation analysis, Automatic control, Forecasting, Projects, Storage.
Identifiers: *Scheduling, *Hydroplants, *Hydrothermal systems, Economic loading, Monthly load forecasts, Rule curves, Values, Data acquisition, Least cost, Hydro projects.

The optimal scheduling of generation is a complex problem for all power systems, and this complexity increases with the number of and type of generating plants. There are power systems with only thermal plants, power systems with only hydro plants, and hydro-thermal systems. Principal considerations for power systems with only thermal plants are the optimization of maintenance schedules, daily unit selections, and the continuous division of generation among plants and units so as to minimize costs. For hydro-thermal plants an additional consideration iws the optimization of the use and distribution of storage, reflecting both streamflow probabilities and the values of stored or storable water as replacement for thermal power. Generation shceduling by the TVA involves the use of several computer applications. Two of these are used directly in scheduling generation by plants, and several others are indirectly involved. The computer applications directly involved with generation scheduling are (1) monthly load forecasts; (2) basic rule curves; (3) system economy rule curves; and (4) values of project storage. Directly involved computer applications include: (1) daily preschedules of generation; and (2) economic dispatch each half hour. These are discussed herein along with programs for a new power system control center. (Bell-Cornell)
W77-10288

DEVELOPMENT OF A COMPREHENSIVE TVA WATER RESOURCE MANAGEMENT PROGRAM,
Tennessee Valley Authority, Knoxville.
W. O. Wunderlich.
In: The Tennessee Valley Authority Experience, Proceedings of the First Conference on Case Studies of Large Scale Planning Projects, October 28-Nov. 1, 1974. Hans Knop (Ed.), CP-76-2, Volume 1, International Institute for Applied Systems Analysis, Laxenburg, Austria, 1976, p 453-535. 12 fig, 12 tab, 24 ref, append.

Descriptors: *Water resources development, *Tennessee Valley Authority, *Programming, *Planning, *Reservoir operation, *Scheduling, *Optimization, *Simulation analysis, Water management(Applied), Alternative planning, Long-term planning, Multiple-purpose reservoirs, River systems, Decision making, Evaluation, Methodology, Reservoir releases, Dynamic programming, Reservoir storage, Constraints, Thermal power, Computers, Flood control, Economic efficiency, Mathematical models, Operations research.
Identifiers: Benefit maximization, Objective functions, System economy, Hydropower, Reduced gradient method, Out-of-kilter-algorithm.

Described is a comprehensive program initiated by TVA to improve the capability of presently-used planning and operation methods for the river and multiple-purpose reservoir system. Discussed are mathematical models for evaluating management alternatives for the real-time system operation. Considered first are simulation models for impact assessment for Browns Ferry Nuclear Plant showing that the cooling mode which uses available system capabilities as needed and is compatible with system constraints allows the most efficient operation. Next, methods are compared for finding optimal reservoir release scheduling when

ne objective function is maximization of annual enefits considered are: (1) linear programming, sing the out-of-kilter-algorithm; (2) discrete differential dynamic programming; (3) dynamic proramming by successive approximations (DPSA); nd (4) the reduced gradient method. The DPSA gorithm appears most promising due to its simlicity, flexibility for allowing stochastic conderations, and modest computer time requirement. Using DPSA, the development of a longange planning model for reservoir system operaons is described, and the development of a multiurpose objective function for hydropower and ood control used in conjunction with this model considered. Finally, future development plans re outlined. It is concluded that much work emains to be done in the areas of multipurpose bjectiv function develoment, especially for such reas as navigation, water quality, water supply nd recreation, and short time step scheduling, to ame a few. (Bell-Cornell)
77-10289

MATHEMATICAL MODEL FOR TRANSIENT PEN CHANNEL FLOW: A WATER ESOURCE PLANNING AND MANAGEMENT OOL,
ennessee Valley Authority, Knoxville.
or primary bibliographic entry see Field 2E.
77-10290

REGIONAL ENVIRONMENTAL QUALITY ANAGEMENT MODEL: AN ASSESSMENT,
esources for the Future, Inc., Washington, D. C.
or primary bibliographic entry see Field 5G.
77-10292

N EVALUATION OF ECONOMIC AND EMOGRAPHIC DATA USEFUL IN WATER ESOURCES PLANNING.
ureau of Economic Analysis, Washington, D.C.
egional Economic Analysis Div.
or primary bibliographic entry see Field 6B.
77-10295

HE APPLICATION OF REMOTE SENSING TO HE DEVELOPMENT AND FORMULATION F HYDROLOGIC PLANNING MODELS,
cosystems International, Inc., Gambrille, Md.
or primary bibliographic entry see Field 2E.
77-10296

IERARCHICAL ANALYSES OF WATER ESOURCES SYSTEMS, MODELING AND OPMIZATION OF LARGE-SCALE SYSTEMS,
ase Western Reserve Univ., Cleveland, Ohio.
Y. Haimes.
cGraw-Hill Series in Water Resources and Enronmental Engineering, McGraw-Hill Internaonal Book Company, New York, N.Y., 1977. 486 87 fig, 49 tab, 428 ref, 3 append. $39.50.

escriptors: *Water resources development, lanning, *Management, *Operations research, lodel studies, *Methodology, *Optimization, nd resources, Linear programming, Dynamic ogramming, Ecosystems, Projects, Scheduling, ver basins, Water supply, Water demand, Water ality control, Effluents, Taxes, Groundwater, rface waters, Costs, Benefits.
entifiers: *Hierarchical modeling, *Multilevel timization, Systems engineering, Nonlinear proamming, Newton-Raphson method, Decomposin technique, Quasilinearization, Capacity exnsion, System identification, Multiobjectives, rrogate worth trade-off method, Mixed integer ogramming.

esented is a unified, comprehensive, and inpth discussion of the hierarchical-multilevel apoach as applied to the planning, operation, and nagement of large-scale and complex water sources systems, maintaining a fine line between theory and application. Included is a panorama of systems methodologies and approaches as they apply to water resources development and related land resources, recognizing the importance of legal, institutional, societal and political aspects. Presented are the results of much recent research and many applications to large-scale water resource systems. The book is divided into two parts. Part One considers the fundamentals of systems engineering, providing the reader with most of the mathematical background needed for understanding Part Two, the modeling and optimization of complex water resources systems. Part One discusses in detail numerous optimization techniques, including the Newton-Raphson method and linear and dynamic programming. Part Two considers: (1) modeling and system identification; (2) quasilinearization and ecosystem modeling; (3) project scheduling and capacity expansion; (4) a decomposition approach for optimal scheduling and capacity expansion; (5) multiobjectives in water resources systems; (6) hierarchical modeling; (7) multiobjective analysis in the Maumee River Basin (level-B planning); (8) coordination of supply and demand planning models; (9) hierarchical structures with effluent charges for water quality control; (10) applications of hierarchical modeling to conjunctive management of ground and surface water; and (11) a tax-quota system for the planning and management of groundwater. (Bell-Cornell)
W77-10418

APPLICATION OF MATHEMATICAL MODELS IN HYDROLOGY AND WATER RESOURCES SYSTEMS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2A.
W77-10419

STOCHASTIC APPROACHES TO WATER RESOURCES, VOLUMES I AND II,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Lecture notes from: The Institute on Application of Stochastic Methods to Water Resources Problems, Colorado State University Fort Collins, June 30-July 11, 1975. H. W. Shen, P.O. Box 606, Fort Collins, Col., 1976. Vol. I - 519 p, 192 fig, 32 tab, 331 ref. Vol. II - 522 p, 175 fig, 26 tab, 435 ref. H. W. Shen, editor and publisher.

Descriptors: *Water resources, *Stochastic processes, *Hydrology, *Simulation analysis, *Mathematical models, Data collections, Risks, Reservoir operation, Planning, Optimization, Decision making, Statistical methods, Design, Networks, Equations, Water policy, Precipitation, Floods, Droughts, Stormwater, Management, Groundwater, Surface waters, Watersheds(Basins), Sediment yield, Mass transfer, Channels, Systems analysis.
Identifiers: Uncertainty, Stream geometry, Velocity distribution.

This collection of articles comprises two separate volumes and is based upon the lecture notes delivered at the Institute on Application of Stochastic Methods to Water Resources Problems, the Colorado State University, June 30-July 11, 1975. The purpose of the books is to describe current knowledge on the application of stochastic methods to various water resource problems, presenting a reasonably comprehensive collection of information in this field. The volumes can be used as reference books or textbooks. The chapters themselves are interrelated yet can stand individually. Among the topics covered in Volume 1 (Chapters 1-13) are: hydrologic time processes; water use time series; data collection, analysis and instrumentation; long-range changes; risk and uncertainty; optimization and uncertainty; water resources planning; statistical decision theory; parameter regionalization and network design; and worth of data. Volume 2 (Chapters 14-28) considers: statistical theory of extreme values; floods and droughts; reservoir planning and operation; reservoir design; urban stormwater management; groundwater systems; watershed sediment yield; simulation of velocity distribution and mass transfer; stream geometry; alluvial channel bedforms; incipient grain motion on riverbeds; and sediment transport. (See W77-10440 thru W77-10443) (Bell-Cornell)
W77-10439

6B. Evaluation Process

THE SACRAMENTO-SAN JOAQUIN DELTA AND THE EVOLUTION AND IMPLEMENTATION OF WATER POLICY: AN HISTORICAL PERSPECTIVE,
California Univ., Davis. Dept. of History.
For primary bibliographic entry see Field 6E.
W77-10101

IMPROVED LOCAL PLANNING FOR RESERVOIR-ORIENTED RECREATION OPPORTUNITIES,
Illinois Univ. at Urban-Champaign. Dept. of Forestry.
J. F. Dwyer, and R. D. Espeseth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 470, Price codes: A08 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 123, June 1977. 142 p, 10 fig, 23 tab, 85 ref. S-053-ILL.

Descriptors: *Recreation, *Reservoirs, *Planning, *Local governments, *Illinois, *Economic impact, *Social impact, Costs, Forecasting, Coordination, Governmental interrelations, Post-impoundment, Attitudes.
Identifiers: *Lake Shelbyville(Ill).

Water-based recreation is becoming an increasingly important aspect of water-resources management. However, there is a great deal of uncertainty about its local socio-economic impact. This uncertainty has played a key role in debates over the construction of reservoirs in Illinois. While much attention has been given to predicting expected impacts of reservoirs, there has been little investigation of the actual impacts, and very little attention has been given to evaluating the effectiveness of various approaches to dealing with those local impacts that do indeed result from water-resources-management projects. This study looks at the actual recreation-induced local impacts of Lake Shelbyville, a multipurpose reservoir constructed by the U.S. Army Corps of Engineers in central Illinois. The reservoir began filling in 1969 and is a major recreation attraction (three million visitor days annually) in a predominately agricultural region. The study is exploratory. It identifies significant impacts and suggests how these impacts may be predicted and dealt with. Significant attention is given to impacts on local government costs and revenues as well as needed intergovernmental cooperation. Local impacts were significantly different from what was expected; local residents and recreationists using the lake could benefit from improvements in local planning and intergovernmental cooperation.
W77-10102

PROCEEDINGS: MINNESOTA'S WATER RESOURCES IN THE YEAR 2000, A CONFERENCE ON PLANNING AND MANAGEMENT.
Minnesota Univ., Minneapolis. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 670, Price codes: A04 in paper copy, A01 in microfiche. Proceedings held at Spring Hill Center, Wayzata, Minnesota, March 1-2, 1977. Water Resources Research Center, Bulletin 92, April, 1977. 68 p. OWRT A-999-MINN(45).

Descriptors: *Minnesota, *Planning, *Future planning(Projected), *Conferences, *Management, Water resources development, Water quality, Water supply, Navigation, Agriculture, Insustries, Electric generation, Recreation, *Projections.

This is the proceedings of a Conference on Minnesota's Water Resources in the year 2000. Topics include: planning and management; agriculture; electric generation; recreation and tourism; navigation; and waste disposal and water supply. (Waelti-Minnesota)
W77-10177

FORECASTING: THE CHALLENGE TO THE AQUATIC SCIENCES,
Michigan Univ., Ann Arbor. Dept. of Natural Resources; and Michigan Univ., Ann Arbor. Dept. of Zoology.
K. F. Lagler.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1, p 1-6, 1976. 5 fig, 1 tab, 19 ref.

Descriptors: *Forecasting, Limnology, Rheology, Fisheries, Rivers, River basins, Land use, Navigation, Flood control, Power generation, Water consumption, Waste disposal, Exploitation, Natural resources, Public health, Recreation, Model studies, *Water utilization, *Aquatic life.
Identifiers: South Africa.

The over-riding modern and near-future challenge in the aquatic sciences is to forecast the effects of continuing and proposed new water uses, arising from the accelerated inland water resource development caused by population growth, urbanization, industrialization, and intensification of agriculture. No serious scientist in this field can avoid responsibility for prediction; or delay entering the arena of environmental advocacy. Human uses and influences on rivers are arranged in major categories, with examples of problems encountered in comprehensive water resources planning. (So. African Water Info. Center)
W77-10190

DEVELOPMENT OF A COMPREHENSIVE TVA WATER RESOURCE MANAGEMENT PROGRAM,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 6A.
W77-10289

A REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT MODEL: AN ASSESSMENT,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-10292

AN EVALUATION OF ECONOMIC AND DEMOGRAPHIC DATA USEFUL IN WATER RESOURCES PLANNING.
Bureau of Economic Analysis, Washington, D.C. Regional Economic Analysis Div.
IWR Pamphlet No. 3, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, April 1975. 18 tab, 5 ref, append.

Descriptors: *Water resources, *Planning, Evaluation, Forecasting, Data collections, *Alternative planning, *Alternative water use.
Identifiers: *Socio-economic data, Data sources, Regional impact assessment, OBERS projections.

In its efforts to plan and evaluate alternative ways of conserving and developing water resources, the U.S. Army Corps of Engineers requires a wide spectrum of information. The Corps is required to incorporate environmental, social, and regional economic effects into a planning process that previously had been dominated by benefit-cost ratios and considerations of national economic gains. The development, accession, and appropriate use of such diverse kinds of data have placed greater burdens on available planning resources. This report is a reference manual which describes the kinds of socio-economic data available from the Department of Commerce, particularly at the Bureau of Economic Analysis, which may be useful for meeting the requirements under different planning tasks. It includes selected data samples and data sources, and it discusses several data problems such as the use of OBERS projects, data integration, and data for normative forecasting. (Bell-Cornell)
W77-10295

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED STATES.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10357

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED KINGDOM.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10358

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN FINLAND.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10359

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN JAPAN.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10360

WATER RIGHTS, CONSERVATION AND RECREATION PLANNING,
Illinois Dept. of Conservation, Springfield.
For primary bibliographic entry see Field 6E.
W77-10445

FLORIDA'S LAND USE RESTRICTIONS: ARE THEY SERVING THE PUBLIC INTEREST,
For primary bibliographic entry see Field 6E.
W77-10465

COST-EFFECTIVE COMPARISON OF LAND APPLICATION AND ADVANCED WASTE WATER TREATMENT,
Environmental Protection Agency, Washington, D.C. Office of Water Programs Operations.
For primary bibliographic entry see Field 5D.
W77-10535

MANAGEMENT ALTERNATIVES FOR LAND TREATMENT SYSTEMS,
Culp/Wesner/Culp-Clean Water Consultants, El Dorado Hills, Calif.
For primary bibliographic entry see Field 5G.
W77-10637

RETHINKING OUR APPROACH TO WATER SUPPLY PROVISION,
London School of Economics and Political Science (England).
J. A. Rees.
Geography, Vol. 61, No. 273 Part 4, p 232-245, 1976. 7 fig, 2 tab, 24 ref.

Descriptors: *Water supply, *Decision making, *Investment, *Water conservation, *Water management(Applied), Water demand, Water reuse, Water allocation(Policy), Water loss, Cost benefit analysis, Droughts, Planning, Impaired water use, Leakage, Reclaimed water, Pricing, Social aspects, Rural sociology.
Identifiers: United Kingdom.

The customary practice of building more storage reservoirs and overcompensating for projected demands as an answer for droughts and increased usage is questioned in view of the high investment required and the losses of lands with agricultural recreational and other development potentials. Storage reservoirs also raise additional problems such as dislocation of small rural communities, adverse ecological and/or aesthetic effects, public opposition involving legal action, and the discouragement of technological innovations for alternative water sources. As a substitute to capacity expansion, costs/benefits of water conservation alternatives are discussed. These include reducing leakage lossses in distribution systems, dual water quality supply systems for new towns, urban renewal areas and new housing on the urban fringe, and where industrial users are clustered. Also evaluated is the supply of reclaimed sewage effluent to provide large incustries with process water thus postponing the need for new capital investment. Managing water demand--as differentiated from water requirements--by unit pricing, as opposed to the current British practice of unmetered domestic water, is another conservation alternative evaluated on the basis of the long-run marginal cost of water supply, including capital costs vs. short-run marginal cost of supplying water, and incorporating the treatment and pumping cost variables. (Auen-Wisconsin)
W77-10746

A GROWTH AND DEVELOPMENT MODEL FOR WATER RESOURCE POLICY,
Florida Atlantic Univ., Boca Raton.
R. D. Thomas, and K. G. Baker.
Social Science Quarterly, Vol. 57, No. 2, p 447-454, 1976. 4 ref.

Descriptors: *Decision making, *Water policy, *Priorities, *Attitudes, Local government, *Florida, Land development, Urbanization, Industries, Pollution abatement, Water resources development, Surveys.
Identifiers: *Economic growth, Housing development, *Public opinion surveys.

How public officials' priorities regarding water resources policy and water pollution problems reflect economic growth and development and how their altitudes are a function of water problem severity was examined by developmental scale to cross-sectional data derived from a questionnaire survey of Florida county commissioners. The purpose of the questionnaire was to ascertain the relative severity of water problems to one another rather than as a class thus the respondents were to indicate the severity of problems involved in water supply for agriculture, domestic purposes, industry, recreation, fish and wildlife, salinity control; pollution from domestic sewage, industrial and agricultural waste; flooding, drainage, beach erosion; and salt water intrusion. County commissioners attitudes were scaled on the problems of water supply and drainage (generally thought to be associated with progress affecting growth and development and sewage treatment and water pollution (generally considered to be the results of growth). The data suggest that commissioners become progressively

decisive about severity of water problems as owth intensifies. Relatively more commissioners om high than low growth counties increasingly rceived all types of water problems as equally vere. The scale suggests that there is substanlly more concern among Florida county comissioners about water problems resulting from owth and development as opposed to water oblems designed to induce growth. (Auenisconsin)
77-10747

N ECONOMIC ANALYSIS OF IRRIGATED ARMING WITH DIMINISHING GROUND ATER RESERVES,
ashington Univ., St. Louis, Mo. Center for the ology of Natural Systems.
r primary bibliographic entry see Field 4B.
77-10748

C. Cost Allocation, Cost Sharing, Pricing/Repayment

PTIMAL DESIGN OF MECHANICAL AERAON SYSTEMS FOR THERMALLY AND ORANICALLY POLLUTED STREAMS,
elbourne Univ., Parkville (Australia). Dept. of emical Engineering.
r primary bibliographic entry see Field 5G.
77-10293

FLUENCE OF METERING, PRICING POLIES AND INCENTIVES ON WATER USE EFFIENCY,
w South Wales Univ., Kensington (Australia). hool of Economics.
R. Gallagher, and R. W. Robinson.
stralian Water Resources Council Technical per No. 19, 1977. 138 p, 48 tab, 28 fig, append.

scriptors: *Water supply, *Water demand, ricing, *Water allocation(Policy), *Australia, ter rates, Water policy, *Water utilization, rketing, Cities, Public utilities, Water requirents.

thorities concerned with water supply manageent have the responsibility of ensuring not only t an adequate quantity and quality of water is plied, but also that the supplies are efficiently d. The conventional Australian approach to er supply and distribution based on extrapola of past consumption trends and a rating tem which encourages all users to consume at st a minimum amount regardless of need, may l to the construction of needlessly large water ply systems. An investigation is reported which ceeded on the hypothesis that water price, ough the water demand function, could be used n effective policy tool to achieve efficient con of water supply and use. Urban water use ds, water supply costs and pricing policies in tralia are reviewed; results of surveys of water sumption in two New South Wales sample s, and the effects of metering on water use, presented; with a literature review of factors rmining water demand. It is concluded that the ent state of affairs is a reflection of the statu obligations of the water authorities, and that e should be altered to allow more attention to and control in encouraging water use efficien(CSIRO)
7-10374

N IRRIGATION WITH MUNICIPAL WASTE TER CONSERVE ENERGY,
fornia Univ., Davis. Dept. of Land, Air, and er Resources.
primary bibliographic entry see Field 5E.
-10579

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: TEXTILES INDUSTRY,
Little (Arthur D.), Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W77-10749

6D. Water Demand

RURAL DOMESTIC WATER SYSTEM PEAK FLOWS AND DESIGN INNOVATIONS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 8B.
W77-10176

FORECASTING: THE CHALLENGE TO THE AQUATIC SCIENCES,
Michigan Univ., Ann Arbor. Dept. of Natural Resources; and Michigan Univ., Ann Arbor. Dept. of Zoology.
For primary bibliographic entry see Field 6B.
W77-10190

INFLUENCE OF METERING, PRICING POLICIES AND INCENTIVES ON WATER USE EFFICIENCY,
New South Wales Univ., Kensington (Australia). School of Economics.
For primary bibliographic entry see Field 6C.
W77-10374

EFFICIENCY IN INDUSTRIAL, MUNICIPAL AND DOMESTIC WATER USE,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
D. P. Heeps.
Australian Water Resources Council Technical Paper No. 20, 1977. 113 p, 24 fig, 33 tab, 49 ref, 3 append.

Descriptors: *Water utilization, *Cities, *Domestic water, *Australia, Water demand, Water requirements, Water loss, Water reuse, Suburban areas, Industrial water, Municipal water.
Identifiers: *Melbourne(Vic).

Efficiency in water use represents an alternative to developing more costly and remote sources of water supply. A study was undertaken to perform a preliminary investigation of Australian urban water use efficiency, using data collected from eight residential test areas in Melbourne. Major findings were: that unaccounted-for water loss in the system was of the order of 16 per cent., that savings could be effected by discouraging overwatering of gardens and the design and use of domestic appliances with excessive water use; that current water rate levels make the utilization of rainwater storage tanks by householders uneconomic; and that potential currently exists for greater reuse of industrial and municipal effluents for non-potable purposes. A principal recommendation is that continuous monitoring of water use should be started in selected areas to provide long term data for future investigations. (CSIRO)
W77-10375

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, PART 4. NORTHERN COASTAL PLAIN,
Geological Survey, Raleigh, N.C. Water Resources Div.
T. M. Robison.
North Carolina Department of Natural and Economic Resources report, January 1977. 218 p, 5 fig, 11 ref.

Descriptors: *Water supply, *Water quality, *Surface waters, *Groundwater, *North Carolina, Water resources, Water utilization, Water treatment, Water works, Available water, Water yield, Chemical analysis, Water analysis, Sites, Maps.

This report on the water resources and the larger public water supplies in 23 counties in the northern Coastal Plain Section of North Carolina is divided into two sections. The first describes the method of investigation, an explanation of the information reported for each water supply and its significance to planning, a discussion of the chemical analyses, and a discussion of some of the problems noted during the investigation. The second includes a water-resources appraisal and a map of each county showing the general area served by public water supplies and an inventory of each public supply in the county with 500 or more customers that gives: (1) the population served, (2) the adjacent communities served, (3) the number of customers, (4) the source of water, (5) estimated allowable draft, (6) total and industrial water use, (7) raw- and finished-water storage, (8) raw- and finished-water pumping capacity, (9) future plans, (10) a water-resources appraisal in the immediate vicinity of the supply and, (11) the results of chemical analyses of raw and finished water. (Woodard-USGS)
W77-10561

ALBUQUERQUE CLOSES WATER-WASTE-WATER CYCLE.
For primary bibliographic entry see Field 5D.
W77-10633

RETHINKING OUR APPROACH TO WATER SUPPLY PROVISION,
London School of Economics and Political Science (England).
For primary bibliographic entry see Field 6B.
W77-10746

6E. Water Law and Institutions

THE SACRAMENTO-SAN JOAQUIN DELTA AND THE EVOLUTION AND IMPLEMENTATION OF WATER POLICY: AN HISTORICAL PERSPECTIVE,
California Univ., Davis. Dept. of History.
W. T. Jackson, and A. M. Paterson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 469, Price codes: A10 in paper copy, A01 in microfiche. California Water Resources Center, Contribution No. 163, June 1977. Technical Completion Report, 192 p. (California Water Resources Center Project UCAL-WRC-W-501).

Descriptors: *History, *Water policy, *Project planning, *Project post-evaluation, Federal Project Policy, *Saline water intrusion, *California.
Identifiers: *Sacramento-San Joaquin Delta(Calif).

An historical review is presented of the attempts to control the encroachment of salinity from San Francisco Bay into the Delta of the Sacramento and San Joaquin rivers from 1920 to the present. Two basic solutions to the problem were: the physical separation of salt water from fresh water by means of a barrier at some point downstream from the Delta, or the release of sufficient water from upstream storage reservoirs to drive back tidal salinity. Water policy in the Delta has always been intimately linked with plans for the control and redistribution of northern California's water supply, particularly the Central Valley Project and State Water Project. Contrary to the protestations of Delta water users and more recently the State of California, the U.S. Bureau of Reclamation has no historical obligation to control salinity beyond the immediate requirements of Central Valley Project operation. Until the 1960's, the political voice of the Delta, a predominately agricultural area, was primarily that of Contra Costa County commercial and industrial interests. Only recently have agricultural water users played a significant role in determining Delta water policy. In the late 1960's, environmental considerations involving the use of

water for fish and wildlife protection became increasingly significant determinants of water policy in the Delta. (Snyder-California, Davis)
W77-10101

IMPROVED LOCAL PLANNING FOR RESERVOIR-ORIENTED RECREATION OPPORTUNITIES,
Illinois Univ. at Urban-Champaign. Dept. of Forestry.
For primary bibliographic entry see Field 6B.
W77-10102

PROCEEDINGS: WORKSHOP ON NON-POINT SOURCES OF WATER POLLUTION.
Illinois Univ. at Urbana-Champaign. Coll. of Agriculture; and Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5G.
W77-10159

IMPACT OF LEGAL CONSTRAINTS ON GROUND-WATER RESOURCE DEVELOPMENT IN IDAHO,
Idaho Univ., Moscow. Dept. of Civil Engineering.
D. R. Ralston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 610, Price codes: A07 in paper copy, A01 in microfiche.
Ph.D. Thesis, September 1974. 131 p, 21 fig, 1 tab, 35 ref. OWRT B-019-IDA(4) and B-031-IDA(3). 14-31-001-3578 and 4076.

Descriptors: *Groundwater, Planning, Legal aspects, Economics, *Idaho, Pumping, Natural recharge, Management, Model studies, *Administration.
Identifiers: *Raft River Valley(Idaho), *Legal constraints, Pumping lift.

Groundwater management in Idaho is based on the appropriation doctrine of water law. An analysis is presented of possible administrative actions utilizing a mathematical model of a selected water resource system. According to the Idaho Code, groundwater administration is outlined by (1) selection of the management tool, (2) definition of the concept, (3) selection of the size of the administrative units and the length of the administrative period, (4) selection of the reasonable pumping lift or recharge value or values for each administrative area and (5) application of the selected value to junior users within the administrative area. Operation of a mathematical model of the water resource system in the Raft River Basin indicated that senior users at the pumping levels benefited little from closure of juniors under any management schemes. It was concluded that effective groundwater management might occur in Idaho through administrative definitions involving the concepts of reasonable groundwater pumping levels and reasonably anticipated average rate of future natural recharge. (See also W75-02981)
W77-10173

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED STATES.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
1976. 127 p, 17 fig, 27 tab, 15 ref.

Descriptors: *Water management(Applied), *Administration, *Legislation, *Regulation, *Water policy, Water pollution control, Water quality standards, Project planning, Water resources, Financing, Industrial wastes, Municipal wastes, Sewage treatment, *United States.

Water management in the United States is handled by hundreds of organizations. No defined form, channel of communication, or co-ordination has been established. Federal participation has resulted from various legislative imperatives such as the Water Resources Planning Act of 1965, the Clean Waters Restoration Act of 1966, the 1961 Federal Water Pollution control Acts, and the 1972 Federal Water Pollution Control Act Amendments. This legislation has established institutions such as the Water Resources Council and the state-federal River Basin Commissions. In other instances, federal agencies have been given control or influence orver water quality standards, pollution control, and waste treatment facilities. Among these agencies are the EPA, Army Corps of Engineers, and the Bureau of Reclamation. The states have their own version of several of these federal laws and agencies. Interstate regional commissions or agencies also play an important part in the planning process. Federal standards have been used as guidelines for the establishment of state standards. Since most water projects require partial or total federal funding, there is an economic impetus for state and local authorities, as well as industrial establishments, to comply with federal guidelines or standards. Industrial compliance can be controlled by fines for polluters. On an international level, the United States participates in joint commissions with Canada and Mexico. (Collins-FIRL)
W77-10357

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED KINGDOM.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
1976. 41 p, 3 fig, 3 tab, 16 ref.

Descriptors: *Water management(Applied), *Administration, *Legislation, *Regulation, *Water policy, Water pollution control, Financing, Water rates, Water quality standards, Water resources, Industrial wastes, Municipal wastes, Sewage treatment.
Identifiers: *United Kingdom.

Water management in England, Wales, and Scotland is reviewed. Scottish organization and practices often vary from those of England and Wales. The English and Welsh system was reorganized in 1974 to condolidate administrative and control practices. Nine English Water Authorities and the Welsh National Water Authority were formed. These agencies have separate divisions responsible for water resources conservation and development, sewerage, sewage disposal, and pollution control. Other structures of this program include the Water Research Centre, National Water Council, Water Space Amenity Commission, Central Water Planning Unit, and Water Data Unit. Scotland has developed nine regional and three island water councils. Seven river purification boards handle water pollution matters. Abstraction of surface or ground water in England and Wales is licensed, but there is no such provision under the Scottish system. English and Welsh financing results from water charges levied on licensed abstractors; payments from municipal, individual, and industrial sewer usage; and government supports. Scottish operations are funded from government grants, metered supplies, and domestic or industrial water rate charges. Nearly 100% of the total population is supplied with piped water and about 80% of English and Welsh populations are connected to public sewer systems. Data are supplied on the progress of the application of water and waste effluent standards. (Collins-FIRL)
W77-10358

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN FINLAND.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
1976. 34 p, 3 append.

Descriptors: *Water management(Applied), *Administration, *Legislation, *Regulation, *Water policy, Water pollution control, Financing, Project planning, Water resources, Industrial wastes, Municipal wastes.
Identifiers: *Finland.

An overview of the Finnish water management program is presented. The system has been based on a regulatory approach. The 1961 Water Act applies to all water functions except ownership. The administrative network is composed of the National Water Board, the Water Court, thirteen Water Districts, and three hundred Municipal Water Boards. A licensing program governs water discharge and withdrawal. The Water Court, the only source of licenses, is the technical inspection branch of the management program. Its main purpose is the integration of water management by different functions. It also encompasses water protection, water main and sewerage expansion, expansion of recreational water uses, and water and water use supervision. Water districts have the responsibility of inspecting and measuring waterway flow rates and quality, inspecting local communities, and offering planning assistance. Municipal Water Boards, independent of national authorities, are empowered to grant licenses for small local operations and to settle simple disputes. Several sources are available for financing water management programs. Loans from the state Post Office Savings' Bank are provided for water supply and sewer systems. Water pollution control subsidies have been set aside for community assistance. The state also operates several water pollution facilities of its own. Investment loans available from the state can be applied to industrial programs. Municipalities have been able to collect sewer connection and operation charges since 1974. Their effects have not been evaluated. (Collins-FIRL)
W77-10359

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN JAPAN.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
1976. 49 p, 26 append.

Descriptors: *Water management(Applied), *Administration, *Legislation, *Water pollution control, Water policy, Water supply development, Industrial wastes, Municipal wastes, Project planning, Water resources, Waste water treatment, Financing.
Identifiers: *Japan.

This report deals with Japanese water management programs. No comprehensive system of water management has been developed in Japan. The nation's water management efforts have resulted from the requirements of various water supply, water pollution control, and waste treatment laws and from the regulation of surface water usage. Such laws include the River Law, the Water Pollution Law, and the Sewerage Law. Many laws regarding industrial regulation have also been influential. Institutional structures for these programs are bi-level. Prefectural Governors are empowered to determine prefectural standards for effluent and area environmental quality and control water areas under their jurisdiction. Physical data on Japanese water resources and the economics of financing management programs are reviewed. (Collins-FIRL)
W77-10360

A NEW CODE FOR REDUCING STREAM S TATION,
Environment Protection Authority, Melbou (Australia).
For primary bibliographic entry see Field 4D.
W77-10369

/ARIATIONS IN EFFLUENT QUALITY AND HE IMPLICATIONS FOR SETTING EF-LUENT STANDARDS,
lew South Wales Univ., Kensington (Australia). chool of Civil Engineering.
or primary bibliographic entry see Field 5G.
/77-10371

/ATER RIGHTS, CONSERVATION AND ECREATION PLANNING,
linois Dept. of Conservation, Springfield.
. L. Erickson, D. L. Groves, and H. Kahalas.
ong Range Planning, Vol 8, p 75-79, February 975.

escriptors: *Illinois, *Land use, *Public access, Riparian rights, *Recreation, Precriptive rights, ccess routes, Water law, Ownership of beds, avigable waters, Water rights, Riparian waters, iparian land, Streambeds, Non-navigable waters, ublic rights, Water pollution, Silting, Sewage, aste water(Pollution).
entifiers: *Water rights(Non-riparians), *Water source management.

he orderly development of land resources quires a coordinated effort among national, ate, and local land use planning activities. anning thus far has been generally fragmentary nature and has lacked the interrelationship of parate elements into a total system. The states ssess ultimate land use control authority but ve failed to exercise it effectively. This paper plores the feasibility of adopting land use poli-s in Illinois. The water resources goals of the Il-ois Department of Conservation are twofold: (1) preserve, restore, and enhance the ecological d aesthetic values of lakes, rivers, and streams Illinois, and (2) to provide quality water-related tdoor recreation opportunities without undue gradation of ecological and aesthetic values. ater rights in Illinois are determined by four sic legal concepts: (1) riparian ownership of the d; (2) navigability of streams and rivers; (3) andered lakes; and (4) prescriptive rights. The errelationship of these concepts determines blic access rights for recreation in waterbodies. source use constraints caused by municipal and ustrial pollution are discussed. Alternative utions to the public access problem are sented and evaluated. These include: (1) revi-n of riparian land; (2) expansion of the criteria determining 'navigable waters' to include reation watercraft; and (3) purchase of water hts. (Quarles-Florida)
7-10445

E PUSH TO EASE WATER RULES.
iness Week, p 69, 72, March 21, 1977.

scriptors: Federal Water Pollution Control Act, dustrial wastes, *Municipal wastes, gulation, *Construction costs, Administrative ncies, Government finance, Standards, Water ution, Legislation, Legal aspects, Water law, nning, Water policy, Water pollution control, nomics, Financing, Costs, Sewage treatment, ustries.
ntifiers: *Congressional hearings, *Federal er Pollution Control Act Amendments of 1972, uent guidelines, Environmental policy, Ad-strative regulations.

plying with the 1977 deadline of the Federal er Pollution Control Act of 1972 is creating blems for both industry and municipalities. Ac-ing to industry spokesmen, the majority of the and twenty percent of the electric utility in-ry will be in violation of the law when the July 77 deadline arrives. Industry's big hope is that n get the 1977 deadline postponed to 1982, a tacit agreement to drop 1983 standards en-. Municipal sanitation and sewage depart-s are facing similar problems. Red tape and g costs have depleted Environmental Protec-Agency funds in most states, leaving clean up projects stranded. The cities have responded by pleading with Congress for more funds. The cities claim that more funds not only will help clean up the environment, but will provide more jobs. At present, it is unlikely that Congress will be sympathetic to the problems of industry. Municipalities, on the other hand, may fare better. High unemployment, growing municipal fiscal problems, and the worsening drought in the West have all served to predispose Congress to attend quickly to municipal concerns. (Stadler-Florida)
W77-10446

CHICAGO CLEANUP: INDUSTRY OUTDOES THE CITY.
Business Week, p 71, 74, July 12, 1976.

Descriptors: *Rainfall-runoff relationships, *Interceptor sewers, *Water pollution sources, *Sewage effluents, Municipal wastes, Industrial wastes, Water pollution, Pollutants, Waste water(Pollution), Wastes, Water quality, Water treatment, Water pollution control, Industrial plants, Industries, Reservoirs, Waste water treatment, Overflow, Effluents, Sewage.
Identifiers: Environmental policy, *Calumet River(Ill), Effluent guidelines.

The city of Chicago in an attempt to clean up the Calumet River has forced industry along the river to comply with Illinois' effluent discharge standards. In response to legal actions brought by the city sanitation department, the four major steel mills have invested over one hundred million dollars in advanced waste water treatment systems. This investment has significantly reduced the amount of pollution flowing into the Calumet River. The river, however, is far from clean. The major source of pollution now is raw sewage dumped by the city sanitation system. This dumping is caused by overtaxed sewers coupled with overflow problems. During periods of moderately heavy rainfall, interceptor pipes are designed to siphon off sewage before it reaches the river overflow. To solve this problem, the city is seeking federal and state aid to build a deep tunnel system which would serve as an underground reservoir. This reservoir would catch and hold sewage overflow until it can be pumped back to the original interceptor sewers. Environmental Protection Agency officials predict that the system will cost between 4.5 and 5 billion dollars. Presently, neither the city nor the federal government is willing to make the investment. (Stadler-Florida)
W77-10447

LAW OF SEA: NEW AND LASTING THEORIES, CONCEPTS PRODUCED IN LAST EIGHT YEARS,
Law of the Sea Conference, New York.
B. Zuleta.
United Nations Monthly Chronicle, Vol 12, p 48-51, July-December, 1975.

Descriptors: *United Nations, *Conferences, *Law of the sea, *Ownership of beds, Oceans, Legal aspects, Water law, International commissions, International law, International waters, Continental shelf, International Bound and Water Comm, Organizations, Foreign countries, Governments.
Identifiers: *Law of the Sea Conference, *International agreements, *Marine resources, Marine ecosystem, Marine environment, Navigability, Outer continental shelf, Territorial seas(Jurisdiction), Territorial waters, Water rights(Non-riparians), Seabed mining.

The process by which the Third United Nations Conference on the Law of the Sea arrived at new and lasting legal theories regarding the uses of the oceans is summarized. The process began in 1967 with the realization by the General Assembly that existing theories were inadequate and outdated. The Third Conference consisted of three sessions, one each in New York, Caracas, and Geneva. The Conference resulted in a single, informal negotiating text containing 324 draft articles covering, inter alia; basic conditions of exploration and exploitation (of the international area); establishment of the International Sea-Bed Authority; territorial sea and contiguous zone; straits used for international navigation; exclusive economic zone; continental shelf; high seas; rules pertaining to land-locked states; archipelagos; regime of islands; enclosed and semi-enclosed seas; rules pertaining to territories under occupation or colonial domination; protection and preservation of the marine environment, marine scientific research; development and transfer of technology. THe text represents a significant advancement in the process of making the law of the sea, and by far exceeds the expectations of the participants. (Brightman-Florida)
W77-10448

CONFERENCE ON LAW OF SEA WILL SEEK TO REACH ACCORD ON HOST OF COMPLEX ISSUES.
United Nations Monthly Chronicle, Vol 12, p 57-61, January--June, 1975.

Descriptors: *Law of the sea, *United Nations, *International waters, Foreign waters, Foreign trade, International law, Navigation, Oceans, Commercial fishing, Fish, Conservation, Continental shelf, Exploration, Exploitation, Mineralogy, Manganese, Legal aspects.
Identifiers: *Law of the Sea Conference, *Territorial seas(Jurisdiction), International agreements, Seabed mining.

The Third United Nations Conference on the Law of the Sea held its second session in Caracas in an attempt to settle questions of the breadth of the territorial sea and fishing limits. The Conference worked under the concept that exploration and exploitation of the sea's resources should be undertaken for the benefit of all mankind. Areas of study were divided among three major committees. The first attempted to diagram an international authority over sea exploration and exploitation. The second committee dealing with territorial jurisdiction appeared to reach a compromise on a twelve mile territorial sea and an exclusive economic zone up to a maximum distance of 200 miles. The third group was concerned about the obligations of States to protect the marine environment from pollution. The President of the Conference stated that a choice must be made between an international sea-bed authority with comprehensive powers and an authority restricted to regulation and exploitation of the sea-bed resources. (Quarles-Florida)
W77-10449

PUBLIC LAW ALLOWS MITIGATION OF SHORE EROSION DAMAGE BY CORPS OF ENGINEERS,
Office of the Chief of Engineers (Army), Washington, D.C. Construction Operations Div.
F. Linney.
Shore and Beach, Vol 44, No 3, p 5, 7, October 1976.

Descriptors: *Coastal engineering, *Beach erosion, *Shore protection, *Rivers and Harbors Act, Damages, Legislation, Federal jurisdiction, Constitutional law, Shores, Ocean currents, Littoral drift, Coastal structures, Accelerated erosion, Projects, Erosion, Erosion control, Navigable waters, Great Lakes, Harbors.
Identifiers: *Environmental impact statement, *Coastal waters, Environmental policy, Liability.

U. S. Army Corps of Engineers studies have confirmed that federal navigation works significantly alter the littoral currents actively flowing along the shorelines of the oceans and the Great Lakes. This alteration results in acceleration erosion of the shore and beach areas adjacent to these navigation works. Even though the federal government is not

constitutionally liable for erosion damages, the Rivers and Harbors Act of 1968 authorizes the Corps to take measures to mitigate such erosion. The initial cost of projects under this Act can not exceed $1,000,000 unless specific authorization is obtained from Congress. A state or private party can allege damages by filing a report with the Corps. Such reports have to show federal responsibility for damage, the area affected, and the amount of beach erosion attributable to federal navigation works. After Corps review of the complaint, a detailed study of the most practical and economic means for correcting the damage is undertaken. Upon receipt of administrative approval, an environmental impact statement is filed and funds are appropriated. Construction can then begin. At present the Great Lakes region has received the most attention from the Corps. (Cocheu-Florida)
W77-10450

FLOODPLAIN ZONING--AN ALTERNATIVE APPROACH TO LAND REGULATION IN FLOOD HAZARD AREAS,
For primary bibliographic entry see Field 6F.
W77-10451

THE EFFLUENT LIMITATIONS CONTROVERSY: WILL CARELESS DRAFTMANSHIP FOIL THE OBJECTIVE OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
National Wildlife Federation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-10452

THE MCCARREN AMENDMENT AND INDIAN TRIBES' RESERVED WATER RIGHTS,
E. McCallister.
American Indian Law Review, Vol 4, p 303-10, Winter 1976.

Descriptors: *Water rights, *Indian reservations, *Reservation doctrine, *Federal-state water rights conflicts, Federal jurisdiction, Legal aspects, State jurisdiction, Judicial decisions, Water allocation(Policy), Colorado, Water districts, Priorities, Legal review, Water law, Adjudication procedure, Legislation, Water requirements.
Identifiers: *Sovereign immunity.

Two 1976 Supreme Court decisions--Colorado River Water Conservation District v. United States and Akin v. United States--hold that state courts have jurisdiction over reserved water rights for Indian tribes. Past doctrine had held that sovereign immunity protected the United States, as trustee for the Indians' rights, from suits to determine any of its water rights. This note examines the McCarren Amendment and other case law that played a part in the landmark decisions. It also explores the possible adverse effects that these decisions may have on the adjudication of Indian tribes' reserved water rights, in view of a tradition of controversy between state officials and Indians over such rights. The state courts will have to consider federal and state law in the allocation, through quantification, of the Indians' reserved water rights. The author concludes that state courts should be granted jurisdiction only if they will use the criteria for quantification established in the case law (cited in the article) which provide for the allocation to be irreducible but allow increase where warranted by future variations in need. (Jones-Florida)
W77-10453

THE SUPREME COURT INTERPRETS THE ROLE OF THE ENVIRONMENTAL PROTECTION AGENCY IN REGULATING RADIOACTIVE MATERIALS,
K. M. Rhoades.
Washburn Law Journal, Vol 16, No 2, p 516-22, Winter 1977.

Descriptors: Federal Water Pollution Control Act, *Pollution abatement, *Radioactive waste disposal, *Environmental effects, Effluents, Discharge(Water), Wastes, Water pollution sources, Water pollution, Nuclear wastes, Radioactive wastes, Water quality control, Water quality standards, Water law, Judicial decisions, Legal aspects, Legislation, Regulation.
Identifiers: *Effluent limitations, *Radioactive pollution, *Federal Water Pollution Control Act Amendments of 1972, Administrative regulations, Effluent guidelines.

This case comment focuses on a recent Supreme Court decision which made the Atomic Energy Commission (AEC) responsible for regulating the discharge of radioactive wastes into navigable waters. Although the Federal Water Pollution Control Act Amendments of 1972 gave the Environmental Protection Agency (EPA) the power to completely eliminate the discharge of pollutants into navigable waters by 1985, the Supreme Court held that the term 'pollutants' does not include those radioactive materials covered by the Atomic Energy Act. Allowing the AEC to retain its exclusive authority over radiation standards has been criticized because the AEC, prior to its recent division into two agencies, had potentially conflicting responsibilities to fulfill: to increase the use of atomic energy and to make such use safe. Despite the AEC's recent division, the author still feels that it would be more beneficial to have a separate government agency, such as the EPA, keep the atomic energy agencies in check. Therefore the Congress should delegate the power to regulate radioactive wastes to the EPA thus curing the conflict between the policy of clean water and the development of atomic energy. (Jones-Florida)
W77-10455

DEEPWATER PORT ACT OF 1974: SOME INTERNATIONAL AND ENVIRONMENTAL IMPLICATIONS,
J. H. Gnann, Jr.
Georgia Journal of International and Comparative Law, Vol 6, No 2, p 535-63, Summer 1976.

Descriptors: *Harbors, *Ships, *Oil industry, *Foreign trade, Structures, Law of the sea, International law, Oil pollution, Oil spills, Import, Transportation, Economic efficiency, United States, Environmental effects, State jurisdiction, Federal jurisdiction, Water law, Legal aspects, Legislation, Regulation.
Identifiers: *International agreements, Licenses, Liability, Supertankers, Territorial seas(Jurisdiction), Environmental impact statement, Hazardous substances(Pollution), Deep Water Port Act of 1974, Environmental Protection Agency, Marine environment.

The Deepwater Port Act of 1974 (Act) established procedures for the location, construction, and operation of deepwater ports off the coasts of the United States to encourage the trade of oil via supertankers. Various provisions of the Act including licensing procedures required for construction, the scope of administrative powers vested in the Secretary of Transportation enforcement procedures, and state input are discussed in this note. Two aspects of the Act are discussed in detail: (1) the legality under international law of authorizing construction of artificial structures on the high seas--such ports are subject to exclusive United States control though located 20 miles or more outside of the territorial limits; and (2) the inherent environmental consequences of encouraging supertankers in American waters--the Act provides for continuous government surveillance coupled with comprehensive civil liability. The author's evaluation of the Act is that it is an ambitious attempt to grapple with a wide range of anticipated problems in a novel area through a format which emphasizes pre-planning. Congress's attempt to balance the needs of present and future generations is favorably viewed. (Jones-Florida)
W77-10456

THE GEORGIA FORESHORE AND STATE V ASHMORE: THE LEGISLATIVE GIVETH AND THE JUDICIARY TAKETH AWAY,
Emory Univ., Atlanta, Ga. Lamar School of Law.
R. E. Richards.
Environmental Law, Vol 7, No 1, p 153-79, Fall 1976.

Descriptors: *Georgia, *Boundaries(Property), *Eminent domain, *Coastal marshes, Public access, Coasts, Water law, Shores, Wildlife conservation, Tidal waters, Adjacent land owners, Tidal marshes, Common law, High water mark, Low water mark, Marshes, Legal aspects, Easements, Judicial decisions, Legislation.
Identifiers: *Property interests, *Public trust doctrine, *Real property law, Coastal Marshland Protection Act of 1970, Foreshore.

An early (1902) act of the Georgia legislature as well as a subsequent constitutional amendment in 1945 appear to extend title to land adjacent to navigable tidewaters in private landowners as far as the low water mark. Under English common law followed up to that time, private ownership extended only to the high water mark. In the Ashmore case, the court had to settle a title dispute over certain accreted beach property. The court chose to construe the earlier legislative acts as grants of rights rather than title. The author traces the history of tideland ownership from the English common law through legislative acts and court decisions in Georgia to conclude that the court's decision in the Ashmore case was contrived. When the 1902 Act was passed, the marshes were considered to be of little value; but today such property is considered biologically critical and irreplaceable. Therefore, public pressure in favor of marsh and beach preservation may have been a factor in this decision. Ordinarily, the state does not have the power to take private property without compensation, but by this decision the court has, in the author's opinion, done indirectly what the legislature could not do directly. (Jones-Florida)
W77-10457

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS,
For primary bibliographic entry see Field 5G.
W77-10458

THE APPLICATION OF SURFACE WATER RULES IN URBAN AREAS,
C. E. Bridges.
Missouri Law Review, Vol 42, No 1, p 76-
Winter 1977.

Descriptors: *Surface waters, *Surface drainage, *Urban runoff, *Alteration of flow, Water rights, Drainage, Urban drainage, Runoff, Surface runoff, Reasonable use, Legal aspects, Drainage effects, Land management, Land use, Land development, Urbanization, Relative rights, Diversion, Natural flow doctrine.
Identifiers: *Common enemy rule, *Liability, Water rights(Non-riparian), Property interest, Civil rule of surface water, Reasonable use rule.

Three rules govern surface water runoff: the civil rule, the common enemy rule, and the reasonable use rule. The civil rule holds that a landowner who interferes with the natural flow of surface water is liable for any injury caused to other landowners. The common enemy rule basically states that a landowner has an unqualified and unlimited right to deal with the surface water on his land as he sees fit. In the reasonable use rule, a landowner's liability turns on a determination of the reasonableness of his action. All three rules have been used in urban areas and both the civil rule and common enemy rule have been modified to make them more workable for urban problems. The common enemy rule seems the least suited for use in urban areas because it ignores the impact of one landowner's action on another's property.

civil rule, although it has not hindered development in urban areas, lacks flexibility because any alteration of flow could subject a landowner to liability. Of the three, the reasonable use rule seems best suited to urban needs because it defines reasonableness in light of the facts of each case. (Petruff-Florida)
W77-10459

JURISDICTION OVER THE SEABED: PERSISTENT FEDERAL-STATE CONFLICT,
J. C. Barrett.
Urban Law Annual, Vol 12, p 291-300, 1976.

Descriptors: *Ownership of beds, *Submerged Lands Act, *Continental shelf, *State jurisdiction, *Federal jurisdiction, Oceans, Boundary disputes, Constitutional law, Low water mark, Legal aspects, Water law, Water rights, Beds under water, Governmental interrelations, Judicial decisions, Coasts, Resources.
Identifiers: *Seabed mining, *Territorial seas(Jurisdiction), Marine resources, Territorial waters.

The latest Supreme Court decision on seabed jurisdiction establishes that the United States, to the exclusion of individual states, has sovereign rights to the seabeds lying beyond the three mile limit. Federal jurisdiction extends to the outer edge of the continental shelf. The three mile limit, demarcating state from federal jurisdiction, is measured from a baseline determined by the mean low water mark or the outer edge of inland waters. Because the federal government and the states disagree on the delineation of inland waters, and since coastlines may shift due to geological change, the establishment of baselines is subject to dispute. Therefore, although the recent Supreme Court holding appears to settle the issue of federal versus state jurisdiction of the continental shelf, it does not eliminate the possibility of seabed conflict. Disagreements may occur over geographical, technological, and political limits of jurisdiction. The author feels that rapid advancement of marine technology coupled with the slow pace of legal development leaves a gap between the law which governs the continental shelf and efforts to discover and utilize its resources. As an alternative to the legal process he recommends accommodation through political processes. (Chocheu-Florida)
W77-10460

WETLANDS REGULATION: THE TAKING PROBLEM AND PRIVATE PROPERTY INTERESTS,
G. R. Garretson.
Urban Law Annual, Vol 12, p 301-10, 1976.

Descriptors: *Eminent domain, *New Hampshire, Wetlands, *Marsh management, *Coastal marshes, Salt marshes, Tidal marshes, Judicial decisions, Marshes, Constitutional law, Public rights, Water law, Maine, Flood plain zoning, Property values, State governments, Regulation, Zoning, Coasts.
Identifiers: *Property interests, *State policy, Coastal waters, Fill permits, Nuisance, Property, Environmental policy.

An increase in state regulation of commercial wetland development has resulted in conflict between state agencies and private owners. These conflicts have resulted in litigation concerning whether state regulation of salt marshes can constitute a taking of property. The New Hampshire Supreme Court resolved the issue by adopting a balancing test which weighed the relative interest of the state in preventing public harm against the interests of private owners in making profitable use of their land. The Maine Supreme Court adopted a diminution of value test, a test expressly rejected by the new Hampshire court. This test states that an unconstitutional taking occurs when regulations deprive the landowner of practically all the value of the property. The author found both tests inadequate. Using the value of property as the sole criterion for wetland regulation was considered too narrow and using public harm as the standard for such regulation could discourage private development by designating previously acceptable activity as harmful. Because alternative compromise solutions can better balance competing interests, the author feels that states should use the power of eminent domain and zoning only as last resorts in wetland regulation. (Cocheu-Florida)
W77-10461

PUBLIC ACCESS TO RECEDING BEACHES,
M. Ratliff.
Houston Law Review, Vol 13, No 5, p 984-1015, July 1976.

Descriptors: *Beach erosion, *Easements, *Public access, *Erosion, Recreation, Legal aspects, Water rights, Water law, Land management, Recreation facilities, Seashores, Shores, Prescriptive rights, Erosion rates, Subsidence, Waves(Water), Texas, Beaches.
Identifiers: *Rolling easement, Public trust doctrine, Dedication.

The designation of a land mass as a beach does not assure public access to it since areas landward of high tide are subject to private ownership. As ocean waters encroach higher upon the land mass, the public's easement rights to the beach are being washed out to sea. Several major legal theories have been adopted to provide for public use and enjoyment of the beach. These theories include the public trust doctrine, prescription, dedication and custom. A serious problem exists, however, in determining exactly where the beach lies. Constant changes in the land-water interface through processes of erosion, subsidence and a rise in sea level create a number of public use--private ownership conflicts. The most feasible method of preserving public beach rights with the least loss to the landowners occurs with the application of a rolling easement. With this concept, the right to the easement moves with the line of vegetation as it recedes in conjunction to the shoreline. Such easements will always allow the beach the mean low tide and the line of vegetation to be reserved for the public regardless of the cause for the recession of the beach. (Rieck-Florida)
W77-10462

WATERS OF THE UNITED STATES: DOES FEDERAL CONTROL INUNDATE THE WETLAND (COMMENT ON US V HOLLAND),
M. C. Austin.
University of Florida Law Review, Vol 26, No 4, p 893-99, Summer 1974.

Descriptors: *Florida, *Federal Water Pollution Control Act, *Wetlands, Navigable waters, *Federal jurisdiction, Rivers and Harbors Act, Artificial watercourses, Non-navigable waters, Standards, Permits, Pollutants, Water pollution control, Water quality control, Landfills.
Identifiers: *Interstate commerce, Fill operations, *Fill permits.

Defendant developer began fill operations without a permit on a Florida wetland tract that was interlaced with nonnavigable artificial mosquito canals. Generally, fill permits are required by the Federal Water Pollution Control Act of 1972 (FWPCA) and the Rivers and Harbors Act of 1899 for all navigable waters. The federal government obtained a preliminary injunction against defendant and initiated a suit under FWPCA. The issue arising from this case, U. S. v. Holland is whether federal jurisdiction extends to all waters of the U. S. affected by interstate commerce without regard to their navigability. The court held that it did; therefore, defendant's fill activity required a permit under FWPCA. Before Holland, the term 'waters' was construed under the Act to cover only navigable waters. Now, the term encompasses 'all waters of the United States' in that even nonnavigable mosquito canals and mangrove wetlands were deemed capable of conveying pollutants into a navigable bay. However, even though Holland has effectively overruled the navigability standard, the FWPCA still cannot extend protection to waters having no effect on interstate commerce. (Denker-Florida)
W77-10463

USE OF THE COMMERCE CLAUSE TO INVALIDATE ANTI-PHOSPHATE LEGISLATION: WILL IT WASH. (SOAP AND DETERGENT ASSOCIATION V CHICAGO).
University of Colorado Law Review, Vol 45, No 4, p 487-500 (Summer 1974). 89 ref.

Descriptors: *Lake Michigan, *Michigan, *Constitutional law, *Common law, *Phosphates, *Phosphorus compounds, Pollution abatement, Environmental control, Environmental effects, Chemical wastes, Water pollution sources, Nutrient removal, Chemicals, Detergents, Domestic wastes, Soaps, Water pollution, Foam fractionation, Surfactants.
Identifiers: Commerce clause, Interstate commerce.

In the case of Soap and Detergent Association v. Chicago, the District Court for Northern Illinois held that the city ordinance, making it a criminal offense to sell detergents containing phosphorus within the city, was an unjustified interference with interstate commerce, and was thus violative of the commerce clause of the Constitution. The burden of justifying the ordinance fell upon the city, and Chicago failed to carry that burden. The court found the phosphate pollution in Lake Michigan attributable to the city to be so negligible as not to be sufficient justification for the ordinance. The author evaluates the court's reasoning, and contends that the court failed to analyze the existing case law and consequently used a decision making process the validity of which is doubtful. The author utilizes commerce-clause case law to justify a different result in the instant case, as well as discounting the procedents the court used to formulate its analysis, especially its use of a balancing test. The author further suggests that the court misunderstood the nature of the burden placed on interstate commerce, including the predicted increase costs of manufacture and distribution. The article urges a reexamination of the commerce-clause and its potential as an instrument for environmental protection. (Welch-Florida)
W77-10464

FLORIDA'S LAND USE RESTRICTIONS: ARE THEY SERVING THE PUBLIC INTEREST,
K. H. MacKay, Jr.
Fla Environmental and Urban Issues, Vol 111, No 3, p 1-3, 13-15 (February 1976).

Descriptors: *Florida, *Legislation, *City planning, *Comprehensive planning, *Local governments, Future planning(Projected), Long-term planning, Administration, Coordination, Forecasting, Governments, Regional development, Social aspects, Governmental interrelations, Legal aspects, Political aspects, Zoning, Building codes, Planning, Land use.
Identifiers: Impact fees, 1975 Local Government Comprehensive Planning Act, Program evaluation, Legislative growth policy resolution.

The basic policy underlying Florida land-use statutes is that regulation, implementation, and enforcement should be the responsibility of local authorities with state preemption only in the event of overriding state interests. With the passage of the New Communities Act in 1975 local authorities were delegated broad legislative powers. Despite active use of these legislative powers by state and local government in the past several years, serious questions have arisen as to whether these laws

even address themselves to the problems of the next decade. The Local Government Comprehensive Planning Act is plagued by lack of a coordinating mechanism and lack of funding; it may well create a greater problem in fragmentation and overlap than anticipated. The disparity in local awareness of planning needs, the lack of agreement on how to measure the costs of growth, and the effects on local government of rapid growth are illustrative of problems yet to be resolved by legislative pronouncement. The truly difficult questions, those involving fundamental value judgments, have not been answered, but must be in the near future. (Moorhouse-Florida)
W77-10465

FEDERAL AND FLORIDA LAW CONCERNING OIL POLLUTION,
Florida Univ., Gainesville. School of Law.
D. S. Swan.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida, 32611. $1.80. Water Law Seminar, Spring 1970, 25 p.

Descriptors: *Maine, *Oil pollution, *Legislation, *Rivers and Harbors Act, Judicial decisions, Administration, Common law, Remedies, Reasonable use, Trespass, Oil spills, Legal aspects, Water pollution, Water law, Oil, Water pollution sources, Oil wastes, Disasters.
Identifiers: *Oil Pollution Act of 1924, Water Quality Improvement Act of 1970.

The author contends that present federal and state legislation available to combat oil spills is ineffective. Section 411 of the Rivers and Harbors Act and the Oil Pollution Act of 1924, as amended 1966, are the major pieces of legislation which form federal protection against oil spills. Other federal acts have proven to be ineffective due to their lengthy administrative and judicial procedures. Such common law theories as the reasonable use rule of water law and remedies such as nuisance and trespass in property and tort law are alternative means to deal with pollution. Recent federal legislation entitled the Water Quality Improvement Act of 1970, an amendment to the Federal Water Pollution Control Act, seems to be a step in the right direction in the field of oil spill control. In addition to providing stricter liability, it presents plans to prevent disasters and provides for immediate effective cleanup. Another positive indication of improved future oil pollution control is the strengthening of state legislation relating to coastal conveyance of oil. For example, Maine provides a license fee to raise monies for immediate cleanup of spills. Legislation mandating stiff penalties and stricter liability is urgently needed. (Rieck-Florida)
W77-10467

WASTE HEAT UTILIZATION FROM THERMAL POWER PLANT IN NEW YORK STATE,
A. Buchwald.
Sea Grant Law Journal, Vol 1, p 211-54 (1976). 183 ref.

Descriptors: *Heated water, *Thermal pollution, *Thermal powerplants, *Coasts, *Waste water(Pollution), New York, Water cooling, Water pollution sources, Water temperature, Pollution abatement, Legislation, Jurisdiction, Federal government, State governments, Local governments, Social aspects, Agriculture, Irrigation, Aquiculture, Fish farming, Fish hatcheries, Powerplants, Electric powerplants, Governmental interrelations.
Identifiers: *Coastal region, *Coastal zone management, *Coastal waters.

Traditionally waste heat on the environment has been considered thermal pollution. However, it is now possible to utilize this waste heat beneficially for aquaculture and agriculture. Such use would permit application of multiple-use principles to the coastal zone regions. Multiple-use has been encouraged by both the Federal and New York State governments. Society will experience maximum benefit as the scarce coastal zone regions will be utilized for both industrial development and environmental preservation. Multiple-use management plans would require power generating facilities to be sited with waste heat utilizing industries, such as fish hatcheries. One major problem in the realization of this goal is that jurisdiction over power plant siting, water quality standards, and coastal zone management is fragmented among federal, state, and local governments. Consolidation would greatly facilitate multiple-use plans. Aside from aquaculture, heated water is beneficial to agricultural irrigation and the heating of greenhouses in the winter. Research has also shown that sewage is treated more effectively with heated water. Both the federal government and the New York legislature have approved minor legislation on the topic. Major legislative programs are needed. A Model Statute is recommended herein highlighting the necessary changes in the existing statutory framework. (Moorhouse-Florida)
W77-10468

COASTAL ZONE MANAGEMENT INVOLVING THE BOUNDARY WATERS OF NEW YORK AND ONTARIO,
R. E. Weinberg.
Sea Grant Law Journal, Vol 1, p 255-334 (1976). 334 ref.

Descriptors: *Lake Ontario, *Lake Erie, *Resources development, *New York, *Canada, International law, Coasts, Legal aspects, Treaties, International Bound. and Water Comm., Federal government, International commissions, International joint commission, St. Lawrence River, State governments, Bank erosion, Water law, Water rights, Water resources development, Resource allocation.
Identifiers: *Coastal waters, *Coastal zone management, National Environmental Policy Act, Ontario, Boundaries(Water).

The 1972 Coastal Zone Management Act encompasses the waters of the Great Lakes to the limit of United States jurisdiction. Thus the coastal zone of New York extends to the international boundary running through the St. Lawrence River and Lakes Ontario and Erie. Compliance with the 1972 act requires New York to implement a comprehensive coastal zone management program. However, any plan for development of coastal zone resources will have an international impact and perhaps international legal consequences. The U. S. Canada Boundary Water Treaty of 1909 created a joint commission to consider all matters pertaining to water management on the international border and provided that citizens of one country have legal rights enforceable in the courts of the other when they are injured by improper utilization of shared waters. The National Environmental Policy Act imposed further obligations to assess the impact upon Canadian interests of New York resource management proposals. As a result, a conceptual framework defining development problems in international terms is essential. The drainage basin approach is illustrated by its operation in terms of fisheries management and mineral resource development. Reciprocal legislation on the federal and state province levels is recommended as a feasible legal framework for implementation of a comprehensive international resource development program. (Moorhouse-Florida)
W77-10469

FEDERAL AND STATE CONTROLS OVER LAND/WATER DEVELOPMENT IN NAVIGABLE AND NON-NAVIGABLE WATERS,
C. G. Novack.
Sea Grant Law Journal, Vol 1, p 335-367 (1976). 156 ref.

Descriptors: *Earth-water interfaces, *Water resources development, *Governments, *Permits, Regulation, Administration, Boundary processes, Interfaces, Resources development, Comprehensive planning, Federal government, State governments, New York, Water law, Planning, Legal aspects, Water permits, Administrative agencies, Control, River and Harbor Act, Water management(Applied), Coordination, Decision making, Administrative decisions.
Identifiers: *Administrative regulations, Federal Water Pollution Control Act Amendments of 1972, Fill permits.

The framework of powers and procedures within which land/water development decisions are made is highly complex. Land/water interfaces and any changes in their character are essential elements to be considered in any development decision. The inherently complex nature of the land/water interface ecosystem further complicates attempts to efficiently and simplistically guide its development. Control over resource development in navigable waters rests primarily in the Corps of Engineers. Federal permit systems authorized by the Rivers and Harbors Act of 1899 and the Federal Water Pollution Control Act of 1972 and legislated penalties are the principle tools of Corps control. The author describes the process of permit application and approval at the federal level in detail. The state of New York has adopted a similar permit program which is administered by its Department of Environmental Conservation. New York's Environmental Conservation Law authorizes issuance of three types of permits: (1) Stream Protection Permits; (2) Tidal Wetlands Moratorium Permits; and (3) Freshwater Wetlands Interim Permits. This dual permit system is expensive and cumbersome. A more plausible solution would place the federal government in charge of all permits or alternatively provide federal support for states issuing all permits for interstate and intrastate waters. (Moorhouse-Florida)
W77-10470

OFFSHORE MINERAL RESOURCE EXPLOITATION: THE STATE AND FEDERAL RESPONSE,
J. K. Sinclair.
Sea Grant Law Journal, Vol 1, p 385-416 (1976). 181 ref.

Descriptors: *Oil reservoirs, *Continental shelf, *Oil, *Exploitation, *Shore protection, Coasts, Offshore platforms, Oil pollution, Oil spills, Oil wells, Oil industry, Resources development, Federal government, State governments, Governmental interrelations, Legislation, Water law, Legal aspects, Coordination, Leases.
Identifiers: Coastal waters, Coastal zone management, National Environmental Policy Act, Federal Water Pollution Control Act Amendments of 1972.

In view of the great need for domestic sources of oil, the President of the United States has authorized the leasing of 10 million acres on the outer continental shelf. Any such coastal exploitation has three types of impact: (1) a primary impact from the exploitation itself; (2) a secondary impact from the development of facilities ancillary to the development; and (3) a tertiary impact which occurs when the exploitation ceases. The federal government has sought to control the impact of exploitation itself primarily through the Outer Continental Shelf Lands Act. However, because of the great environmental risks of offshore drillings Atlantic Coast states are justifiably dissatisfied with the federal legislation. If the states are to bear the environmental risks of projects from which the federal government will reap the benefits, resolution is unlikely. But if states were given title to the leased lands and received royalties from the developments they would be at least partially compensated for risks assumed. The Coastal Zone Management Act is concerned with the secondary impact of offshore development and directs states to preserve and protect shoreline areas. In so doing, the act fails

cknowledge the socioeconomic effects of secon-
lary development necessitated by offshore
rilling. Furthermore, neither states nor the
ederal government have adequately studied and
lanned for the depletion and abandonment of
acilities now being developed. Numerous legisla-
ive amendments are proposed for consideration.
Moorhouse-Florida)
W77-10471

RGANIC CHEMICALS MANUFACTURING
OINT SOURCE CATEGORY, PROPOSED EF-
LUENT GUIDELINES AND STANDARDS.
nvironmental Protection Agency, Washington,
.C.
or primary bibliographic entry see Field 5G.
77-10472

PPLICATION OF PERMIT PROGRAM TO
EPARATE STORM SEWERS.
or primary bibliographic entry see Field 5G.
77-10473

LASTICS AND SYNTHETICS MANUFACTUR-
NG POINT SOURCE CATEGORY, EFFLUENT
IMITATIONS AND GUIDELINES.
nvironmental Protection Agency, Washington,
.C.
or primary bibliographic entry see Field 5G.
77-10474

AYLEY V KANE (ENFORCEMENT OF
RDER TO REMOVE IMPROVEMENTS HELD
O BE IN VIOLATION OF FLOOD CONTROL
ONES ACT).
0 P2d 1165-69 (Wash App 1977).

escriptors: *Flood control, *Flood routing,
lood plain zoning, *Washington, Flood protec-
n, Flow control, River flow, Flood forecasting,
ood frequency, Channel improvement, Flood
mage, Maximum probable flood, Riparian
hts, Flood flow, Floods, Landfills, Permits,
lkheads, Concrete structures.

efendant, flood plain landowner, appealed from
judgment for plaintiffs, County and State De-
rtment of Ecology. The original suit was brought
plaintiffs seeking removal of improvements on
fendant's property which were in violation of
Flood Control Zones Act. These improve-
nts were constructed after a permit application
their construction had been denied by plaintiffs
rsuant to Flood Control Zones Act. The permit
s denied because the improvement plans were
ntrary to that act in that they would increase the
w of floodwaters expected in a one hundred
r frequency flood, causing more severe flood-
downstream. Defendant contended that since
statute contemplated a one hundred year flood
the standard, and increased downstream flood-
as the reason, that the original removal order
uld be affirmed. The court agreed with the
intiffs, and affirmed the order as modified. The
rt's modification provided for a more clearly
ined method of abatement. (Brightman-Florida)
7-10475

NSON V BURGESS (SUPERIOR AND SUB-
DINATE RIGHTS TO IRRIGATION
TER).
P2d 11-15 (Colo 1977).

criptors: *Preferences(Water rights),
djudication procedure, *Irrigation permits,
iorities, *Prescriptive rights, Irrigation, Irriga-
canals, Irrigation water, Permits, Water per-
, Judicial decisions, Colorado, Water law,
er rights, Legal aspects, Prior appropriation,
er supply.

ellants, owners of an irrigation ditch, sought
ew of a decree which made their water rights subordinate to those of the appellee. Appellee, owner of another irrigation ditch, obtained a decree granting him the rights to the water of the Coryell Gulch. Since the decree had an appropriation date. Appellants had a subordinate decree, which granted appellants rights to the water of Surface Creek. In 1975, appellee had the appellants' decree reviewed. The court found that the appellants' decree accordingly. On appeal, appeallants asserted that the appellee had failed to file his 1975 protest pursuant to section 37-92-302(3) of the Colorado Revised Statutes. The court found, however, that appellee had shown that he was adversely affected by the previous decree, that he was excused from compliance with the three year statute of limitations, and that appellants had not obtained exclusive water rights by either adverse use, prescription, or relinquishments of water rights by other irrigation ditch owners. Accordingly, the 1975 decree was affirmed. (Stadler-Florida)
W77-10476

APPLICATION OF SANBORN (APPLICATION TO REGISTER TITLE TO LAND BELOW HIGH WATER MARK).
562 P2d 771-79 (Hawaii 1977).

Descriptors: *Hawaii, *High water mark, *Water level fluctuations, *Boundaries(Property), Water courses(Legal), Tidal waters, Tidal effects, Seashores, Fluctuations, Water levels, Tides, Erosion, Shores, Boundary disputes, Public lands, Waves(Water), Beach erosion, State governments.
Identifiers: *Submerged lands, *Property interests, Real property law, Presumptions(Legal), Public trust doctrine.

Appellant, the state land surveyor, sought reversal of a land court ruling which ordered appellant to certify a map showing appellee's (landowner) beach front property line to be below the high water mark. The property line in controversy was drawn pursuant to distances and azimuths contained in an earlier land court decree of registration. It was appellee's contention that the previous land court registration was controlling and the fact that that title placed the property line below the high water mark was due to permanent erosion. Thus, title should be determined pursuant to an exception to the general rule holding all such land in public trust. Appellant contended that there was no permanent erosion, only seasonal variation, and the annual high water mark was the criterion specified in the statute. The state supreme court, in reversing the land court's decision, held that natural monuments such as a high water mark are controlling over distances and azimuths, and that where it is proved that the distances and azimuths are not coterminous with a line reflecting the upper reaches of the wash of waves, the latter line will prevail. (Brightman-Florida)
W77-10477

VAN DEURSEN V DUNLAP TOWING COMPANY (THE RIGHT OF NAVIGATION AS PREVAILING OVER THE RIGHT TO FISH).
562 P2d 666-69 (Wash App 1977).

Descriptors: *Washington, *Navigation, *Harbors, *Negligence, Commercial shellfish, Safety, Hazards, Crabs, Navigable waters, Crustaceans, Shellfish, Aquiculture, Shellfish farming, Legal aspects, Water law, Law of the sea, Aquatic animals, Aquatic life, Trespass.
Identifiers: *Liability, *Navigation obstructions, Coastal waters, Jury instructions, Navigational servitude, Navigability, Vessels.

Defendant, owner of log tow vessels, appealed from a verdict finding him sixty percent negligent in overrunning and destroying a number of crab pots belonging to plaintiff. The crab pots were destroyed as defendant entered a bay seeking shelter from a storm. A corridor about one mile wide was provided between the crab pots to allow entry to the bay. Plaintiff contended that the right of navigation prevails over the right of fishing when the two come into conflict, and that consequently this action should have been dismissed as a matter of law. Plaintiff contended that the governing rule of law is not so strict, and the right of navigation has no authority to trespass upon the rights of fishing where the two may be enjoyed freely and fairly. The court recognized the primacy of navigation, but only where the two rights were in direct conflict and could not freely and fairly co-exist. Therefore, the appeal was not allowed. The findings of negligence in the lower court were affirmed. (Brightman-Florida)
W77-10478

WARD V COLEMAN (CONSTITUTIONALITY, AND THE CRIMINAL OR CIVIL NATURE OF FINES UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
423 F Supp 1352-59 (W D Okla 1976).

Descriptors: *Oklahoma, *Oil pollution, *Oil spills, Federal Water Pollution Control Act, Regulation, Assessments, Water law, Oil wells, Oil fields, Oil industry, Law enforcement, Water pollution control, Navigable rivers, Navigable waters, Legal aspects, Judicial decisions, Damages, Penalties(Legal), Drilling, Water pollution sources.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Hazardous substances(Pollution), Liability, Sheen test.

Defendant, owner and operator of an oil drilling site, sought summary judgment or judgment on the pleadings in a suit by plaintiff, U. S. government, to enforce a penalty levied on defendant as a result of an oil spill from defendant's drilling operation into a navigable waterway. The fine was levied pursuant to the Federal Water Pollution Control Act (FWPCA). Defendant contended that: the fine imposed was criminal in nature, and as such, the self-reporting requirement of FWPCA violated his fifth amendment protection from self-incrimination; that his rights were violated by the strict liability imposed by FWPCA; and that the 'sheen' test was not such a test as was authorized by FWPCA to determine spill magnitude. Plaintiff contended that: the fine imposed was civil in nature and therefore not violative of defendant's rights; that due process was afforded before strict liability was applied; and that the 'sheen' test was within the scope of FWPCA. The court ruled in favor of plaintiff on all three issues and denied defendant's motion for summary judgment or judgment on the pleadings. (Brightman-Florida)
W77-10479

VANDERVELDE V CITY OF GREEN LAKE (AUTHORITY OF CITY TO REQUIRE USE OF CITY WATER AND SEWER MAINS).
240 NW2d 399-403 (Wisc 1976).

Descriptors: *Municipal water, *Cities, *Sewers, *Wisconsin, *Legal review, Judicial decisions, Legislation, Local governments, Eminent domain, Condemnation, Construction, Building, Sewage disposal, Water users.
Identifiers: *Injunctive relief.

Plaintiff City of Green Lake sought to lift a court-ordered injunction that restrained it from requiring the use of city sewer and water mains under local ordinances. Defendants, property owners who were the objects of condemnation proceedings for the purposes of constructing such facilities, and who also would have been forced to use the city services, argued on several grounds that the injunction should remain. The Supreme Court reversed the trial court, stating that the city had the authority to require use of city sewer and water mains; furthermore, there were such substantial irregularities in city council proceedings as to require reversal in the interest of justice. The court's decision hinged on the interpretation of a state statute which stated that authority to compel

sewer and water use was given to towns having a population of more than 7,500. The court found that cities were not subject to such a limitation, and thus could enforce the uses even though populated by less than 7,500 people. (Frank-Florida)
W77-10480

UNITED STATES V ALLIED CHEMICAL CORPORATION (MULTIPLE-COUNT INDICTMENTS FOR WASTE DISCHARGE VIOLATIONS OF THE RIVERS AND HARBORS ACT).
420 F Supp 122-25 (E D Va 1976).

Descriptors: *Virginia, *Chemical wastes, *Discharge(Water), *Rivers and Harbors Act, Navigable waters, Damages, Chemical industry, Navigable rivers, Discharge frequency, Chemicals, Chemical degradation, Legal aspects, Rivers, Effluents, Legislation, Waste disposal, Water pollution, Pollutants, Water pollution sources, Wastes.
Identifiers: *Kepone, Tris 2-hydroxyethyl isocyanurate(THEIC), Triallyl isocyanurate(TAIC), Multiple-count indictments, *Refuse Act of 1899, Chemical compounds, River contamination, Effluent guidelines.

Defendant, a chemical manufacturing plant in Virginia, discharged industrial wastes from the production of kepone, Tris 2 - Hydroxyethyl Isocyanurate (THEIC), and Triallyl Isocyanurate (TAIC) into a branch of the James River, a navigable waterway. The defendant was charged with violations of the Refuse Act and a 456 count indictment was filed. Each day in which any of the three chemical compounds were discharged was listed as a separate count. Defendant contends that the courts were multiplicitous and the government should be required to elect a single count or in the alternative, to consolidate all counts into a single count. The court held that the determination of whether several counts charging violation of the same statute are multiplicitous is one of legislative intent and doubts should be resolve against viewing a single transaction as multiple offenses. However, the Rivers and Harbors Act is meant to punish each separate act of discharging refuse and not the discharge itself. The court could not determine until proofs had been offered whether the 456 counts were multiplicitous. (Denker-Florida)
W77-10481

HOGAN V. OLIVERA (GENERAL DAMAGES AWARD UPHELD FOR FLOOD DAMAGE TO REAL AND PERSONAL PROPERTY).
233 S.E.2d 428-33 (Ga Ct App 1977).

Descriptors: *Georgia, *Ditches, *Trespass, *Flood damage, *Compensation, Property values, Water conveyance, Construction, Surface drainage, Surface runoff, Floods, Surface waters, Water control, Water law, Legal aspects, Judicial decisions, Damages.
Identifiers: *Real property law.

Defendant's contractor, while developing a subdivision above plaintiff's lot, cut an extension ditch from the end of a drainage pipe in such a way that the water collected was discharged onto plaintiff's property. Plaintiff sued for damages, general and special, from this trepass to realty. A jury verdict which set the amount of damages due was appealed by defendant upon a claim that there was no probative evidence of certain of the special damages suffered by plaintiff. The Court of Appeals of Georgia held that since there was no showing that the jury considered illegal elements and its findings were within the range of the evidence, the judgment would not be reversed. (Jones-Florida)
W77-10482

JOUBERT V. STATE (STATE LIABLE FOR FLOOD DAMAGE TO CROPS CAUSED BY OPENING OF DAM'S FLOODGATES).
345 So2d 220-25 (La App 1977).

Descriptors: *Flood damages, *Louisiana, *Crops, *Flood control, *Compensation, Soybeans, Water management(Applied), Damages, Dams, Reservoirs, Floodgates, Legislation, Legal aspects, Adjacent landowners, Negligence, Penalties(Legal), Proprietary power, Water law, Bayous, Flooding.
Identifiers: Dam effects, Liability, Real property law, Strict liability.

Plaintiff sharecroppers in the two consolidated cases sought recovery of crop damages caused when their crops of soy beans and milo were flooded from water flowing over a state-owned dam in the neighboring state park. The trial court held that the state was responsible for the flooding by causing one of the dam floodgates to be opened following a period of heavy rains when the water level in the lake was high. Despite testimony that the land would have flooded without this action, the trial court concluded that the opening of the gates caused larger volumes to escape the reservoir and in turn flood plaintiffs' crops. The suit was based on a strict liability statute imposing upon every landowner a duty not to use his land in such a way as to deprive his neighbor of the enjoyment of his land. On appeal, to the Third Circuit Court of Appeal of Louisiana, the amount of damages allowed was reduced by the percentage of the landowner's share of the crops, but the judgment was otherwise upheld. (Jones-Florida)
W77-10483

UNITED STATES V ATLANTIC RICHFIELD COMPANY (ABSOLUTE LIABILITY FOR OIL SPILLS UNDER FEDERAL WATER POLLUTION CONTROL ACT).
429 F Supp 830-43 (E D Pa 1977).

Descriptors: Federal Water Pollution Control Act, *Penalties(Legal), *Oil spills, *Accidents, *Navigable waters, Water pollution, Water pollution sources, Water Law, Rivers and Harbors Act, Harbors, Hazards, Negligence, Constitutional law, Administrative decisions, Federal jurisdiction, Judicial decisions, Legal aspects.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Refuse Act of 1899, *Absolute liability, Administrative regulations, Coastal waters, Hazardous substances(Pollution), Liability, Vessels.

Plaintiff, the United States, sought to enforce penalties assessed, pursuant to the Federal Water Pollution Control Act (FWPCA) against defendant oil companies. Defendants had accidentally discharged oil into navigable waters. They promptly reported each spill and cleaned it up to the satisfaction of the Coast Guard. Subsequently the Coast Guard assessed penalties against the defendants pursuant to section 1321 (b)(3), (5), and (6) of the FWPCA. Defendants argued that because they had cleaned up the spills, they were not in violation of section (b)(3) which prohibited harmful discharges into navigable waters. The defendants further asserted that by subjecting an accidential, self-reporting, self-cleaning discharger to a fine under section (b)(6), the government was attempting to impose a criminal penalty contrary to the grant of immunity in section (b)(5). Plaintiff contended that remedial action initiated after a spill was irrelevant to the question of harmfulness under section (b)(3); that fault was not an element of the violation but merely a factor relevant to the administrative penalty procedure; and that the goal of section (b)(6) was to deter spills and not to punish responsible parties. The court held that penalties are proper, and that the statute bears a rational basis, that the legislative intent is clear, and that section (b)(6) is not only primitive in nature, but operates as a civil sanction. (Cocheu-Florida)
W77-10484

UNITED FAMILY FARMERS V KLEPPE (INITIAL STAGES OF RECLAMATION PROJECTS POSSIBLE BEFORE RECORDABLE CONTRACTS ARE EXECUTED).
552 F2d 823-28 (8th Cir 1977).

Descriptors: *South Dakota, *Reclamation, *Contracts, Water resources development, Legislation, Judicial decisions, River basin development, Federal government, Water law, Administrative agencies, Legal aspects, Dams, Rivers, Project purposes, Decision making, Damsites, Diversion structures, Farms, River basins, Diversion, Projects, Missouri River.
Identifiers: *Reclamation Extension Act of 1914, *Omnibus Adjustment Act of 1926, *Missouri River Basin Project, *Oahe Dam, Injunctive relief, Private interest groups, Property interests.

Plaintiff, a non-profit South Dakota Corporation, sought injunctive relief against the United States Secretary of the Interior to halt construction of the initial stage of the Oahe Diversion Unit of the Missouri River Basin Project. Plaintiffs cited the secretary's failure to comply with section 12 of the Reclamation Extension Act of 1914 as grounds for relief. The Act required all excess land owners to have executed recordable contracts for sale 'before any contract is lt or work begun'. The District Court for the Southern District of South Dakota granted summary judgment for the defendant and the Court of Appeals for the Eighth Circuit affirmed. After extensive review of relevant statutory history, the courts found that section 46 of the Omnibus Adjustment Act of 1926 had superseded section 12 of the Reclamation Extension Act of 1914 for projects built after 1926. Section 46 of the Omnibus Adjustment Act was interpreted as allowing construction to proceed even though all excess land owners had not executed recordable contracts, but prohibiting delivery of water to any excess land until a contract for its sale was executed. (Moorhouse-Florida)
W77-10485

STATE V WILSON (SEASONALLY FLOWING STREAM NOT CONSTANTLY FLOWING STREAM).
562 P2d 172-75 (Ore 1977).

Descriptors: *Oregon, *Streams, Flow, *Obstruction to flow, Legal aspects, Legal review, Water law, Aquatic life, Running waters, Natural streams, Streamflow, Streambeds, State government, Legislation, Administrative agencies, Permits, Flow rates, Riparian rights, Water rights, Alteration of flow, Judicial decisions.
Identifiers: *Fill permits, *Injunctive relief, Administrative regulations.

The State, acting through the Division of State Lands, sought to enjoin defendant from filling a portion of a creek that crossed his land. The creek was dry from June or July through October. Injunctive relief was sought pursuant to a statute prohibiting the filling of constantly flowing streams without obtaining a proper permit. The Division of State Lands, through regulation, had defined constantly flowing streams as any stream which flows during a portion of every year and supports aquatic life. The Supreme Court of Oregon denied the injunction and held the administrative regulation invalid. The court's detailed analysis of the relevant statutory history led them to conclude that the inclusion of a stream which flows during any portion of the year in the class of constantly flowing streams was clearly inconsistent with legislative intent. (Moorhouse-Florida)
W77-10486

DE SIMONE V KRAMER (ARTIFICIALLY CREATED ACCRETION SUBJECT TO LAW CONCERNING NATURAL ACCRETION).
252 NW2d 653-59 (Wis 1977).

Descriptors: *Wisconsin, *Accretion(Law), aspects), *Boundaries(Property), *Boun

lisputes, *Riparian rights, Legal aspects, Judicial lecisions, Adjacent land owners, Shores, Water aw, Banks, Relative rights, Remedies, Riparian and, Legal review, Penalties(Legal), Damages, Rivers, Property values, Real property, Dredging. dentifiers: Property interests, Property, Real pro-erty law, Frontage, Deeds.

Purchasers brought an action against vendors for leed reformation. The plaintiffs alleged that the leed description based on a 1928 plat did not accu-ately describe the property agreed upon in the urchase and sale agreement executed by the arties. Specifically, there was an eighteen foot iscrepancy in frontage. This discrepancy was aused by an enlargement of the shoreline as a esult of dredging by the Army Corps of En-ineers. Plaintiffs prayed that the additional rontage sould be awarded them. The defendants rgued that the fill area caused by the dredging as not theirs to convey and that they relied on the re-fill 1928 plat map in making the conveyance. he trial court ruled for the plaintiffs but granted oney damages since reforming the deed would e harmful to abutting property owners. The Visconsins Supreme Court affirmed discounting ne defendant's argument that they did not own ne accreted property by stating the familiar rule nat alluvion formed by accretion belongs to the wner of the upland to which it is contiguous. The ourt held that even though the accretion in this ase was caused by artificial means the rule con-rming natural accretion should be applied. Moorhouse-Florida)
/77-10487

EED V CALIFORNIA COASTAL ZONE CON-ERVATION COMMISSION (CALIFORNIA OASTAL CONSERVATION ACT UPHELD GAINST CONSTITUTIONAL CHALLENGE).
8 Cal Rptr 315-34 (Cal App 1974).

escriptors: *California, *Constitutional law, Administrative agencies, *Permits, *Regulation, Real property, Judicial decisions, Legal aspects, nvironment, Legislation, Coasts, State govern-ents, Wetlands, Administrative decisions, overnments, Water policy, Conservation. entifiers: Administrative regulations, Property terests, Fill permits, Real property law, Coastal ne.

aintiff building associations and trade unions ught declaratory relief, challenging the constitu-nality of the California Coastal Conservation ct. The Act designates a geographical conserva-n zone within which any person seeking to im-ove property must obtain a permit from a re-nal commission. The applicant bears the burden proof that the development will not have a sub-ntial adverse environmental effect. Plaintiffs al-ged violations of both the United States and lifornia constitutions, including infringement on e right to travel, unlawful taking of private pro-rty without just compensation, and denial of due ocess to affected property owners. The Califor-a Court of Appeals, Fourth District, held that the t imposes no chilling effect on an individual's edom of movement as it is not discriminatory d imposes no durational residence requirements penalties; that the Act does not provide for per-nent taking of property without just compensa-n; and that plaintiffs were not deprived of due ocess merely because the Act places the burden proof on all issues upon the applicant for a per-t. (Sloan-Florida)
7-10488

GRAM V CITY OF REDONDO BEACH IVERSE CONDEMNATION SUIT RESULT-G IN DAMAGES FOR FLOODING).
Cal Rptr 688-92 (Cal App 1975).

scriptors: *Condemnation, *Flooding, *Flood nage, *California, *Drainage effects, Water , Local governments, Cities, Floods, Sumps, Legal aspects, Overflow, Surface water, Damages, Percolation, Flow, Drainage systems, Flood control, Runoff, Drainage, Judicial decisions.
Identifiers: Citizen suits, Liability, Property interests, Proximate causation, Inverse condemnation.

Plaintiff landowners brought action against defendant city for water damages caused by a collapse of a retaining wall appurtenant to defendant's drainage sump. The trial court found for the defendant on the issue of liability. On appeal, the lower court found that the plaintiffs failed to establish any liability for inverse condemnation within the meaning of Article 1, Section 14 of the California Constitution. That section allows for compensation for any actual physical injury to real property which is proximately caused by deliberately designed and constructed public improvement. Previous cases had interpreted this to allow recovery if the public entity's work was a substantial cause of the injury. The lower court held that no damages to plaintiff occurred as a proximate result of the defendant's public improvement. The appellate court reversed, holding that the lower court used an incorrect principle of law with respect to causal responsibility. The collapse of the wall which released a flood onto the plaintiffs' properties could have been a substantial factor in causing the damages. Barring a finding by the lower court that the damages were the result solely of an unforeseen and intervening cause, inverse condemnation liability will result. (Petruff-Florida)
W77-10489

CRUMPTON V DEPARTMENT OF WATER RESOURCES (WATER RIGHTS CANCELLED AS A RESULT OF NONUSE).
559 P2d 927-30 (Or Ct App 1977).

Descriptors: *Oregon, *Appropriation, *Beneficial use, *Administrative agencies, *Permits, Water law, Legislation, Judicial decisions, Legal aspects, Diversion, Water rights, Irrigation, State governments, Irrigated land, Regulation, Water allocation(Policy), Irrigation water.
Identifiers: *Presumptions(Legal).

Petitioner land owners appealed an order of respondent department which cancelled certain water rights. The cancelled water rights dated from 1910 and allowed appropriation for irrigation purposes of what is now three parcels of land. The order cancelling the water rights to the entire first parcel and a portion of the second parcel was based on a state statute. The statute provides that when an owner of a water right ceases or fails to put the water to beneficial use for a period of five consecutive years, the right to use shall cease and the water right will be presumed to be abandoned. The respondent cancelled the water right upon substantiated evidence of such nonuse. This order was affirmed noncompliance with statutory proceedings which require a change of permit if a change is made in the point of diversion. The appellate court found that the respondent's findings and conclusions were insufficient to permit review. The order was remanded for entry of a more informative order. (Petruff-Florida)
W77-10490

ODOM V DELTONA CORPORATION (NON-MEANDERED LAKES IN FLORIDA ARE PRESUMED TO BE NON-NAVIGABLE IN THE ABSENCE OF EVIDENCE TO THE CONTRARY).
341 So2d 977-92 (Fla Sup Ct 1977).

Descriptors: *Florida, *Navigable waters, *Non-navigable waters, *Lakes, Riparian rights, Ownership of beds, Legal aspects, Judicial decisions, Bodies of water, Riparian waters, Swamps, State governments, Dredging, Real property, Lake shores, Lake beds, Ponds.
Identifiers: *Navigability, *Real property law, Fill permits, Navigability tests, Submerged lands, Swamp and Overflow Lands Grant Act, Sovereignty.

Plaintiff corporation sought declaratory relief against the Board of Trustees of the Internal Improvement Fund of the State of Florida. The Board had refused permission for the plaintiffs to alter certain unmeandered lakes to which plaintiffs laid claim under various chains of title; the Board's contention was that the lakes are 'the waters, beds, and shores of navigable waters' held in trust for the public by virtue of the state's sovereignty. Under federal and state common law there is no dispute as to the proposition that the beds and shores of navigable waters are held by the sovereign, but considerable litigation has arisen as to what constitutes navigability. The Supreme Court of Florida held that lakes which were not originally meandered by government surveyors and which were subsequently alienated are presumed to be non-navigable and hence the property of those to whom they had been conveyed, if the chain of title to the property falls within the provisions of the Florida Marketable Record Title Act. this presumption of non-navigability is rebuttable, however, by evidence of navigability. (Sloan-Florida)
W77-10491

APPROPRIATION OF WATER FOR USE OUTSIDE STATE.
Idaho Code Ann secs 42-401 thru -411 (1948), as amended, (Supp 1976).

Descriptors: *Water permits, *Idaho, *Appropriation, *Water distribution(Applied), *Water allocation(Policy), Water policy, Water rights, Wyoming, Nevada, Washington, Permits, Water management(Applied), *Water transfer, Interstate rivers, Interstate, State jurisdiction.

Public waters of Idaho may be appropriated for use in Oregon provided the interests of Idaho will not be harmed. The appropriation permit may be conditioned on the filing of a certificate from the receiving state showing that the intended appropriation will be used benefically. Idaho laws control the administration of water appropriations to sister states as long as the waters remain within Idaho. Appeals from agency-made permit decisions may be taken to the district court of the county in which the water at issue is located. Idaho will not authorize water appropriation to states which do not have reciprical legislation allowing appropriations into Idaho. Proof of completion of works within the sister state shall be made. Officials of the receiving state may be required to certify the completion of such works and to verify the capacity of reservoirs and conduits. Permit applications to divert and appropriate Idaho's waters into Washington are treated as if the proposed use were within Idaho. Permit applications for appropriations of Idaho's waters for domestic, livestock or irrigation uses within Nevada are also allowed as if the proposed use were within Idaho. (Josepher-Florida)
W77-10492

WATER AND LAND DEVELOPMENT (WATER RESOURCES DEVELOPMENT).
Hawaii Rev Stat secs 174-1 thru -22, 176-1 thru -9 (1968).

Descriptors: *Hawaii, *Irrigation programs, *Water resources development, *Water supply development, Comprehensive planning, Governments, State governments, Administrative agencies, Potential water supply, Water allocation(Policy), Water utilization, Economic impact, Competing uses, Legislation, Multiple-purpose projects, Municipal water, Domestic water, Water purification.

The state of Hawaii has determined that additional water and water facilities are necesary to the development of the state's economy, and has thus established the board of land and natural resources. The board is vested with the power of eminent domain to acquire water and water sources, the power to contract, and also the power to survey and conduct all studies necessary to carry out its duties. Additionally, the board is empowered to lay and collect annual acreage assessments within a project and to set and collect tools for the use of the board's water facilities. Procedures are established for the formation of irrigation projects either through the iniative of the board or by petition of landowners. The board also has responsibility for collecting and correlating all existing information concerning the water resources of the state, for surveying and inventorying the water resources, and for planning domestic and industrial water systems. (Moorhouse-Florida)
W77-10493

WATER DISTRICTS; WATER MASTERS; DISTRIBUTION OF WATER GENERALLY: CHANGE IN USE OR TRANSFER OF RIGHTS.
Ore Rev Stat secs 540.010 thru .990 (1973).

Descriptors: *Oregon, *Water districts, *Water management(Applied), *Water distribution(Applied), Water policy, Wells, Reservoirs, Well regulations, Water rights, Prior appropriation, Appropriation, Priorities, Dams, Water wells, Water users, Water works, Ditches, Water law, Legal aspects, Reservoir operation, Reservoir construction.

Oregon has enacted legislation providing that water districts may be created by the state engineer. Such districts are to be under the charge of a watermaster having supervisory powers. These watermasters have authority to make regulations regarding the use of all streams and wells within the districts. Various duties of the watermaster include the settlement of disputes as to water rights, regulation of water works and reservoirs in times of water scarcity, and regulation of headgates to ditches or the controlling works to wells or reservoirs. Persons requesting the use of a watermaster must pay the set statutory fee. Failure to pay will result in a lein on the appurtenant water work or land. It is also provided that construction of dams, dykes, and other hydraulic works are subject to inspection by the state engineer. Statutory procedures are set forth allowing owners of water rights to change water uses and places of use without a loss of priority. Injunctions, fines, and jail sentences are provided for statutory enforcement. (Josepher-Florida)
W77-10494

GROUND WATER ACT OF 1955 (REGULATION OF UNDERGROUND WATERS THRU A PERMIT SYSTEM).
Ore Rev Stat secs 537.505 thru .990 (1973).

Descriptors: *Oregon, *Groundwater resources, *Legislation, *Water allocation(Policy), *Water permits, Permits, Well regulations, Well permits, Wells, Appropriation, Stock water, Domestic water, Beneficial use, Water rights, Water resources development, Water management(Applied), Prior appropriation, Water conservation, Water measurement.

Oregon has enacted statutory provisions to insure that the groundwater of the state is benefically used. Most uses of ground water are unlawful without appropriation permits; however, certain noncommercial, domestic, single industrial and stockwatering uses are exempt from permit registration. Registration statements must be filed by all persons claiming appropriation rights which vested prior to this permit system. The required content of permit applications is described and procedures for determining relative rights to appropriate water from ground water reservoirs are detailed. The location, extent, capacity and quality of ground water sources are to be identified by the state. Provisions are included to prevent or control the depletion or waste of ground water supplies. In addition, well construction is regulated by stringent licensing and reporting requirements. (Josepher-Florida)
W77-10495

SCENIC WATERWAYS (DESIGNATION, ACQUISITION, AND PROTECTION).
Ore Rev Stat secs 390.805 thru .925 (1973).

Descriptors: *Oregon, *Scenic easements, *Scenery, *Wild rivers, *Conservation, Land development, Land appraisals, Wildlife conservation, Rivers, River flow, Land use, Land management, Landscaping, Permits, Scenic highways, State governments, Streams, Land resources, Wildlife.

Oregon has designated some of its rivers as 'scenic waterways'. The purpose of this designation is to strike a balance between policies permitting the construction of dams and other impoundments of rivers and policies which would preserve Oregon's rivers in their natural free-flowing state. Recreation, fish and wildlife uses are declared to be the highest and best uses of waters within scenic waterways. The construction of dams, reservoirs or other impoundments wihin scenic waterways is prohibited. Furthermore, land use within one-fourth of one mile on each side of river banks of scenic waterways is regulated so as to enhance the aesthetic value of the waterway itself. The construction of buildings, railroads, utilities, or business structures within scenic areas is prohibited unless state approval is obtained. The State Highway Commission is empowered to make purchases for the acquisition of easements and related adjacent lands. Procedures for the purchase of adjacent lands, assessment of property values, and transfer of public lands are also included. (Josepher-Florida)
W77-10496

SUBMERSIBLE AND SUBMERGED LANDS (STATE OWNERSHIP OR JURISDICTION).
Ore Rev Stat secs 274.005 thru .990 (1971).

Descriptors: *Oregon, *Submerged Lands Act, *Swamps, *Lake beds, *Tidal waters, Leases, Legal aspects, Bays, Streams, Lakes, Bids, State jurisdiction, State governments, Tidal marshes, Interest, Sulfur, Kelps, Drilling, Geological surveys, Geophysics.

Oregon has enacted legislation providing for the acquisition and ownership or rights, titles, or interests in submersible and submerged lands. Titles to submerged and submersible lands in Oregon which have not previously vested in any persons are now vested in the state. Sales, leases and easements of submersible lands owned by the state must be in accord with these provisions. The state may enter into contracts for drainage and reclamation of lakes, marshes, and swamps. The Division of State Lands may cause reclamation surveys, plans and specifications to be made. Also here included are provisions for removal of materials and for mineral extraction from the beds of streams, bays, and lakes. Additional provisions cover: bid procedures; sulfur, kelp, and drilling leases; applications for geological and geophysical surveys relating to tidal submerged and submersible lands; and ownership rights relating to the creation of new lands created upon submerged lands. (Josepher-Florida)
W77-10497

NATIONAL RENDERERS ASSOCIATION V ENVIRONMENTAL PROTECTION AGENCY (REVIEW OF EPA EFFLUENT LIMITATIONS FOR RENDERERS).
541 F2d 1281-92 (8th Cir 1976).

Descriptors: *Water pollution sources, *Administrative decisions, *Federal government, *Water quality standards, Legislation, Federal Water Pollution Control Act, Regulation, Permits, Administrative agencies, Industrial wastes, Effluents, Water pollution, Chemical industry, Food processing industry, Economics.
Identifiers: *Federal Water Pollution Control Act(FWPCA) Amendments of 1972, *Effluent guidelines.

Petitioner association and member companies sought direct review of regulations promulgated by the Environmental Protection Agency (EPA) setting standards for effluent discharges from new plants, under authority of the Federal Water Pollution Control Act of 1972. Petitioners alleged that technology other than that specified by the EPA would be needed, that the initial cost of the technology would be higher than estimated, and that annual costs would be so high that new plants would not be built. The EPA, while conceding some issues regarding the necessary technology presented evidence tending to show that the industry does have the ability to raise reasonable amounts of capital for pollution control equipment. The court defined its task as determining whether the EPA's decision was arbitrary, an abuse of discretion, or otherwise not in accordance with law. After a point-by-point analysis the court rejected the new source standards. The matter was remanded to the EPA for proceedings to determine the required technology, necessary costs, and an economic analysis of the ways in which the guidelines will affect construction of new plants. (Molloy-Florida)
W77-10498

UNITED STATES V RESERVE MINING COMPANY (DISCHARGE OF TACONITE TAILINGS INTO LAKE SUPERIOR CAUSING DISCOLORATION OF SURFACE WATER).
412 F Supp 705-14 (D Minn 1976).

Descriptors: *Mine wastes, *Asbestos, *Lake Superior, *Pollution abatement, *Minnesota, Permits, Regulation, State governments, Water purification, Water treatment, Strip mine wastes, Water allocation, Economics, Water pollution sources, Safety factors, Judicial decisions, Legal aspects, Penalties(Legal).
Identifiers: Standing(Legal), Duluth.

Plaintiffs sought an order imposing penalties for violations of state pollution control laws and excess costs for water purification treatment. Defendant mining company was discharging huge quantities of waste directly into Lake Michigan daily. In a suit to enjoin the activity, the defendant had caused delays in bad faith, and failed to properly answer discovery attempts. The court then imposed daily penalties for violations of the terms of defendant's discharge permit, for the period from enactment of the penalty statute until the discharge was enjoined. The costs of filtering asbestos from the drinking water of the city of Duluth were taxed against the defendant as Duluth had standing to sue as an injured party. In addition, suit costs and partial attorney's fees were charged the defendant because of the bad faith in failing to properly answer interrogratories and failing to respond to court orders. Discharges of taconite tailings into Lake Michigan could have been made on land within a reasonable cost-allocation, and defendant's allegation that such disposition was impossible had no foundation in fact. (Molloy-Florida)
W77-10499

ARTESIAN WELLS.
Utah Code Ann, sec 73-2-21 (1958).

Descriptors: *Legislation, *Utah, *Artesian wells, *State jurisdiction, *Water management(Applied), Water sources, Water wells, Wells, Water supply, Legal aspects, Water law, Administrative

lanning, Legislation, Preferences(Water rights), Vater control, Water rights, Water conservation, Vater policy, Public rights, Water loss, Regula-on.

he Utah state engineer is authorized to plug, epair, or otherwise control artesian wells which re wasting public water. He may, on behalf of the tate, enter into co-operative agreements with well wners. Under such agreements the state would gree to provide the necessary equipment and su-ervision for well control operations, or to share e expense. The state engineer shall exercise easonable precautions to preserve the flow of ater from such wells. In addition, abandoned ells on public lands or wasting wells on private nds may be plugged entirely at the expense of the ate. (Cowart-Florida)
77-10500

ELEASING DEAD ANIMALS, ETC., INTO OR EAR WATERS.
Va Code Ann secs 16-9-2 thru 16-9-3 (Supp 75).

escriptors: *West Virginia, *Legislation, *Water uality Act, *Public health, Water quality, Water ollution control, Streams, Running waters, reamflow, Water pollution, Banks, Riparian nd, Drainage systems, Roads, Urban runoff, ublic lands, Water law, Environmental sanita-on.

y person who knowingly and willfully throws or leases any dead animal, garbage, excrement or fensive substance into any well, stream, or other dy of water used for domestic purposes in West rginia is guilty of a misdemeanor. Similarly, the lease of such substances on land adjacent to nning water in such a location that high water or rmal drainage will wash the substance into the eam, the release of such substances on public ht-of-ways are also proscribed. Furthermore, e who knowingly permits such offensive materi- to remain on private property under his control 24 hours after notice of the public health enace or nuisance created thereby is guilty of a sdeamor. None of the above provisions are ap-cable to state regulated commercial and indus-al wastes. Conviction for either offense is nishable by a fine. The fine for release into mestic waters is punishable by ranges from 25 to dollars while the fine for the deposit of offen-e substances on public or private land ranges m 100 to 1000 dollars. The statutes provide for a parate punishable offense for each successive 24 ur period in which the material is not removed d destroyed. (Moorhouse-Florida)
7-10501

NSAS TASK FORCE TO DEVELOP WATER E PROGRAM TO RESOLVE SERIOUS OBLEMS,
primary bibliographic entry see Field 4B.
7-10522

BRASKA ISSUES REGULATIONS UNDER FE DRINKING WATER ACT OF 1976.
primary bibliographic entry see Field 5G.
7-10523

LTIFUNCTIONAL APPROACH TO POLLU-ON PREVENTION,
rkshire Water Authority (England).
primary bibliographic entry see Field 5G.
7-10638

E (WEST GERMAN) WASTE WATER CHARGE TAX LAW (DAS ABWASSERAB-BENGESETZ),
hnische Universitaet, Darmstadt (West Ger-y).
primary bibliographic entry see Field 5G.
7-10695

6F. Nonstructural Alternatives

DYNAMICS OF URBAN DEVELOPMENT ON FLOOD PLAINS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 4A.
W77-10179

OPTIMAL EXPANSION OF FLOOD CONTROL SYSTEMS, (FINAL REPORT: VOLUME I),
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering.
T. L. Morin, and Y. S. Shin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 643, Price codes: A04 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 121, March 1977, 56 p, 1 fig, 47 ref. OWRT A-079-ILL(1).

Descriptors: *Flood control, *Dynamic programming, Optimization, *Non-structural alternatives, *Methodology, *Planning, Algorithms, *Optimum development plans.
Identifiers: Structural and nonstructural measures, *Capacity expansion planning, Branch-and-bound, Water resources systems, *Myopic decision rules.

Despite substantial expenditures on flood protection structures, flood damages continue to increase. One explanation for this apparent paradox is that the structural measures often provide a false sense of security to existing and potential floodplain occupants and, as such, may actually result in increased flood damages, contrary to their intended purpose. This realization, among others, has led to an increasing interest in the role of nonstructural measures as an integral part of any overall flood protection plan. This report presents methodologies for the planning of flood control systems of structural measures, as well as a first cut at methodologies for the planning of flood control systems consisting of both structural and nonstructural measures. Specifically, myopic decision rules, dynamic programming and hydrid dynamic programming/branch-and-bound algorithms are developed for capacity expansion planning with both independent and dependent projects under budgetary constrants. Similar methodologies are also presented for capacity expansion planning with both deterministic and stochastic demand. The advantages and shortcomings of the methodologies are discussed and promising directions for future research are indicated. (See also W77-09927)
W77-10263

FLOODPLAIN ZONING--AN ALTERNATIVE APPROACH TO LAND REGULATION IN FLOOD HAZARD AREAS,
S. D. Mac Rae.
Shore and Beach, Vol 44, No 1, p 31-33, April 1976.

Descriptors: *Flood control, *Flood plains, *Floodways, *Michigan, *Flood plain zoning, Non-structural alternatives, Legislation, Flood data, State jurisdiction, Land use, Flood plain insurance, Land management, Flood protection, Flood frequency, Dredging, Legal aspects, Channel improvement, Water policy, Floodwater zoning.
Identifiers: *Environmental policy, State policy, Flood fringe districts.

In response to a flood hazard condition, Kalamazoo, Michigan has proposed floodplain regulations which establish floodway and flood fringe districts. A floodplain is an area of land adjoining a body of water which has been or may be covered by floodwater. Floodway districts are high flood hazard areas usually located adjacent to the principal channel while a flood fringe district is located just beyond the floodway. The reasonableness of a floodplain ordinance is based upon a determination of the extent of the flood hazard. Taken into account are such factors as historical evidence of flooding, flood frequency, and flood levels. Floodplain zoning provisions have been upheld by the courts under the broad health, safety, and general welfare language of zoning codes. Kalamazoo's regulations require floodway lands to remain open, thus lessening the potential for damages in the overall floodplain. Flood fringe areas are open to a wide variety of development provided that such development is protected from flood waters. Kalamazoo's regulations comply with Michigan floodplain management standards as well as the Federal Flood Insurance Program. The author feels that adoption of floodplain zoning provisions such as those proposed by Kalamazoo can significantly deter improper and indiscreet development in the floodplain. (Cocheu-Florida)
W77-10451

6G. Ecologic Impact Of Water Development

COMPARATIVE LIMNOLOGY OF DIFFERENTIALLY REGULATED SECTIONS OF A COLORADO MOUNTAIN RIVER,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
J. F. Ward.
Archiv fur Hydrobiologie, Vol. 78, No. 3, Sept. 1976, p. 319-342. 5 fig, 10 tab, 35 ref.

Descriptors: *Dams, *Streams, *Environmental effects, *Environmental gradient, Rivers, Gastropods, Chemical properties, *Colorado, Distribution, Limnology, Stoneflies, Algae, Invertebrates, Mayflies, Diptera.
Identifiers: *South Platte River(Colorado), *Deep-release dams, Gammarus, Submerged angiosperms, Macroinvertebrates.

The effects and extent of the ecologic impact of deep-release dams on the South Platte River on the east slope of the Continental Divide in the Rocky Mountains of Colorado was studied by means of all-year monititing of ecosystem parameters at four study sites differentially regulated by the dams. Greater development of algae and submerged angiosperms at more regulated sites were reflected in lower free carbon dioxide and higher pH values. Bound co-2 and total dissolved salts progressively decreased downstream from the dam, exhibiting lowest values at unregulated sites. Macroinvertibrates exhibited lower standing crops but much higher diversity at unregulated sites. Gammarus and gastropods were found only at regulated sites, whereas filipalpian stoneflies, heptageniid mayflies and certain dipterans were not found below the dam. These distribution restrictions are explained by differences in (1) chemical limiting factors; (2) distribution and abundance of submerged angiosperms and epilithic algae; (3) diversity of organic matter inputs; (4) predation pressure and competitive interactions; (5) environmental stability and predictability; and (6) thermal signals. (Harris-Wisconsin).
W77-10155

A GENERAL PURPOSE UNIVARIATE PROBABILITY MODEL FOR ENVIRONMENTAL DATA ANALYSIS,
Environmental Protection Agency, Washington, D. C., Office of Research and Development.
W. R. Ott, and D. T. Mage.
Computers and Operations Research, Vol. 3, No. 2/3, p 209-216, August 1976. 5 fig, 2 tab, 13 ref.

Descriptors: *Environment, *Data collections, *Probability, *Water quality, Air pollution, Water resources, Ohio River, Pollutants, Standards, Monitoring, Equations, Operations research, Biochemical oxygen demand.

Identifiers: *Univariate probability model, *Data analysis, Physical processes, Chemical processes, Diffusion processes.

The analysis of environmental quality data for decision making purposes generally requires a suitable univariate probability model. It is sometimes difficult, when many probability models are available, to select the most appropriate one for a given data set. The underlying physical laws which generate pollutant concentrations--diffusion processes--offer insight into which model may be most appropriate for a variety of situations. Treating the diffusion equation as a stochastic differential equation, the time series of pollution concentration data from diffusion phenomena is shown to have a distribution that is best approximated by the censored, 3-parameter lognormal probability model (LN3C). The model is applied to 10 air quality data sets (SO2, O3, CO, particulate, hydrocarbons, and NO2 from the United States, France, West Germany, and Denmark) and 9 water quaity data sets (BOD, coliform, chloride, and sulfate from the Ohio River). It is concluded that the LN3C probability model offers data analysts a superior, general purpose model suitable for a large variety of environmental phenomena. (Bell-Cornell)
W77-10291

AN ECOSYSTEM APPROACH TO THE PLANNING OF WATER POLLUTION CONTROL,
University of New England, Armidale (Australia). School of Natural Resources.
For primary bibliographic entry see Field 5G.
W77-10367

IMPACTS OF NUCLEAR RELEASES INTO THE AQUATIC ENVIRONMENT.
International Atomic Energy Agency Vienna (Austria).
For primary bibliographic entry see Field 5C.
W77-10384

ETUDE DE LA CONTAMINATION DE CONSTITUANTS DU MILIEU MARIN PAR DES FORMES SOLUBLES ET INSOLUBLES DE RADIONUCLIDES, (STUDY OF THE CONTAMINATION OF COMPONENTS OF THE MARINE ENVIRONMENT BY SOLUBLE AND INSOLUBLE FORMS OF RADIONUCLIDES),
CEA Centre de la Hague, Cherbourg (France). Laboratoire de Radioecologie Marine.
For primary bibliographic entry see Field 5C.
W77-10388

DREDGE RIVER CHANNEL: NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT (FINAL SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT).
Naval Facilities Engineering Command, Philadelphia, Pa. Northern Div.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 433 and ADA-031 435, Price codes: A99 in paper copy, A01 in microfiche. September 1976. 2 vols.

Descriptors: *Environmental effects, *Dredging, *Channel improvement, *Submarines, Spoil banks, Federal government, Disposal, Military aspects, Naval architecture, Earthworks, Rivers, Connecticut, Channels, Beds, Sedimentation, Project feasibility, Project planning, Project purposes, Alternate planning, Benefits, Costs, Engineers estimates.
Identifiers: *Environmental impact statement, Administrative regulations, Navigation obstructions.

This document reviews the environmental impact of river channel dredging operations at the naval submarine base in New London, Groton, Connecticut. The operations were undertaken to accommodate the new deep-draft SSN 688 class submarines as well as a related floating drydock facility. Approximately 2.8 to 2.9 million cubic yards of material would be dredged and deposited at a designated ocean disposal site. Both the commercial shipping and the commercial fishing industries would be enhanced due to an increase in channel depth and the removal of polluted sediments from the Thames River, thus increasing the productivity of the estuary. No short term or long term adverse environmental effects have been detected for either the dredging or disposal sites. Several alternative dredging and disposal techniques and systems were considered, however, the present program was deemed the most environmentally acceptable. Comments and suggestions were solicited from federal and state agencies as well as private organizations and individuals. They are included within the report. (Moorhouse-Florida)
W77-10454

A LONG-RANGE PROGRAM FOR MEETING THE PAPER INDUSTRY'S ENVIRONMENTAL PROTECTION TECHNICAL INFORMATION NEEDS,
National Council of the Paper Inustry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-10720

MODIFICATION OF ISLAND VEGETATION AFTER RISING GROUNDWATER LEVELS ON THE DANUBE ISLANDS AT OFFINGEN, (IN GERMAN),
Forstliche Forschungsanstalt, Munich (West Germany). Weldbauinstitut.
For primary bibliographic entry see Field 2I.
W77-10725

COLONIZATION OF IMPERILED PLANTS IN DREDGED LAKES OF THE UPPER RHINE PLAIN, (IN GERMAN),
Gruenlandwirtschaft Futerbau, Aulendorf (West Germany). Staatliche Versuchsanstalt.
For primary bibliographic entry see Field 2H.
W77-10730

7. RESOURCES DATA

7A. Network Design

GEOLOGICAL SURVEY RESEARCH 1976.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W77-10560

METHODOLOGY FOR RIVER-QUALITY ASSESSMENT WITH APPLICATION TO THE WILLAMETTE RIVER BASIN, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
D. A. Rickert, W. G. Hines, and S. W. McKenzie.
Branch of Distribution, USGS 1200 S. Eads St., Arlington, VA 22202. Circular 715-M, 1976. 55 p, 23 fig, 12 tab, 71 ref.

Descriptors: *Water quality, *Evaluation, *Methodology, *River basins, *Oregon, Assessments, Projects, Data collection, Water pollution sources, Chemical analysis, Trace elements, Nutrients, Dissolved oxygen, Algal control, Land development, Industrial wastes, Planning, Water resources development, Water quality control, *Willamette River Basin.

The U.S. Geological Survey completed an intensive river-quality assessment in the Willamette River basin, Oregon in 1976. The objectives were to (1) develop a practical framework for conducting comprehensive river-quality assessments; (2) determine the kinds and amounts of data required to adequately assess river-quality problems; (3) develop techniques for evaluating data and for presenting it so as to promote better public understanding of its significance; (4) develop and document methods for evaluating basin-development alternatives in terms of potential impacts on river quality; and (5) apply the framework, data, and methods to assess the existing or potential river-quality problems of the Willamette River basin. This circular covers the five objectives by examining overall project development and pertinent results from the assessment of four river-quality related problems. The assessed problems were: (1) the effect of population and industrial growth and resulting waste discharges on dissolved oxygen, (2) the potential for nuisance algal growths, (3) the possibility of trace-metal accumulation in river-bottom sediments, and (4) the potentially harmful effects of accelerated erosion resulting from intensified land use. The methods and results of the assessments are pertinent to resource issues being debated across the United States. (Woodard-USGS)
W77-10565

WATER-RESOURCES INVESTIGATIONS IN MONTANA, 1976.
Geological Survey, Helena, Mont. Water Resources Div.
U.S. Geological Survey Reston, Va. 22092. 1977. Folder.

Descriptors: *Water resources, *Investigations, *Montana, Surveys, Hydrologic data, Basic data collections, Streamflow, Sediment yield, Precipitation(Atmospheric), Groundwater, On-site investigations, Bibliographies, Networks, Maps.

Water-resources studies and investigations in Montana made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, are hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; groundwater observation wells; and water quality observation sites. Small State maps show areas covered by published and open-file groundwater reports, annual sediment yield of streams, principal sources of groundwater, discharge of the principal rivers, mean annual precipitation, flood-prone areas, average annual runoff, and quality of surface waters. A large map shows the hydrologic data network and investigations in Montana. (Woodard-USGS)
W77-10573

WATER-RESOURCES INVESTIGATIONS IN OKLAHOMA, 1976.
Geological Survey, Oklahoma City, Okla. Water Resources Div.
U.S. Geological Survey Reston, Va. 22092. 1977. Folder.

Descriptors: *Water resources, *Investigations, *Oklahoma, Surveys, Hydrologic data, Basic data collections, Streamflow, Groundwater, On-site investigations, Water level fluctuations, Bibliographies, Networks, Maps.

Water-resources studies and investigations in Oklahoma made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, are hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; groundwater observation wells; and water quality observation sites. Small State maps show average annual runoff, aver-

nnual precipitation, discharge and chemical quali-
y of principal rivers, principal sources of ground-
vater, basin reports on surface-water resources,
nd flood-prone areas. A larger map shows the
ydrologic data network and investigations in
klahoma. (Woodard-USGS)
77-10574

**VATER-RESOURCES INVESTIGATIONS IN
VYOMING, 1976.**
Geological Survey, Cheyenne, Wyo. Water
Resources Div.
Available from the U.S. Geological Survey
Reston, VA 22092. 1977. Folder.

Descriptors: *Water resources, *Investigations, Inter-agency cooperation, Wyoming, Surveys, Hydrologic data, Basic data collections, Streamflow, Runoff, Precipitation(Atmospheric), Flood plains, Groundwater, On-site investigations, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.

Water-resources studies and investigations in Wyoming made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; groundwater observation wells; and water quality observation sites. Small state maps show mean annual precipitation, average annual runoff, sediment concentrations in rivers, principal sources of groundwater, discharge of the principal rivers, flood-prone areas, and the dissolved solids in surface waters. A larger map shows the hydrologic data network and investigations in Wyoming. (Woodard-USGS)
W77-10575

**N EVALUATION OF PRECIPITATION GAGE
ENSITY IN A MOUNTAINOUS TERRAIN,**
ephen F. Austin State Univ., Nacogdoches, Tex.
hool of Forestry.
r primary bibliographic entry see Field 2B.
77-10800

3. Data Acquisition

**EASONAL OCEANIC PRECIPITATION
REQUENCIES FROM NIMBUS 5
ICROWAVE DATA,**
olorado State Univ., Fort Collins. Dept. of Atospheric Science.
r primary bibliographic entry see Field 2B.
77-10105

**ETERMINATION OF RAINFALL DISTRIBUONS FROM MICROWAVE RADIATION
EASURED BY THE NIMBUS 6 ESMR,**
sconsin Univ.-Madison. Dept. of Meteorology.
r primary bibliographic entry see Field 2B.
77-10106

FIELD EXPERIMENT ON THE CALIBRAON OF RADARS WITH RAINDROP DISOMETERS,
oming Univ., Laramie. Dept. of Atmospheric
ence.
primary bibliographic entry see Field 2B.
7-10112

**SATELLITE TECHNIQUE FOR QUANTITAELY MAPPING RAINFALL RATES OVER
E OCEANS,**
ional Aeronautics and Space Adminstration,
enbelt, Md. Goddard Space Flight Center.
primary bibliographic entry see Field 2B.

W77-10113

AN INVESTIGATION OF THE PARTICULATE PHASE OF ACID PRECIPITATION,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 2B.
W77-10178

THE DESIGN OF A FULLY AUTOMATIC LIQUID INJECTION APPARATUS FOR USE ON A CARBON ANALYSER,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W77-10209

A QUANTITATIVE SAMPLER FOR SUBMERGED AQUATIC MACROPHYTES,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
C. Howard-Williams, and T. G. Longman.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1, p 31-33, 1976. 1 fig, 1 tab, 6 ref.

Descriptors: *Bottom sampling, Aquatic plants, Biomass, Vegetation, Equipment, Submerged plants, Sampling.
Identifiers: South Africa, *Macrophytes, Swartvlei, Wilderness lakes, Potamogeton pectinatus.

A simple rotary sampler, capable of quantitatively harvesting submerged aquatic macrophytes, is described. The sampler can be operated from a boat and consists of central rod with a specially designed cutting blade at the base, and collecting hooks to catch the cut material. The values obtained with this sampler were not significantly different (at the 95% level of probability) from those obtained by manual cutting underwater. The rotary sampler has great advantages in terms of time, ease of positioning, and effort over hand cutting. (So. African Water Info. Center)
W77-10226

EVALUATION OF FRESHWATER WETLANDS DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2H.
W77-10267

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
For primary bibliographic entry see Field 2E.
W77-10296

CHANNEL SILTATION DETERMINED WITH SIDE-SCAN SONAR,
Army Engineer District, Portland, Oreg. Dredging Operations Div.
For primary bibliographic entry see Field 8B.
W77-10315

AUTOMATED HYDROGRAPHY FOR CHANNEL DREDGING,
Army Engineer District, Philadelphia, Pa. Survey Branch.
For primary bibliographic entry see Field 8B.
W77-10316

ACOUSTIC OCEANOGRAPHY,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-10318

EXPERIMENTAL DETERMINATION OF THE RADIO EMISSION OF THE UNDERLYING SURFACE ON LAMBDA = 2.1 CM,
Z. I. Gordon, and A. V. Frolov.
Soviet Hydrology, Selected Papers, Issue No. 4, p 256-260, 1975. 2 fig, 3 tab, 4 ref. Translated from Transactions of the Central Aerological Observatory (Trudy TsAO), No 116, p 68-76, 1974.

Descriptors: *Radiation, *On-site tests, *Surfaces, *Vegetation effects, On-site investigations, Remote sensing, Background radiation, Instrumentation, Measurement, Field crops, Corn(Field), Forests, Rivers, Grasses, Land, Radioactivity, Foreign research, Foreign countries, Soil moisture.
Identifiers: *Radiometer, Emissivity, Radio luminance temperature.

To solve meteorological and resource problems from a satellite, one must have information on the radio emission of the underlying surface. The surface contributes greatly to the radio luminance temperature recorded by an SHF radiometer on board a satellite or aircraft. A modulation radiometer, using a superheterodine circuit and having a response of 0.8 degrees and a time constant of 1 sec, was used to measure the radio emission of varying underlying surface areas under natural conditions. Emissivity, determined in the spring, summer, and autumn of 1971, was tabulated for cornfields, beet fields, forests, coastal shrubs, rivers, paths, grasses to left of paths, cut pea fields, and grasses under antenna. The radio luminance temperatures of given areas of the earth's surface can experience daily and seasonal fluctuations because of variation in the kinetic temperatures of the areas and because variations in emissivity produced by a change in the state of the surface, such as vegetation, soil moisture, etc. (Humphreys-ISWS)
W77-10322

TECHNIQUES FOR MEASURING STRESS IN SEA ICE,
Alaska Univ., College. Inst. of Arctic Environmental Engineering.
For primary bibliographic entry see Field 2C.
W77-10507

INSPECTION AND REPAIR OF MAIN-SEWERS (L'INSPECTION ET LA REPARATION DES COLLECTEURS D'EGOUTS),
For primary bibliographic entry see Field 5D.
W77-10541

AUTOMATIC NETWORK ANALYSIS BY MICROCOMPUTER.
For primary bibliographic entry see Field 5B.
W77-10544

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS.
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-10662

AN OVERVIEW OF THE APPLICATIONS SYSTEM VERIFICATION TEST ON SNOWCOVER MAPPING,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2C.
W77-10663

THE APPLICATION OF HYDROMETEOROLOGICAL DATA OBTAINED BY REMOTE SENSING TECHNIQUES FOR MULTIPURPOSE RESERVOIR OPERATIONS,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 4A.

W77-10664

INTERPRETATION OF SNOWCOVER FROM SATELLITE IMAGERY FOR USE IN WATER SUPPLY FORECASTS IN THE SIERRA NEVADA,
California State Dept. of Water Resources, Sacramento. Snow Surveys Branch.
For primary bibliographic entry see Field 4A.
W77-10665

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS IN RIO GRANDE DRAINAGE OF COLORADO,
Soil Conservation Service, Denver, Colo.
For primary bibliographic entry see Field 4A.
W77-10666

OPERATIONAL APPLICATION OF SATELLITE SNOWCOVER OBSERVATIONS-NORTHWEST UNITED STATES,
Bonneville Power Administration, Beaverton, Oreg. Hydrology Section.
F. A. Limpert.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 71-85, 1975. 3 fig, 5 tab, 2 ref.

Descriptors: *Remote sensing, *Snow cover, *Runoff, *Columbia River, *Pacific Northwest U.S., Satellites(Artificial), Snowpacks, Snow, Snowmelt, Watersheds(Basins), Hydroelectric power, Streamflow, Rivers, Projects, Mapping.
Identifiers: *LANDSAT data.

A demonstration project has been undertaken in the Pacific Northwest to determine the applicability of satellite snowcover observations for operational use in three test areas of the Columbia River Basin. It is still too early to draw any definite conclusions on the use of satellite data for determining area of snowcover in this region; particularly with the large number of cloud-covered days, the problem of determining the snowline in forested areas, and the lack of high resolution with the Synchronous Meteorological Satellite (SMS) data. The addition of new satellites this past year and future improvement in resolution should materially improve satellite data. Yet to be tested is the turn around time in getting the satellite data from the receiver sites to the user for real-time application. Nonetheless, what we have seen to date shows that satellite determination of snow coverage is a promising adjunct to our current methods. Continuation of our project, particularly with the deep snowpack and late runoff experienced in 1975, should provide us with much added information. (See also W77-10662) (Sims-ISWS)
W77-10667

UTILIZATION OF LANDSAT MONITORING CAPABILITIES FOR SNOWCOVER DEPLETION ANALYSIS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W77-10670

OPERATIONAL USE OF LANDSAT IMAGERY FOR THE ESTIMATION OF SNOW AREAL EXTENT,
California Univ., Berkeley. Remote Sensing Research Program.
E. F. Katibah.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 129-142, 1975. 4 fig, 5 tab, 11 ref. NASA NGL 05-003-404.

Descriptors: *Remote sensing, *Snow cover, *Runoff, Satellites(Artificial), Snowpacks, Snow, Snowmelt, Melting, Streamflow, Data processing, Analytical techniques, Watersheds(Basins), Streamflow.
Identifiers: *LANDSAT data.

Quantification of the surface area of snow covering watersheds can be a useful parameter in estimating snow water content for inclusion in water runoff prediction equations. This paper documented an operational manual interpretation technique which allows fast and accurate estimates to be made of the areal extent of snow parameter using LANDSAT-1 imagery. The analysis procedures and the statistical results were presented in this paper. (See also W77-10662) (Sims-ISWS)
W77-10671

OPERATIONAL APPLICATIONS OF NOAA-VHRR IMAGERY IN ALASKA,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 4A.
W77-10672

EMPLOYMENT OF SATELLITE SNOWCOVER OBSERVATIONS FOR IMPROVING SEASONAL RUNOFF ESTIMATES,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 4A.
W77-10673

APPLICATIONS OF SATELLITE SNOW COVER IN COMPUTERIZED SHORT-TERM STREAMFLOW FORECASTING,
For primary bibliographic entry see Field 4A.
W77-10674

SIERRA NEVADA SNOW MELT FROM SMS-2,
National Environmental Satellite Service, Redwood City, Calif. Satellite Field Services Station.
For primary bibliographic entry see Field 2C.
W77-10675

SYNOPSIS OF CURRENT SATELLITE SNOW MAPPING TECHNIQUES, WITH EMPHASIS ON THE APPLICATION OF NEAR-INFRARED DATA,
Environmental Research and Technology, Inc., Concord, Mass.
For primary bibliographic entry see Field 2C.
W77-10676

APPROACHES TO DIGITAL SNOW MAPPING WITH LANDSAT-1 DATA,
Zurich Univ. (Switzerland). Dept. of Geography.
For primary bibliographic entry see Field 2C.
W77-10677

AN ALL DIGITAL APPROACH TO SNOW AREAL MAPPING AND SNOW MODELING,
California Univ., Davis.
For primary bibliographic entry see Field 2C.
W77-10678

DIGITAL SNOW MAPPING TECHNIQUE USING LANDSAT DATA AND GENERAL ELECTRIC IMAGE 100 SYSTEM,
General Electric Co., Beltsville, Md.
For primary bibliographic entry see Field 2C.
W77-10679

SNOW COVER MONITORING BY MACHINE PROCESSING OF MULTITEMPORAL LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 2C.
W77-10680

SNOWCOVER MAPPING BY MACHINE PROCESSING OF SKYLAB AND LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 2C.
W77-10681

A PROGRESS REPORT ON ESTIMATING SNOW DEPTH USING VHRR DATA NOAA ENVIRONMENTAL SATELLITES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-10682

A COMPARISON OF OPERATIONAL AND LANDSAT-AIDED SNOW WATER CONTENT ESTIMATION SYSTEMS,
California Univ., Berkeley. Social Science Group.
For primary bibliographic entry see Field 2C.
W77-10683

RED AND NEAR-INFRARED SPECTRAL REFLECTANCE OF SNOW,
Cold Regions Research and Engineering Laboratory, Hanover, N.H.
For primary bibliographic entry see Field 2C.
W77-10684

REMOTE SENSING OF SNOWPACK DENSITY USING SHORTWAVE RADIATION,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-10685

MICROWAVE EMISSIONS FROM DRY AND WET SNOW,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2C.
W77-10687

APPLICATION OF BAYESIAN DECISION THEORY TO AIRBORNE GAMMA SNOW MEASUREMENT,
National Weather Service, Portland, Oreg. River Forecast Center.
For primary bibliographic entry see Field 2C.
W77-10688

SUMMARY OF THE OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS WORKING SESSION - AUGUST 1975,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2C.
W77-10689

ANALYSIS OF DATA FROM INSTRUMENTATION PROGRAM, COLUMBIA LOCK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 8G.
W77-10783

NALYTICAL EVALUATION OF ECHNIQUES FOR USE OF A LASER DOP-LER VELOCIMETER TO MEASURE FLOW ND TURBULENCE,
olorado State Univ., Fort Collins. Dept. of ysics.
or primary bibliographic entry see Field 2E.
77-10784

TRAIN METERS AND STRESS METERS FOR MBEDMENT IN MODELS OF MASS ONCRETE STRUCTURES; REPORT 2, VALUATION OF MICRODOT EMBEDMENT TRAIN GAGE,
my Engineer Waterways Experiment Station, cksburg, Miss. Concrete Lab.
or primary bibliographic entry see Field 8G.
77-10785

N EVALUATION OF PRECIPITATION GAGE ENSITY IN A MOUNTAINOUS TERRAIN,
ephen F. Austin State Univ., Nacogdoches, Tex. hool of Forestry.
r primary bibliographic entry see Field 2B.
77-10800

C. Evaluation, Processing and Publication

SATELLITE TECHNIQUE FOR QUANTITA-VELY MAPPING RAINFALL RATES OVER E OCEANS,
tional Aeronautics and Space Adminstration, eenbelt, Md. Goddard Space Flight Center.
r primary bibliographic entry see Field 2B.
7-10113

RPS-WIDE CONFERENCE ON COMPUTER-DED DESIGN IN STRUCTURAL ENGINEER-G. VOLUME VI. GATES, STOP LOGS, AND ASHRACKS,
ice of the Chief of Engineers (Army), Washing-, D.C. Structural Section.
primary bibliographic entry see Field 8C.
7-10135

RPS-WIDE CONFERENCE ON COMPUTER-DED DESIGN IN STRUCTURAL ENGINEER-G. VOLUME IX. SHEET PILE WALLS AND VALLS,
ny Engineer District, New Orleans, Louisiana, ign Branch.
primary bibliographic entry see Field 8B.
7-10136

COMMENDATIONS FOR THE ROUTINE CORDING OF BOREHOLE DATA FOR DROGEOLOGICAL PURPOSES,
ional Physical Research Lab., Pretoria (South ca).
primary bibliographic entry see Field 4B.
7-10224

ALUATION OF FRESHWATER WETLANDS INITIONS,
necticut Univ., Storrs. Inst. of Water ources.
primary bibliographic entry see Field 2H.
-10267

ELOPMENT OF A COMPREHENSIVE TVA TER RESOURCE MANAGEMENT PRO-AM,
nessee Valley Authority, Knoxville.
primary bibliographic entry see Field 6A.
-10289

A GENERAL PURPOSE UNIVARIATE PROBABILITY MODEL FOR ENVIRONMENTAL DATA ANALYSIS,
Environmental Protection Agency, Washington, D. C., Office of Research and Development.
For primary bibliographic entry see Field 6G.
W77-10291

AN EVALUATION OF ECONOMIC AND DEMOGRAPHIC DATA USEFUL IN WATER RESOURCES PLANNING.
Bureau of Economic Analysis, Washington, D.C. Regional Economic Analysis Div.
For primary bibliographic entry see Field 6B.
W77-10295

ANALYSIS OF THE STOCHASTIC COINCIDENCE OF CERTAIN HYDROLOGICAL PROCESSES,
For primary bibliographic entry see Field 2E.
W77-10299

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VII. SINGLE- AND MULTICELL CONDUITS AND TUNNELS,
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 8A.
W77-10333

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VIII. PILE FOUNDATIONS AND SHEET PILE CELLS,
Army Engineer Div. Southwestern, Dallas, Tex.
For primary bibliographic entry see Field 8A.
W77-10334

HIERARCHICAL ANALYSES OF WATER RESOURCES SYSTEMS, MODELING AND OPTIMIZATION OF LARGE-SCALE SYSTEMS,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 6A.
W77-10418

APPLICATION OF MATHEMATICAL MODELS IN HYDROLOGY AND WATER RESOURCES SYSTEMS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2A.
W77-10419

A NEW METHOD FOR MODELLING MONTHLY DISCHARGE SERIES,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W77-10425

PERFORMANCE OF TWO DETERMINISTIC HYDROLOGICAL MODELS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 4A.
W77-10426

SIMULATION OF THE HYDROLOGICAL CYCLE OVER THE TISZA VALLEY USING ATMOSPHERIC WATER VAPOUR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W77-10427

A HYDROLOGICAL MODEL WITH PHYSICALLY REALISTIC PARAMETERS,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2A.
W77-10428

APPLICATION OF DYNAMIC PROGRAMMING TO MODEL TRI-DIMENSIONAL FLOW IN POROUS MEDIA (APPLICATION DE LA PROGRAMATION DYNAMIQUE AUX MODELES TRIDEMENSIONNELS DE CALCUL DES ECOULEMENTS DANS LES MILIEUX POREUX),
Tehran Univ. (Iran), Dept. of Irrigation.
For primary bibliographic entry see Field 2F.
W77-10429

STOCHASTIC IDENTIFICATION OF NON-LINEAR HYDROLOGICAL SYSTEMS,
Pittsburg Univ., Pa. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2A.
W77-10431

CHARACTERISTICS OF RAINFALL CELL PATTERNS IN THE SOUTHEAST COASTAL PLAIN AREAS OF THE USA, AND A COMPUTER SIMULATION MODEL OF THUNDERSTORM RAINFALL,
Middle East Technical Univ. Ankara (Turkey).
For primary bibliographic entry see Field 2B.
W77-10435

APPLICATION OF CONCEPTUAL RAINFALL-RUNOFF MODELS IN A COMPLEX PROGRAM,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 2A.
W77-10437

GENERATION OF HYDROLOGIC AND WATER RESOURCES SAMPLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10441

DATA COLLECTION, ANALYSIS AND INSTRUMENTATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10442

MAPS OF SHORE AND NEARSHORE STRUCTURES, SHORE AND BLUFFLINE POSITIONS, THE 100-YEAR ANTICIPATED RECESSION LINE AND SHORE OWNERSHIP,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
For primary bibliographic entry see Field 2J.
W77-10506

LAKE ONTARIO ATLAS: LAKE TEMPERATURES,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 2H.
W77-10508

GREAT LAKES WATER TEMPERATURES, 1966-1975,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W77-10510

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 1. ARKANSAS RIVER BASIN, RED RIVER BASIN, SABINE RIVER BASIN, NECHES RIVER BASIN, TRINITY RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 081, Price codes: A25 in paper copy, A01 in microfiche. Water-Data Report TX-75-1, Vol 1, June 1976. 566 p, 5 tab, 23 ref.

Descriptors: *Texas, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments, Arkansas River Basin, Red River Basin, Sabine River Basin, Neches River Basin, Trinity River Basin.

Surface-water data for the 1975 water year for Texas are presented in three volumes, appropriately identified as to content by river basins. This volume (Volume 1) includes the Arkansas, Red, Sabine, Neches, and Trinity River basins and the intervening coastal basins. Data consist of records of stage, discharge, and water quality of streams and canals; and stage, contents, and water quality of lakes and reservoirs. Also included are crest-stage and flood-hydrograph partial-record stations, reconnaissance partial-record stations, and low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. (See also W77-10553 and W77-10554) (Woodard-USGS)
W77-10552

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 2. SAN JACINTO RIVER BASIN, BRAZOS RIVER BASIN, SAN BERNARD RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-257 082, Price codes: A19 in paper copy, A01 in microfiche. Water-Data Report TX-75-1, Vol 2, June 1976. 435 p, 5 tab, 31 ref.

Descriptors: *Texas, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments, San Jacinto River Basin, Brazos River Basin, San Bernard River Basin.

Surface-water data for the 1975 water year for Texas are presented in three volumes, appropriately identified as to content by river basins. This volume (Volume 2) includes the San Jacinto, Brazos, and San Bernard River basins and the intervening coastal basins. Data consist of records of stage, discharge, and water quality of streams and canals; and stage, contents, and water quality of lakes and reservoirs. Also included are crest-stage and flood-hydrograph partial-record stations, reconnaissance partial-record stations, and low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. (See also W77-10552 and W77-10554) (Woodard-USGS)
W77-10553

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 3. COLORADO RIVER BASIN, LAVACA RIVER BASIN, GUADALUPE RIVER BASIN, NUECES RIVER BASIN, RIO GRANDE BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 083, Price codes: A22 in paper copy, A01 in microfiche. Water-Data Report TX-75-1, Vol 3 June 1976. 510 p, 5 tab, 31 ref.

Descriptors: *Texas, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments, Colorado River Basin, Lavaca River Basin, Guadalupe River Basin, Nueces River Basin, Rio Grande Basin.

Surface-water data for the 1975 water year for Texas are presented in three volumes, appropriately identified as to content by river basins. This volume (Volume 3) includes the Colorado, Lavaca, Guadalupe, Nueces, and Rio Grande basins and intervening coastal basins. Data consist of records of stage, discharge, and water quality of streams and canals; and stage, contents, and water quality of lakes and reservoirs. Also included are crest-stage and flood-hydrograph partial-record stations, reconnaissance partial-record stations, and low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. (See also W77-10552 and W77-10553) (Woodard-USGS)
W77-10554

WATER-QUALITY DATA FOR THE EAGLE RIVER VALLEY IN THE VICINITY OF EAGLE AND VAIL, WEST-CENTRAL COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-10555

INDEX OF PUBLISHED SURFACE-WATER-QUALITY DATA FOR OKLAHOMA 1946-1975,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
J. D. Stoner.
Open-file report 77-204, March 1977. 212 p, 3 fig, 4 tab.

Descriptors: *Water quality, *Surface waters, *Water analysis, *Oklahoma, Documentation, Data collections, Stations, Chemical analysis.

Surface water-quality data for Oklahoma have been published by the U.S. Geological Survey in cooperation with various State agencies on an annual basis since 1949. The published data represent 2,733 station-years of data from 527 stations, ranging from one sample from a station once during the thirty-year period to a continuously operating daily station where more than one hundred samples were collected in a year. The index was designed to provide the data user a means of rapid search for stations by downstream order, county, and alphabetically by stream or station name. The data types are divided into 10 broad water-quality categories. (Woodard-USGS)
W77-10567

A SIMPLE EFFECTIVE METHOD FOR THE COMPUTER SIMULATION OF GROUND-WATER STORAGE AND ITS APPLICATION IN THE DESIGN OF WATER RESOURCE SYSTEMS,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W77-10660

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS.
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-10662

AN OVERVIEW OF THE APPLICATION SYSTEM VERIFICATION TEST ON SNOW COVER MAPPING,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2C.
W77-10663

THE OPERATIONAL PROGRAM OF SATELLITE SNOWCOVER OBSERVATION ... NOAA/NESS.
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 4A.
W77-10668

USE OF AREAL SNOW COVER MEASUREMENTS FROM ERTS-1 IMAGERY IN SNOW MELT-RUNOFF RELATIONSHIPS ... ARIZONA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2C.
W77-10669

SYNOPSIS OF CURRENT SATELLITE SNOW MAPPING TECHNIQUES, WITH EMPHASIS ON THE APPLICATION OF NEAR-INFRARED DATA,
Environmental Research and Technology, Inc., Concord, Mass.
For primary bibliographic entry see Field 2C.
W77-10676

APPROACHES TO DIGITAL SNOW MAPPING WITH LANDSAT-1 DATA,
Zurich Univ. (Switzerland). Dept. of Geography.
For primary bibliographic entry see Field 2C.
W77-10677

AN ALL DIGITAL APPROACH TO SNOW AREAL MAPPING AND SNOW MODELING,
California Univ., Davis.
For primary bibliographic entry see Field 2C.
W77-10678

DIGITAL SNOW MAPPING TECHNIQUES USING LANDSAT DATA AND GENERAL ELECTRIC IMAGE 100 SYSTEM,
General Electric Co., Beltsville, Md.
For primary bibliographic entry see Field 2C.
W77-10679

SNOW COVER MONITORING BY MACHINE PROCESSING OF MULTITEMPORAL LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 2C.
W77-10680

SNOWCOVER MAPPING BY MACHINE PROCESSING OF SKYLAB AND LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 2C.
W77-10681

UMMARY OF THE OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS WORKING SESSION - AUGUST 20, 1975,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2C.
W77-10689

TABILIZATION OF POTENTIALLY LIQUEFIABLE SAND DEPOSITS USING GRAVEL DRAINS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-10777

ENGINEERING WORKS

HE KWA DABEKA-CLERMONT SEWERAGE CHEME-PLANNING, DESIGN AND OPERATION,
Theron (J. C.), Burke and Isaac, Inc. (South Africa).
For primary bibliographic entry see Field 5D.
W77-10220

A. Structures

ORPS-WIDE CONFERENCE ON COMPUTER-DED DESIGN IN STRUCTURAL ENGINEERING. VOLUME IX. SHEET PILE WALLS AND WALLS,
Army Engineer District, New Orleans, Louisiana, Design Branch.
For primary bibliographic entry see Field 8B.
W77-10136

SANITARY ENGINEER'S VIEWPOINT ON LL BUILDINGS,
Murray (Alex) Pty Ltd., Durban (South Africa).
T. Murray.
Municipal Administration and Engineering, Vol. No. 487, p 48-61, 1976. 7 fig.

Descriptors: *Drainage systems, *Buildings, Design, Installation, *Plumbing, Standards, Fees, Architecture, Maintenance costs, Waste Disposal, Sewerage, Education, *Sanitary engineering.
Identifiers: South Africa, Sovent system.

The shortcomings of the present approach to the design of plumbing and drainage systems for tall buildings are discussed. The urgent need for specialized education and areas of necessary improvement are covered. Modern complex buildings of more than 12 floors are discussed. (So African Water Info Center)
W77-10213

RPS-WIDE CONFERENCE ON COMPUTER-ED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VII. SINGLE- AND MULTICELL NDUITS AND TUNNELS,
Army Engineer District, Tulsa, Okla.
V. Henson, C. M. Terzian, and R. J. Smith.
Volume 7 of the Proceedings of a Conference held September 22-26, 1975, New Orleans, Louisiana. Army Engineer Waterways Experiment Station Vicksburg, Mississippi, August 1976. 56 p, 4 fig, 2 tab, 6 ref, 1 append. N. Radhakrishnan, editor.

Descriptors: *Computer programs, *Tunnels, *Conduits, Construction, Tunnel construction, Dams, Levees, Design, Computers, Computer models, Structural models, Conferences, Structural design, Structural analysis, Engineering, Civil engineering.
Identifiers: *Computer-aided design, Single-cell conduits, Multi-celled conduits.

This paper examined the computer-aided design of cast-in-place single-barrer conduits through embankment type dams and levees. Circular and oblong shapes under high fill were emphasized. The paper used design criteria defined in EM 1110-2-2902, Conduits, Culverts and Pipes. Design loads are groundwater and surcharge water, internal water pressure, concentrated live loads, and backfill. The circular shapes were analyzed as rings of uniform thickness. Shearing and diagonal tension stresses are less critical for the circular shapes than those in the ACI code. A computer program rating procedure composed of 15 elements was devised to evaluate programs useful for the design of multicell conduits. The concrete conduits typically are used for river diversion through urban areas and in earthen dam embankments under high fills. Most Crops constructed tunnels are either water conveyance or transportation tunnels driven through rock. This paper was limited to ways in which the computer can be used to aid the structural engineer in the design of such tunnels. (See also W77-10334). (Sims-ISWS)
W77-10333

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VIII. PILE FOUNDATIONS AND SHEET PILE CELLS,
Army Engineer Div. Southwestern, Dallas, Tex.
B. H. James, T. J. Mudd, T. Gaddie, and H. Gray.
Volume 8 of the Proceedings of a Conference held September 22-26, 1975, New Orleans, Louisiana. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, August 1976. 74 p, 38 fig, 2 tab, 35 ref, 2 append. N. Radhakrishnan, editor.

Descriptors: *Piles(Foundations), *Cofferdams, *Sheet piling, Steel piles, Retaining walls, Structures, Engineering structures, Computer programs, Computer models, Foundations, Walls, Design, Structural design, Structural engineering, Hydraulic structures, Engineering, Civil engineering, Conferences.
Identifiers: *Computer-aided design.

Two papers were contained in this volume: PILE FOUNDATIONS - The state of the art concerning the design of pile foundations was presented. Topics presented include design philosophy, design methods, and the computer programs which are currently available for rigid structures. Selection of the preferred design method was made, giving consideration to types of structures for which they should be used. Recommendations also were made concerning the adoption of a standard computer program for Corps-wide use. CELLULAR SHEET PILE STRUCTURES - The first cellular cofferdam, constructed of sheet steel piling, was built in 1909. the cellular sheet pile construction technique is still most commonly used for cofferdams. Other applications are fixed crest dams and weirs, navigation lock walls, mooring cells, retaining walls, and substructures for concrete gravity superstructures. The most common configurations for cellular sheet pile structures are circular cell, diaphragm, and cloverleaf. The circular cell type is preferred for construction in river currents. Diaphragm-type cells are economical for moderate height structures in still water. Where there is no room for stability berms and large cells are needed for stability, the cloverleaf configuration is practical. (See also W77-1033) (Sims-ISWS)
W77-10334

PUBLIC LAW ALLOWS MITIGATION OF SHORE EROSION DAMAGE BY CORPS OF ENGINEERS,
Office of the Chief of Engineers (Army), Washington, D.C. Construction Operations Div.
For primary bibliographic entry see Field 6E.
W77-10450

MAPS OF SHORE AND NEARSHORE STRUCTURES, SHORE AND BLUFFLINE POSITIONS, THE 100-YEAR ANTICIPATED RECESSION LINE AND SHORE OWNERSHIP,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
For primary bibliographic entry see Field 2J.
W77-10506

MAN-MADE GEOTHERMAL ENERGY SOURCE USES OIL-FIELD KNOW-HOW.
Oil and Gas Journal, Vol 75, No 29, p 59, July 18, 1977.

Descriptors: *Thermal power, *Deep wells, *Geothermal studies, Drilling, New Mexico.
Identifiers: Hydraulic fracturing.

Modified oil-well drilling and fracturing techniques have been used by the Los Alamos, New Mexico, Scientific Laboratory to create a man-made geothermal energy source. The system involves two holes drilled almost 2 miles deep that are separated at the surface by about 250 feet. A heat exchange surface of rock with a temperature of about 400 degress F was exposed via hydraulic fracturing and development of a network of cracks. Water pumped downhole at 900-1000 psi circulates through the crack system and flows from the second hole at 265 degrees F. Back pressure is applied to the second hole to prevent water from boiling until pressure is released at the surface. (Eberle-NWWA)
W77-10515

COLLECTION, TREATMENT AND REUTILIZATION OF WASTE WATERS IN ARID ZONES OF THE MIDDLE EAST,
Taylor (John) and Sons, London (England).
For primary bibliographic entry see Field 5D.
W77-10591

PVC SEWER PIPE SURVIVES DEEP BURIAL.
For primary bibliographic entry see Field 8G.
W77-10592

8B. Hydraulics

BUOYANT SURFACE DISCHARGE AND SMALL-SCALE OCEANIC FRONTS: A NUMERICAL STUDY,
Catholic Univ. of America, Washington, D.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-10104

INCIPIENT TRANSPORT OF FINE GRAINS AND FLAKES BY FLUIDS-EXTENDED SHIELDS DIAGRAM,
Imperial Coll. of Science and Technology London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-10116

EVOLUTION OF MULTIJET SLEEVE VALVE,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 8C.
W77-10117

PROPORTIONAL WEIRS AS VELOCITY CONTROLLING DEVICES,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
L. Rao, N. S. Rao, and D. Chandrasekaran.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY6, Proceedings Paper 13016, p 633-648, June 1977. 5 fig, 2 tab, 10 ref, 2 append.

Descriptors: *Weirs, *Velocity, *Canals, Discharge coefficient, Sedimentation, Sediment control, Orifices, Settling basins, Settling velocity, Hydraulics.
Identifiers: *Proportional weirs, Velocity controlling devices, Settling chambers.

Of the many factors that govern the settling phenomenon, the flow velocity in the settling tanks can be controlled favorably by fixing suitably designed weirs at the outlets of the tanks. The velocity at the bottom should not dislodge the particles that have already settled. The requirements might be met by velocities which are controlled to be constant with respect to the depth of flow, or by velocities which reduce linearly with increasing depth or velocities that vary inversely with the depth. To achieve these types of velocity control, new proportional weirs were designed. Very near to the outlet of the tank, over a small length, the flow was found to be turbulent and noncompliant with the expected type of velocity control. This small length of the disturbance may be provided over and above the theoretical settling length of the tank for efficient sedimentation. (Lee-ISWS)
W77-10118

ON THE PROBLEM OF FLUID FLOW UNDER A SLUICE GATE,
California Univ., Berkeley. Dept. of Mechanical Engineering.
D. A. Caulk.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 778, Price codes: A03 in paper copy, A01 in microfiche. AM-76-3, June 1976. 24 p, 1 fig, 14 ref, 1 append. ONR N00014-76-C-0474.

Descriptors: *Sluice gates, *Supercritical flow, *Froude number, *Hydraulic jump, Steady flow, Mathematical studies, Free surfaces, Hydraulics, Energy equation, Flow.
Identifiers: *Inviscid fluid, *Conformal mapping, Two-dimensional theory.

The flow of an inviscid, incompressible fluid under a sluice gate was concerned. The problem was approached on the basis of the two-dimensional theory of a directed fluid sheet developed recently by Green, Laws, and Naghdi. In the context of this theory, the appropriate jump conditions at the sluice gate were discussed, and the exact solution was obtained for the region on each side of the gate. Also discussed was the relationship of the solution obtained to previous treatments of the same problem. (Singh-ISWS)
W77-10134

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VI. GATES, STOP LOGS, AND TRASHRACKS,
Office of the Chief of Engineers (Army), Washington, D.C. Structural Section.
For primary bibliographic entry see Field 8C.
W77-10135

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME IX. SHEET PILE WALLS AND T-WALLS,
Army Engineer District, New Orleans, Louisiana, Design Branch.
W. D. Judlin, III, and R. Veselka.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-031251, Price Codes: A04 in paper copy, A01 in microfiche. Volume 9 of the Proceedings of a Conference held September 22-26, 1975, New Orleans, Louisiana. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, August 1976. 57 p, 9 fig, 5 append. N. Radhakrishnan, editor.

Descriptors: *Walls, *Retaining walls, *Levees, *Sheet piling, Structures, Engineering structures, Computer programs, Computer models, Design, Structural design, Structural engineering, Hydraulic structures, Engineering, Civil engineering, Conferences.
Identifiers: *Computer-aided design, T-walls.

Two papers were contained in this volume: SHEET PILE WALLS -Cantilever and tieback sheet pile walls can be used for retaining walls and floodwalls. A cantilever sheet pile wall is a continuous diaphragm of interlocking sheet piling supported against lateral loads only by the soil around it. A tieback sheet wall has the same components and is supported by the surrounding soil and exterior supports. The two types of sheet pile walls were compared for suitability in various applications. Earth pressure design methods (free earth support and fixed earth support) and the flexible soil support method were compared. The design techniques are all suitable for computer applications. A listing of available computer programs was included. INVERTED T-TYPE FLOODWALLS AND CANTILEVER T-TYPE RETAINING WALLS - Corps of Engineers criteria for the design/analysis of inverted T-type reinforced concrete cantilever floodwalls and retaining walls were summarized. A list of all T-wall computer programs in use throughout the Corps of Engineers was enclosed. CADSE Conference discussions concerning inverted T-type walls were summarized. (See also W77-10135) (Sims-ISWS)
W77-10136

RURAL DOMESTIC WATER SYSTEM PEAK FLOWS AND DESIGN INNOVATIONS,
Utah Water Research Lab., Logan.
T. C. Hughes, Y. Kono, and R. Canfield.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 671, Price codes: A04 in paper copy, A01 in microfiche. Utah Water Research Laboratory Publication PRJER-030-3, January 1977. 50 p, 15 fig, 12 tab, 30 ref, 5 append. OWRT A-030-UTAH(1).

Descriptors: *Water supply, *Rural areas, *Peak runoff, Orifices, Design standards, Planning, Domestic water, *Utah, Flow rates, Water demand, Demand, Measurement, Plastic pipes.
Identifiers: Hydraulic friction.

Planning engineers commonly use generous factors of safety for peak flow estimates in urban water supply systems both as a hedge against unforeseen growth and because economies of scale result in relatively low user costs even with such reserve capacity. Transplanting of such design criteria into the rural setting, however, does not work. The low density portions of rural domestic systems require very realistic design criteria or the construction costs become infeasible for the small number of customers involved. Peak instantaneous flow rates in a Utah rural system were measured continuously during two summers on three dead-end lines serving various numbers of customers. The second summer included measurement of flows to customers whose maximum flow rate was limited by a simple orifice placed in each meter. Conclusions which emerged from this study included: (1) Actual peak demands were lower than those required for design purposes by some state regulatory agencies, but higher than the Farmers Home Administration minimum standard. (2) Where extremely small mains are required by the economics of low density situations, or where unforeseen growth is overtaxing system capacity, peak demands can be cut significantly by simple, flow restricting devices at each meter without decreasing the quality of water service to the customer. (3) Field measurements of head loss through 10 year old plastic pipe indicated a Hazen Williams friction factor average of 133.
W77-10176

A COASTAL ENGINEERING STUDY OF INDI AN RIVER INLET, DELAWARE,
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marin Studies.
G. A. Lanan, and R. A. Dalrymple.
Sea Grant Technical Report No. DEL-SG-5-77 an Ocean Engineering Technical Report 14, (1977 239 p, 86 fig, 14 tab, 73 ref, 2 append.

Descriptors: *Delaware, *Inlets(Waterways *Erosion, *Littoral drift, *Coastal engineering Sedimentation, Sand bypassing, Sediment tran port.
Identifiers: *Indian River Inlet(Del).

A field study was conducted in order to determi the causes of and possible solutions to vario coastal engineering problems at Indian River Inl Delaware. The stabilization of the inlet in 1938 h interfered with the natural littoral processes. T major problems present at Indian River Inlet a the erosion of the beach north of the inlet, the er sion of the inlet channel banks, and the loss sand onto the ebb tidal shoal. Information on se ment movement trends was obtained by comp ing volumes of erosion and accretion from histo cal charts and conducting a series of three hyd graphic surveys. The sediment movement patte were documented with a sand tracer study. T tidal hydraulics of Indian River Inlet were also s died through tidal and current measurements. T conclusions of this study also include an appro mate sand budget. The net annual littoral drift Indian River Inlet was determined to be appro mately 105,000 cubic yards northward. The st of various sand bypassing techniques indica that sand bypassing would be a feasible solution several of the problems presently being perienced at Indian River Inlet. The bulkhead of the unprotected portions of the channel bank also recommended. (NOAA)
W77-10189

A MATHEMATICAL MODEL FOR TRANSIE OPEN CHANNEL FLOW: A WAT RESOURCE PLANNING AND MANAGEME TOOL,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 2E.
W77-10290

END DEPTH UNDER ZERO-INERTIA CON TIONS,
California Univ., Davis. Dept. of Water Sci and Civil Engineering.
T. Strelkoff, and N. Katopodes.
Journal of the Hydraulics Division, Amer Society of Civil Engineers, Vol 103, No. H Proceedings Paper 13053, p 699-711, July 197 fig, 4 ref, 2 append.

Descriptors: *Open channel flow, *Model stu *Flood routing, Hydraulics, Dimensional anal Surface irrigation, Flow profiles, Equati Mathematical studies.
Identifiers: End depth, Kinematic wave theor rigation-water flow, St. Venant equation, discharge problem, Zero-inertia conditions.

The terminal depth and velocity condition flow in an open channel ending in a free ov were investigated under the assumption that tial effects are everywhere negligible. When tial terms are retained, as in the Saint-Vena varied-flow equations, the terminal condition

oth at critical. When not only the inertial terms ut also the depth-gradient term are dropped, epth and velocity at the brink of the overfall are t normal. Under the zero-inertia assumption, end epth is found to be zero and the velocity cor-espondingly infinite. This notion was tested in a eries of steady-flow comparisons with results ob-ined from the varied-flow equation. The results f a zero-inertia assumption lie close to those of ne varied-flow equation when the flow conditons re characterized by low Froude numbers. In ap-lication to the problem of discharge from a lake to a channel ending in an overfall, the traditional ial-and-error solution is replaced by a new direct olution read off from a graph. (Lee-ISWS)
77-10302

ODEL STUDIES OF DENVER WHITEWATER HANNEL,
ureau of Reclamation, Denver, Colo. Engineer-g and Research Center.
. P. Simmons, T. H. Logan, R. A. Simonds, and J. Brown.
urnal of the Hydraulics Division, American ciety of Civil Engineers, Vol. 103, No. HY7, oceedings Paper 13080, p 763-775, July 1977. 9 , 1 tab, 1 ref, 1 append.

escriptors: *Recreation facilities, *Open channel w, *Model studies, *Colorado, Channels, Open annels, Channel flow, Hydraulic models, Boat-g, Gates, Control structures, Recreation, Water orts, Wild rivers, Streamflow, Hydraulics.
entifiers: *Whitewater channels, enver(Colo).

draulic model studies on a scale of 1:20 were scribed for a 500 ft-long (152-m) whitewater yak and boating channel with a 6 ft (1.8-m) drop. tails of site conditons, hydraulic criteria, model nstruction, testing, measurement, and the velopment of the channel configurations were iewed. The recreational whitewater channel l vary from 25 ft - 40 ft (7.6 m - 12.2 m) in width, e minimum flow depths of 2 ft - 3 ft (0.6 m - 0.9 and operate at discharges from 150 cfs - 320 cfs cu m/s - 9 cu m/s). The selected inlet control e structure was described, as well as the steps en to make the channel a safe recreational ility. The boating channel was proposed for nstruction on the South Platte River in Denver, orado. (Sims-ISWS)
7-10304

ED OF INERTIAL BED LOAD TURBANCES,
tral Water and Power Research Station, Poona lia).
admavally.
rnal of the Hydraulics Division, American iety of Civil Engineers, Vol. 103, No. HY7, ceedings Paper 13072, p 777-795, July 1977. 7 14 ref, 4 append.

criptors: *Flow, *Bed load, *Velocity, Dunes, sion, Fluid mechanics, Shear stress, es(Water), Hydrology, Streambeds, Sediment sport, Channel flow.
tifiers: *Bed load movement, Propagation, load discharge.

flow of water on a movable bed was studied e method of characteristics. The equations of on and continuity for water and bed load were idered separately. A relation between the city of propagation of a slight disturbance in ate of bed load transport and the average bed velocity was obtained. Also, the possibility indicated of the existence of more than one city of propagation for 'bed forms' or rbances in the static bed level. A method of oximate numerical solution of the flow equa-was given. (Lee-ISWS)
10305

CHANNEL SILTATION DETERMINED WITH SIDE-SCAN SONAR,
Army Engineer District, Portland, Oreg. Dredging Operations Div.
G. L. Hartman.
Civil Engineering-American Society of Civil Engineers, Vol. 47, No. 6, p 71-73, June 1977. 1 fig.

Descriptors: *Remote sensing, *Sonar, *Silting, *Dredging, *Oregon, Sediments, Sedimentation, Estuaries, Depth, Hydrography, On-site investigations, Monitoring, Sediment transport, Channels, Cross-sections, Civil engineering.
Identifiers: *Side-scan sonar, *Coos Bay(Ore), Water depth.

Of the new electronic means to measure water depth, side-scan sonar is unusual in that it gives not only a cross section of the bottom but also a semi-3-D picture of the bottom surface. Experienced analysts can identify small-scale features like ripples and exposed rock, and sometimes even the type of bottom sediments. The technique can be used productively in conjunction with core borings, one to survey broad areas and the other to get detailed information at selected spots. Sediment transport and dredging activity can be monitored by the technique. A case history of use of the technique at Coos Bay, Oregon, was given. (Sims-ISWS)
W77-10315

AUTOMATED HYDROGRAPHY FOR CHANNEL DREDGING,
Army Engineer District, Philadelphia, Pa. Survey Branch.
H. R. Spies.
Civil Engineering-American Society of Civil Engineers, Vol. 47, No. 6, p 73-75, June 1977. 2 fig.

Descriptors: *Automation, *Delaware River, *Hydrography, *Instrumentation, Surveys, Remote sensing, Channels, Depth, *Dredging, Rivers, Beds, Cross-sections, On-site investigations, On-site data collections, Estuaries, Civil engineering.
Identifiers: Water depth.

After studying both non-line of sight and microwave systems of overwater distance measurement, one of the microwave systems was selected for checking dredged channel depth on the Delaware River. Horizontal position of a survey boat is so automated that the survey boat's position can be determined once each second. Another display showed water depth at that location, so whether or not dredging is needed on the river channel leading to Philadelphia can be determined rapidly. (Sims-ISWS)
W77-10316

BREAKING WAVES,
Institute of Oceanographic Sciences, Wormley (England).
E. D. Cokelet.
Nature, Vol. 267, No. 5614, p 769-774, June 30, 1977. 8 fig, 81 ref.

Descriptors: *Waves(Water), *Ocean waves, *Surf, *Model studies, Mathematical models, Beaches, Shores, Oceans, Fluid mechanics, Computer models, Energy, Deep water, Shallow water, Oceanography.
Identifiers: *Breaking waves.

Breaking waves, both whitecaps and surf, commonly are observed in the ocean, but surprisingly little is known about them. Yet, they are important for a variety of reasons. Breaking waves place large hydrodynamic loads on man-made structures, transfer horizontal momentum to surface currents, provide a source of turbulent energy to mix the upper layers of the ocean, move sediment in shallow water, and enhance the air-sea exchange of gases and particulate matter. More than a hundred years of mathematical studies still leave some aspects of breaking waves unanswered, although much is now understood about the processes leading up to breaking and the period after breaking has occurred. (Sims-ISWS)
W77-10317

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VII. SINGLE- AND MULTICELL CONDUITS AND TUNNELS,
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 8A.
W77-10333

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VIII. PILE FOUNDATIONS AND SHEET PILE CELLS,
Army Engineer Div. Southwestern, Dallas, Tex.
For primary bibliographic entry see Field 8A.
W77-10334

HYDRAULIC DESIGN DATA FOR WATER WELLS IN UNCONSOLIDATED SEDIMENTS,
New South Wales Univ., Kensington (Australia). Water Research Lab.
C. R. Dudgeon, and R. J. Cox.
Australian Water Resources Council Technical Paper No. 22, 1977. 88 p, 54 fig, 6 tab, 6 ref.

Descriptors: *Water wells, *Design data, *Unconsolidated aquifers, Groundwater movement, Drawdown, Water yield, Sediments, Australia, Finite element analysis.

Rational design of a water well to be constructed at a given point in an aquifer requires prediction of the drawdown-discharge relationship for each type of construction and geometrical configuration under consideration. Once this prediction is possible, alternative designs may be compared and the optimum chosen. Information is presented on the effects of design variables on the drawdown-discharge relationship for a range of conditions selected on examination of records of wells constructed in unconsolidated sedimentary aquifers in eastern Australia. The data provided are based on finite element digital computer programs used to analyze flow conditions in close proximity to wells. These have been verified as far as possible by comparison with known analytical solutions and electrical analogue and experimental tank results. (CSIRO)
W77-10377

WELL MAINTENANCE AND REHABILITATION,
National Water Well Association, Worthington, Ohio.
J. H. Lehr.
Water Well Journal, Vol. 31, No. 8, p 8-9, August, 1977.

Descriptors: *Water wells, *Rehabilitation, *Maintenance.
Identifiers: Incrustation.

A significant contribution that the ground water industry can make toward conservation of natural and economic resources lies in the sphere of water well maintenance and rehabilitation. Increasing costs, scarcity of materials, and threats to the purity of the nation's aquifers demand an all-out effort to extend the lives of existing wells instead of abandoning hundreds of feet of casing to deteriorate in the ground and ultimately pollute the subsurface. It is possible today to restore many old wells to 95% of their original design capacity through well rehabilitation, however, industry wide expertise in such techniques is lacking. The National Water Well Association is initiating a project supported by an EPA grant, to amass well maintenance and rehabilitation data and to produce a manual of rehabilitation technology.

The result will be a guide and text dealing primarily with application and methodology as opposed to theory, with special emphasis on procedures for diagnosing the failures of individual wells. 'New' types of well such as those used in energy production, freshwater or waste water recharge, underground heat storage, etc., will also be discussed. (Eberle-NWWA)
W77-10516

NEW INSTRUMENT EXPANDS WATER WELL TECHNOLOGY,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8G.
W77-10521

PUMPING TESTS PROVIDE USEFUL DATA, PART II,
Universal Oil Products, St. Paul, Minn. Johnson Div.
T. L. Johnson.
Johnson Drillers Journal, Vol 49, No 3, p 8-12, May-June, 1977. 5 fig.

Descriptors: *Water wells, *Drawdown, *Transmissivity, *Storage coefficient, Aquifer characteristics, Boundaries(Surfaces), Water levels, *Pumping.

Data analysis discussed is done via the modified, non-equilibrium formula, or Jacob's method. Values are plotted on semi-logarithmic paper and form a straight line, thus greatly simplifying the formulas and calculations used in determining the transmissivity and storage coefficient on the aquifer. A best-fitting line is drawn for the plot of elapsed time versus drawdown from which change in drawdown over one logarithmic cycle can be read, as well as the point in time that the plotted line intersects the line of zero drawdown. Transmissivity and coefficient of storage can then be computed. Special care must be taken when fitting the line for a pumping test during which barrier or recharge boundary effects are encountered. Once transmissivity and storage coefficient have been determined, specific capacity and well efficiency can be calculated through manipulation of the equations in this article and constructing distance-drawdown curves. Interference between wells can also be determined. (See also W77-08658) (Eberle-NWWA)
W77-10530

CONSTRUCTION OF A LARGE DIAMETER WELL,
R. B. McDannald.
Water Well Journal, Vol 31, No 6, p 36-37, June, 1977. 10 fig.

Descriptors: *Water wells, *Water yield improvement, Drilling, Drill holes, Well casings.

A 58 foot 5 inch diameter shale well with shale starting at 7 feet yielded only 30 gal. per hour and could not support the water demands of the family of the new well owner. This photoessay illustrates the steps taken to convert the well to an unconventional but effective system. The existing well served as a pilot hole for a 30 inch augered bore, subsequently counterbored to 36 inches to accommodate casing (30 inch 12 gauge culvert pipe). The completed enlargement produces 3 gpm and has a reservoir of 1950 gallons to act as a buffer between high usage periods. (Eberle-NWWA)
W77-10531

HEAT TRANSFER CHARACTERISTICS OF MELTING AND REFREEZING A DRILL HOLE THROUGH AN ICE SHELF IN ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H. Physical Sciences Branch.
For primary bibliographic entry see Field 2C.
W77-10655

PREDICTION OF VELOCITY DISTRIBUTION IN A VORTEX TUBE SEDIMENT TRAP WITH TURBULENCE MODELS,
Nebraska Univ. Panhandle Station at Scottsbluff.
For primary bibliographic entry see Field 4D.
W77-10657

SEQUENT PEAK PROCEDURE: MINIMUM RESERVOIR CAPACITY SUBJECT TO CONSTRAINT ON FINAL STORAGE,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
For primary bibliographic entry see Field 4A.
W77-10781

ANALYTICAL EVALUATION OF TECHNIQUES FOR USE OF A LASER DOPPLER VELOCIMETER TO MEASURE FLOW AND TURBULENCE,
Colorado State Univ., Fort Collins. Dept. of Physics.
For primary bibliographic entry see Field 2E.
W77-10784

MODELING OF STREAM GEOMETRY AND ITS APPLICATIONS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-10791

DETERMINISTIC AND STOCHASTIC APPROACHES FOR MODELLING OF LONGITUDINAL DISPERSION IN A TURBULENT OPEN CHANNEL FLOW,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 5B.
W77-10794

8C. Hydraulic Machinery

EVOLUTION OF MULTIJET SLEEVE VALVE,
Southern California Metropolitan Water District, Los Angeles.
W. W. Watson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY6, Proceedings Paper 13006, p 617-631, June 1977. 17 fig, 1 tab, 10 ref, 2 append.

Descriptors: *High pressure valves, *Hydraulicvalves, *On-site tests, *Design data, Pressure, Regulated flow, Water distribution(Applied), Equipment, Hydraulics, Regulation, Flow control, Jets, Gates, Sealants.
Identifiers: *Sleeve valves.

Described herein were the different types of multijet sleeve valves that have evolved, the experience that has been gained in the operation of the valves, the various problems, and the modifications made to solve the problems since the development of the multijet sleeve valve in the early 1970's. A table was presented giving various design data for selected multijet sleeve valve flow and pressure control structures that are in use or under construction. Also, the valve design standards and operator thrust formula were given, with a plot of nozzle diameter vs. tank size as a function of valve head loss. The multijet sleeve valve has proven to be versatile, easily configured to match various hydraulic operating conditions, and dependable. The valve also has met the original design parameters of cavitation free operation, low noise, and vibration levels. (Humphreys-ISWS)
W77-10117

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VI. GATES, STOP LOGS, AND TRASHRACKS,
Office of the Chief of Engineers (Army), Washington, D.C. Structural Section.
K. O'Donnell,, W. D. Churchill, L. E. Sell, and J. D. Gibson, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-031248, Price Codes: A03 in paper copy, A01 in microfiche. Volume 6 of the Proceedings of a Conference held September 22-26, 1976, New Orleans, Louisiana. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, August 1976. 68 p, 23 fig, 13 ref, 6 append.

Descriptors: *Gates, *Trash racks, *Spillways, Roller gates, Radial gates, Spillway gates, Intake gates, Hydraulic gates, Structures, Check structures, Hydraulic structures, Computer programs, Computer models, Engineering structures, Engineering, Design, Civil engineering, Conferences.
Identifiers: *Computer-aided design.

Three papers were contained in this volume. TAINTER GATES FOR SPILLWAYS - The radial or tainter gate is the most common type of spillway crest gate used on dams. The Corps has constructed 800 in the last 15 years. Tainter gate advantages are simplicity, light weight, low hoist requirements, favorable hydraulics, and service and maintenance ease. Structural components for tainter gates are: skin plate assembly, end frames, trunnions, and anchorages. Several satisfactory programs for tainter gate design are available, but there is much duplication. The programs should be reviewed and tainter gate programs recommended for Corps-wide use. There are no programs available for designing prestressed concrete trunnion girders and anchorage systems; design programs should be developed for these items. WHEEL GATES, ROLLER GATES, AND TRASHRACKS - Design requirements presented in this paper are a consolidation of criteria published in Corp engineering manuals. The criteria are supplemented by the documentation of field problems that need consideration for future designs. A simple trash structure is required at the upstream end of a reservoir outlet to keep trees and other large trash from entering the gate passages. Roller, wheel, and slide gates are the types of vertical lift gates most commonly used by the Corps. Design procedures must allow for design head, discharge capacity, vibration, load selection, closing forces, corrosion protection and the potential for gate catapulting. There are no published programs for a complete gate design. Gate computations are relatively brief, and District-level programming has not been economically feasible. MITER GATES AND STOP LOGS - Miter gates for navigation locks fill and empty the lock chamber and provide walkways across the locks. Double-leaf miter gates, quickly opened and closed and low in maintenance costs, are usually chosen for moderate-and high-lift locks. Computer programs can be easily adapted to the simple stop log design requirements. Several programs are specifically tailored for stop log design requirements. Several programs not specifically tailored to stop log design have been adapted for this use. (See also W77-10136) (Sims-ISWS)
W77-10135

THE APPLICATION OF ULTRASONIC LIQUID FLOW MEASUREMENT TO THE WATER AND WASTE WATER CONTROL INDUSTRY,
J. B. Orknew.
Municipal Engineer, Vol. 7, No. 1, p 89-90, 1976. fig.

Descriptors: *Ultrasonics, *Flow measurement, Water quality control, Equipment, Monitors, Flow, *Waste water treatment.
Identifiers: South Africa, *Ultrasonic flowmeters.

The author discusses the Ultrasonic Flow Monitor UFM-200 and its application in measuring and recording liquid flow accurately and reliably with no maintenance. (So African Water Info Center)

V77-10219

COMPUTER APPLICATIONS TO ACHIEVE OPTIMUM ECONOMIC LOADING OF GENERATING PLANTS,
ennessee Valley Authority, Knoxville.
or primary bibliographic entry see Field 6A.
/77-10288

OWN-HOLE MUD MOTOR PASSES FIELD EST.
il and Gas Journal, Vol. 75, No. 30, p 101, July 5, 1977. 1 fig.

escriptors: *Rotary drilling, *Drilling equipment, rilling fluids, Wells, Mud, Oil industry.
entifiers: *Downhole mud motors.

he feasibility of a positive-displacement design ownhole mud motor was recently demonstrated an oil well drilling test in Louisiana. The motor, veloped by Allegheny-Ludlum Industries, per-rmed successfully while drilling a 1000-foot ver-al interval in 22 hours. This rate (47 feet/hour) is mparable to conventional drilling rates. Previ-s mud motors or turbines have required the use diamond bits because of their high rotation rate; e low rotation rate of this motor, combined with high-capacity thrust bearing assembly, offers llers the chance to put more horsepower wnhole, using standard mill-tooth bits. Torque erted by the motor is directly related to fluid ut pressure. The positive displacement feature events stalling at low flow rates. (Eberle-WWA)
77-10514

ERE COMES THE SUN.
ound Water Age, Vol. 11, No. 10, p 25, 26, 56, ne, 1977. 3 fig.

scriptors: *Irrigation engineering, *Pumping, nergy, Irrigation systems, Irrigation design, ar radiation, *Arizona.
ntifiers: *Solar collectors, Rankine cycle tur-es.

e world's largest solar powered irrigation tem is now in operation at Gila Bend, Arizona. e system, developed by the Columbus Labora-es of Batelle Memorial Institute, includes a 50 pump capable of delivering up to 10,000 gal-s of irrigation water per minute at peak opera-. Water under pressure is pumped into solar ectors, heated to a high temperature, and ed to a boiler where it heats liquid Freon until anges to gas. The gas, in turn, drives a Ran-e cycle turbine which operates the irrigation p. During the longest days of the year, the em can deliver up to 5.6 million gallons of er in less than 10 hours. While there is ently no provision for energy storage to allow onger periods of operation, this feature can be rporated if desired. (Eberle-NWWA)
-10518

MERSIBLE PUMPS SPEED SEWAGE W,
primary bibliographic entry see Field 5D.
-10587

V ACCURATE ARE SHOP-MADE ORIFICE TES,
cultural Research Service, Stillwater, Okla.
er Conservation Structures Lab.
primary bibliographic entry see Field 3F.
-10782

8D. Soil Mechanics

DRAWDOWN ANALYSIS OF SLOPES BY NUMERICAL METHOD,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
C. S. Desai.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol 103, No GT7, Proceedings Paper 13054, p 667-676, July 1977. 10 fig, 2 tab, 8 ref, 2 append.

Descriptors: *Finite element analysis, *Safety factors, *Dewatering, *Slope stability, *Reservoir stages, *Bank stability, Numerical analysis, Slopes, Seepage, Reservoirs, Embankments, Soil mechanics, Design criteria, Water table, Drainage, Earthworks.

A numerical procedure was used to analyze slopes subjected to transient free surface seepage. The procedure combined a finite element scheme with a method of slope-stability analysis. The finite element scheme allows computations of time dependent locations of free surface, and the stability analysis method permits computation of factor of safety. The final results were plotted in charts expressed through a number of nondimensional quantities. It was found that the value of the lowest factor of safety by the proposed procedure is approximately equal to that from the conventional assumption of sudden drawdown. The procedure can lead to more economical design if the designer can adopt drawdown ratios less than unity. The numerical procedures can provide an improved understanding of the behavior of slopes during transient drawdown conditions. (Adams-ISWS)
W77-10776

STABILIZATION OF POTENTIALLY LIQUEFIABLE SAND DEPOSITS USING GRAVEL DRAINS,
California Univ., Berkeley. Dept. of Civil Engineering.
H. B. Seed, and J. R. Booker.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol 103, No GT7, Proceedings Paper 13088, p 757-768, July 1977. 8 fig, 12 ref, 2 append.

Descriptors: *Computer programs, *Sands, Stabilization, *Foundations, *Drainage systems, Drainage, Soil mechanics, Pore pressure, Quick sand, Earthquakes, Vibrations, Theoretical analysis, Permeability.
Identifiers: *Liquefaction.

The installation of a drainage system offers an attractive and economical procedure for stabilizing an otherwise potentially liquefiable sand deposit. Such a procedure has already been used in one case involving the construction of stone columns in a relatively loose sand deposit, and it is being proposed for stabilization of a medium dense sand layer. The paper presented a simplified theory that provides a convenient basis for evaluating the possible effectiveness of a drain system in such cases. Where appropriate, additional analyses may be made readily using a computer program based on the theory presented, but for most practical cases, it is believed that the charts presented in the paper will provide for effective stabilization of potentially liquefiable sand deposits. (Adams-ISWS)
W77-10777

ANALYSIS OF DATA FROM INSTRUMENTATION PROGRAM, COLUMBIA LOCK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 8G.
W77-10783

8E. Rock Mechanics and Geology

MAN-MADE GEOTHERMAL ENERGY SOURCE USES OIL-FIELD KNOW-HOW.
For primary bibliographic entry see Field 8A.
W77-10515

8F. Concrete

AUXILIARY CEMENTING MATERIALS CONTRIBUTE TO SUCCESSFUL JOBS,
Western Co., Houston, Tex.
P. Parker, and C. Clement.
Oil and Gas Journal, Vol. 75, No. 21, p 80-84, May 23, 1977. 15 fig, 1 tab.

Descriptors: *Rotary drilling, *Cement grouting, *Cements, Drilling fluids, Drilling equipment, Well casings, Slurries.
Identifiers: Centralizers, Cementing plugs, Cementing shoes, Float collars, Cementing heads, Mud removal.

A variety of mechanical equipment is used in oil well cementing to insure reliable bonding. Centralizers, mechanical spacers which fit on the outside diameter of a casing string, center the string in the hole in order that cement can be placed evenly on all sides of the pipe. Scratchers made of wire or cable can be fastened on to casing like a collar to help scour the hole wall as casing is being run, removing the drilling fluid's residual filter cake and thus permitting a better formation bond. Cementing shoes, plugs, float collars, and stage tools are among the other necessary pieces of equipment involved in cement placement. Proper utilization of these items is essential for adequate removal of drilling muds from the hole and for obtaining a pressure-tight seal between pipe and formation. (Eberle-NWWA)
W77-10524

CEMENTING OIL AND GAS WELLS, PART 4,
Completion Technology Co., Houston, Tex.
G. O. Suman, Jr., and R. C. Ellis.
World Oil, Vol 184, No 7, p 69-77, June, 1977. 15 fig, 3 tab, 33 ref.

Descriptors: *Cements, *Drilling fluids, *Rotary drilling, Flow characteristics, Mud, Slurries, Fluid friction, Laminar flow, Turbulent flow, Viscosity, Pressure, Well casings.
Identifiers: Plug flow, Centralizers, Standoff rings.

In order to adequately displace drilling fluids during well cementing jobs, due consideration must be given to drag forces of both fluid and cement slurry, formation characteristics, and flow properties of the cement. Determination of the proper cement makeup, flow velocity, and pumping pressure is complex because of the non-Newtonian fluid characteristics of drilling muds and cements, i.e., such fluids can exhibit plug, laminar, or turbulent flow depending upon the combination of fluid properties and placement pressures employed. Several flow equations are provided for determining annular velocity of slurries, and suggestions are presented for cement makeup for certain anticipated flow conditions. Advantages of well casing rotation and use of auxiliary casing devices (centralizers, scratchers, standoff rings, etc.) are listed in some detail. Several cautions regarding formation damage or circulation loss during cementing are also presented. (See also W77-07697, W77-08327, W77-08328 and W77-10529) (Eberle-NWWA)
W77-10528

CEMENTING OIL AND GAS WELLS, PART 5,
Completion Technology Co., Houston, Tex.
G. O. Suman, Jr., and R. C. Ellis.

World Oil, Vol 185, No 1, p 117-125, July, 1977. 8 fig, 11 ref.

Descriptors: *Cements, *Rotary drilling, *Drilling equipment, Well casings, Slurries, Boreholes, Density.
Identifiers: Guide shoes, Float collars, Centralizers, Scratchers, Cementing heads, Stage collars.

Previous articles in this series have presented basic principles of hole preparation, casing handling, cement slurry chemistry and additive selection, and described how drilling mud is displaced by the cement slurry. This installment discusses downhole and surface equipment used in conventional cementing. Concepts and applications of such equipment on casing strings are explained. A discussion is included of stage cementing, mixing and density measuring devices, and the process of cementing large diameter casing by the stab-in method. (See also W77-07697, W77-08327, W77-08328 and W77-10528) (Eberle-NWWA)
W77-10529

STRAIN METERS AND STRESS METERS FOR EMBEDMENT IN MODELS OF MASS CONCRETE STRUCTURES; REPORT 2, EVALUATION OF MICRODOT EMBEDMENT STRAIN GAGE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Concrete Lab.
For primary bibliographic entry see Field 8G.
W77-10785

8G. Materials

FIELD EVALUATION OF 102-MM (4-INCH) CORRUGATED POLYETHYLENE TUBING,
Soil Conservation Service, Broomal, Pa. Dept. of Water Management Engineering.
D. E. McCandless, Jr.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 514-516, Special Edition 1976. 7 tab, 3 ref.

Descriptors: Drainage, Drainage engineering, *Drainage practices, *Tubes, *Irrigation, Conveyance structures.
Identifiers: *Polyethylene tubing, Elongation.

A field evaluation of the physical condition of installed 102 mm (4 in.) corrugated polyethylene tubing was made in four states in the Northeast by the United States Department of Agriculture Soil Conservation Service. Elongation and deflection data were summarized on tubing from 54 sites. Deflections of 13 to 25 percent were typical, however seven sites had deflections greater than 35 percent. The tubing was elongated 4.2 percent on the average when installed with a wheel trenching machine. (Skogerboe-Colorado State)
W77-10172

MUD DESIGN TO MINIMIZE ROCK IMPAIRMENT DUE TO PARTICLE INVASION,
Shell Development Co., Houston, Tex.
A. Abrams.
Journal of Petroleum Technology, Vol 29, No 5, p 586-592, May, 1977. 8 fig, 10 ref.

Descriptors: *Drilling fluids, *Rotary drilling, *Porous media, *Damages, Mud, Pores, Permeability, Laboratory tests.
Identifiers: *Particle invasion, *Bridging materials.

Although invasion and formation damage occur with all muds during drilling, it is possible to minimize solids invasion and formation impairment by adding bridging material to the muds. Such bridging material is selected by matching its size to the formation rock pore size. Most research on drilling mud invasion to date has not included data on pore vs. particle size relationships; in this study, laboratory flow tests were performed on two different kinds of rock systems (radial, high-permeability unconsolidated sand, and linear, low-permeability dolomite) with the following results: (1) Muds containing bridging material with diameters equal to or greater than one-third the median pore size of the formation, at a concentration of at least 5 percent by volume of mud solids, impair rock to depths less than one inch. (2) Matching procedures based on calculation of the rock pore sizes from capillary pressure or permeability data can be used for selecting additives. Silica, calcium carbonate, wax, and asphalt solids are available in different size ranges and can be used for this application. (Eberle-NWWA)
W77-10513

NEW INSTRUMENT EXPANDS WATER WELL TECHNOLOGY,
Universal Oil Products, St. Paul, Minn. Johnson Div.
J. L. Mogg.
Johnson Drillers Journal, Vol. 49, No. 3, p 1-7, May-June, 1977. 9 fig, 3 ref.

Descriptors: *Water wells, *Drawdown, *Instrumentation, *Transmissivity, Aquifer characteristics, Rehabilitation, Water levels, Pumping, Specific capacity, Storage coefficient.
Identifiers: *Well efficiency, Incrustation.

Interest in obtaining accurate measurements from the very early parts of time-drawdown and recovery phases of pumping tests has led to the development of a portable water well analyzer with the capability of measuring a 100 foot range of drawdown accurately to 0.1 foot at 1.0 second intervals. Because conditions in the immediate vicinity of a well are reflected in the data obtained immediately after a pump is turned on or off, it was hoped that the analyzer's monitoring ability during these brief periods would allow the interpreting geologist to compute the efficiency or state of deterioration of a producing well. A study involving a plugged well for which the original specific capacity was known provided evidence that the water well analyzer is as accurate and useful as had been hoped. Inferences made from the pumping test data suggested a well treatment procedure which eventually restored the well under study to better than its original efficiency. (Eberle-NWWA)
W77-10521

AUXILIARY CEMENTING MATERIALS CONTRIBUTE TO SUCCESSFUL JOBS,
Western Co., Houston, Tex.
For primary bibliographic entry see Field 8F.
W77-10524

HOW TO IMPROVE DRILLING ECONOMICS BY USING A SHOCK ABSORBER,
Dresser Industries, Inc., Houston, Tex.
S. W. Worford.
Drilling-DCW, Vol 38, No 9, p 49, June, 1977. 2 fig.

Descriptors: *Rotary drilling, *Drilling equipment, *Construction costs, Vibrations, Oil wells.
Identifiers: Shock absorbers, Penetration rate.

A properly used shock absorber can improve rotary drilling economics by preventing bit and drill string damage as well as permitting increased penetration rate. Standard procedure for minimizing drill string vibration when it occurs is to reduce bit weight and rotary speed until more favorable drilling conditions are encountered; unfortunately, slower penetration and higher drilling costs are inevitable results. Running shock absorbers immediately above the bit allows the driller to apply more energy to the bit with much less vibration. In surveys comparing shock absorber systems to conventional systems in oil well drilling, total cost per foot has been uniformly lower for the former. As drilling expenses continue to swell, shock absorbers may be valuable tools for keeping drilling operations economical. (Eberle-NWWA)
W77-10526

HOW TO EXAMINE DIFFERENTIAL STICKING CHARACTERISTICS OF MUD,
E. Williams.
Drilling-DCW, Vol 38, No 9, p 46, June, 1977. 2 fig.

Descriptors: *Drilling, *Drilling fluids, *Laboratory tests, *Lubricants, Drilling equipment, Mud, Oil wells.
Identifiers: *Differential sticking, *Filter cakes, PAL Stickometer, Drill pipe.

Stuck pipe and tool fishing jobs are expensive problems in drilling operations world-wide. Techniques have now been developed to evaluate the sticking characteristics of water base drilling muds and to determine the effectiveness of lubricants in minimizing differential sticking problems. Lubricants have proved useful in countering the effects of filter cakes in permeable formations; however, environmental constraints now prohibit the use of diesel oil and other primitive lubricants once used in oil drilling operations. The 'Stickometer', manufactured by P.A.L., Inc., provides a means by which new synthetic lubricants can be evaluated and matched with muds to form workable combinations. Differential sticking conditions are simulated by the Stickometer, allowing the researcher to record mud conditions before sticking (mud weight, solids content, gel strength, etc.) as well as determine the torque necessary to move the Stickometer shaft when sticking occurs. (Eberle-NWWA)
W77-10527

CEMENTING OIL AND GAS WELLS, PART 4,
Completion Technology Co., Houston, Tex.
For primary bibliographic entry see Field 8F.
W77-10528

CEMENTING OIL AND GAS WELLS, PART 5,
Completion Technology Co., Houston, Tex.
For primary bibliographic entry see Field 8F.
W77-10529

PUMPING TESTS PROVIDE USEFUL DAT PART II,
Universal Oil Products, St. Paul, Minn. Johns Div.
For primary bibliographic entry see Field 8B.
W77-10530

COLLECTION, TREATMENT AND RE TILIZATION OF WASTE WATERS IN AR ZONES OF THE MIDDLE EAST,
Taylor (John) and Sons, London (England).
For primary bibliographic entry see Field 5D.
W77-10591

PVC SEWER PIPE SURVIVES DEEP BURIAL
The American City and County, Vol. 92, No. 5 89-90, May, 1977.

Descriptors: *Pipes, *Sewers, Plastics, Constr tion materials, Pressure, Design criteria, Condu Conveyance structures, Loads(Forc Joints(Connections).

Polyvinyl chloride (PVC) sewer pipe was succe fully installed by Genge/Meurer, Serafini Meurer, Incorporated, of Denver, Colorado, 42-foot deep trench. Proper bedding and contro the trench width were able to minimize deflect The achievement of a 90% Standard Proctor C paction or better around the sides of the pipe lowed transmission of the load from the pipe to trench wall. The bedding also had to permit w

o percolate through to avoid deterioration and ex-
essive deflection. A composite material or gravel
ith minimal sand and no clay was used as
edding. Washed rock was placed on the sides of
e pipe and crushed rock with dirt and fine sand
as used on top of the pipe. The project described
ed 15-inch diameter pipe in 12 1/2-foot sections.
he pipe allowed easy and fast joint assembly. A
ng-Tite joint, made of a rubber ring seated in the
g groove of the pipe's bell end, was used. The
int, tight and leakproof, also allowed for deflec-
on. The most severe deflection in the 2200-foot
ngth of pipe was 3 1/2%. (Collins-FIRL)
77-10592

REVENTION OF SCALE FORMATION IN
VAPORATOR CHAMBERS (USTRANYAT'
BRAZOVANIE NAKIPI V KAMERAKH
YPARNOI STANTSII),
asnodarskii Politekhnicheskii Institut (USSR).
r primary bibliographic entry see Field 5D.
77-10691

NALYSIS OF DATA FROM INSTRUMENTA-
ON PROGRAM, COLUMBIA LOCK,
my Engineer Waterways Experiment Station,
cksburg, Miss. Soils and Pavements Lab.
L. Sullivan, Jr.
ailable from the National Technical Informa-
n Service, Springfield, VA 22161 as ADA-027
3, Price codes: A03 in paper copy, A01 in
crofiche. Miscellaneous Paper S-74-24, Sep-
mber 1974. 36 p, 16 fig, 7 ref.

scriptors: *Locks, *Louisiana,
strumentation, *Load distribution,
ads(Forces), Pressure, Piezometers, Strain
ges, Piles(Foundations), Bearing piles, Struc-
es, Hydraulic structures, Engineering struc-
es, Concrete structures, Backfill, Soil
chanics, Soil pressure, Settlement(Structural),
ta processing, Civil engineering.
ntifiers: *Columbia Lock(La).

ree monoliths at Columbia Lock were instru-
nted and monitored during and after construc-
in order to determine the distribution of ap-
d loads on the piles for comparison with pre-
ed values. One of the monoliths was represen-
ve of the landside walls which support a
kfill of compacted sand. One monolith was
resentative of the riverside walls which support
backfill. The instrumentation consisted of (1)
ded electrical strain gages for measuring axial
ls on the piles, (2) earth pressure cells (landside
nolith only) for measuring soil reaction, (3)
zometers, and (4) settlement plates and
rence markers. Pressure cells indicated that
foundation soils carried only a small portion
proximately 5%) of the applied load. Practically
f the net applied load was carried by the foun-
on piles. For the landside monolith, the dis-
ution of pile loads along each of the instru-
ted rows differed considerably from the
ar distribution assumed for design. In general,
outer piles carried more load than the piles in
center. Analysis indicated that vertical drag
es resulting from settlement within the backfill
developed, accounting in part for the observed
ibution of pile loads. (Sims-ISWS)
-10783

AIN METERS AND STRESS METERS FOR
EDMENT IN MODELS OF MASS
NCRETE STRUCTURES; REPORT 2,
LUATION OF MICRODOT EMBEDMENT
AIN GAGE,
y Engineer Waterways Experiment Station,
sburg, Miss. Concrete Lab.
McDonald.
lable from the National Technical Informa-
Service, Springfield, VA 22161 as ADA-032
Price codes: A03 in paper copy, A01 in
fiche. Technical Report No 6-811, Report 2,
1972. 41 p, 25 fig, 4 ref.

Descriptors: *Strain gages, *Testing, *Evaluation, Measurement, Concrete, Concrete structures, Structural models, Gages, Instrumentation, Stress, Structures, Strain measurement, Concrete testing, Civil engineering.
Identifiers: *Embedment strain gages.

To obtain information on the actual state of stress and/or strain within a concrete structure or model, it is of primary importance to make measurements in the interior of the structure or model. The main problem in model work is to obtain measuring devices small enough for embedment in a small-scale model. This report described the results of tests to evaluate the effectiveness of a small, bonded-metal embedment gage manufactured by Microdot, Incorporated. Due to its small size (2-in active gage length, 0.04-in diam), the gage can be embedded in relatively small-scale models, yet it appears large enough to give meaningful average readings within a heterogeneous material such as microconcrete. Because of its size, stability, and other desirable inherent qualities, the Microdot embedment gage appears suitable for use in measuring internal strains within models, provided an empirical calibration of the gage is made. (Sims-ISWS)
W77-10785

8I. Fisheries Engineering

THE REPRODUCTION OF BARBUS CF. KIMBERLEYENSIS (PISCES, CYPRINIDAE) IN THE HARDAP DAM, SOUTH WEST AFRICA,
Fort Hare Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 02H.
W77-10218

UNINTENTIONAL INTRODUCTIONS OF FISHES VIA HYDROELECTRIC POWER STATIONS AND CENTRIFUGAL PUMPS,
Albany Museum, Grahamstown (South Africa).
R. A. Jubb.
Journal of the Limnological Society of South Africa, Vol. 2, No. 1, p 29-30, 1976. 8 ref.

Descriptors: *Centrifugal pumps, *Hydroelectric power plants, Tailraces, Pumping, *Fish, Turbines, Fish migration.
Identifiers: South Africa, Victoria Falls, Lake Kariba, Zambesi River, Beitbridge Dam, Limpopo River.

Geographical and physical isolation barriers earlier considered impassable to fish fauna can be bypassed via hydro-electric power stations. Two possible routes exist at the Victoria Falls: down the header dam overflow or via the feed to the turbines. Observations prove that juvenile and small fishes can survive a passage through the turbines of large hydroelectric power stations. Unintentional introduction of fish from one water system to another by pumping is discussed. Juvenile fish have been proved to be more tolerant of sudden water pressure changes than adult fish. A list of the fish fauna in the Beitbridge dam is given. (So. African Water Info. Center)
W77-10225

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

COAL AND COAL MINE DRAINAGE, (LITERATURE REVIEW),
Bituminous Coal Research Inc., Monroeville, Pa.
For primary bibliographic entry see Field 05G.
W77-10355

A BIBLIOGRAPHY OF ESTUARINE RESEARCH IN OREGON,
Oregon State Univ., Corvallis. Sea Grant Coll. Program.
For primary bibliographic entry see Field 02L.
W77-10511

3377

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 10, NUMBER 22
NOVEMBER 15, 1977

W77-10801 -- W77-11500
CODEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 22
NOVEMBER 15, 1977

W77-10801 -- W77-11500

retary of the U.S. Department of the Interior has de-
that the publication of this periodical is necessary in the
on of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent onographs, journal articles, reports, and other publication rmats. The contents of these documents cover the water-lated aspects of the life, physical, and social sciences as ell as related engineering and legal aspects of the charac-ristics, conservation, control, use, or management of water. ach abstract includes a full bibliographical citation and a set descriptors or identifiers which are listed in the **Water esources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-earch categories established by the Committee on Water esources Research of the Federal Council for Science and echnology.

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provide WRSIC with input, selected organizations with tive water resources research programs are supported as enters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent litera-ture in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover

Supplementary documentation is being secured from estab-lished discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Ab-stracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear ab-stractless in SWRA. Similar arrangements with other pro-ducers of abstracts are contemplated as planned augmen-tation of the information base.

The input from these Centers, and from the 51 Water Re-sources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the informa-tion base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and ar-rangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

. WATER CYCLE

A. General

OMPUTER SIMULATION IN WATER ESOURCES SYSTEMS.
russels Univ. (Belgium); and Ghent Rijksu-versiteit (Belgium).
roceedings of the IFIP Working Conference on omputer Simulation of Water Resources ystems, Ghent, Belgium, July 30-Aug. 2, 1974. orth-Holland Publishing Company, Amsterdam, he Netherlands, 1975. 686 p, Vansteenkiste, G. ., Ed. Price - $51.95.

escriptors: *Water resources, *Simulation analy-s, *Computers, *Mathematical models, Analytical techniques, *Water manage-ent(Applied), *Water quality, Surface waters, roundwater, Computer models, Engineering, ptimization, Environment, Biology, Hybrid mputers, Planning, Regional analysis, ethodology, Evaluation economics, Systems alysis.
entifiers: Multi-disciplinary, Simulation lan-age.

ere are many complex and interrelating oblems which affect the management of water. is necessitates more careful planning of water sources systems, whose relationship to the natu- and biological area and to the institutional and onomical domain illustrates the multi-disciplina- character of water resources development. athematical models are needed to analyze and derstand these systems. It is very difficult, how-er, to derive models which fit all the critria cessary for the most efficient and complete alysis of a water system. Many systems are too mplex for any model to contain all the important teria. And yet a model containing most all the evant factors may be too complicated to op-ize by existing techniques. Hybrid computers interactive simulation languages are the tools st useful to the system engineer in utilizing the dgments and experience of a hydrologist. esently available simulation methods are in-equate to generate reasonably accurate com-ter models of complex eco- and biosystems. A ge research effort is urgently required in the in-face domain between specialists in simulation thodology and experts in environmental and logical systems. Hence, this conference was or-ized, bringing together seventy specialists resenting sixteen countries. A very comprehen-e spectrum of computer simulation modeling blems in the water resources field has been ered. The 52 articles presented appear under r headings: (1) modeling and computing in ter resources systems; (2) surface-groundwater drology simulation; (3) water quality models; (4) system engineering in water resources nagement. (See also W77-10807 thru W77-30) (Bell-Cornell)
7-10806

RECURSIVE APPROACH TO TIME-SERIES ALYSIS FOR MULTIVARIABLE SYSTEMS,
nbridge Univ. (England). Dept. of Engineering.
primary bibliographic entry see Field 5B.
7-10807

SIGNING SIMULATION MODELS FOR OP-IZATION STUDIES,
caster Univ., Bailrigg (England). Dept. of rational Research.
primary bibliographic entry see Field 6A.
7-10808

E ARNO RIVER MODEL PROBLEMS, THODOLOGIES AND TECHNIQUES,
tro di Ricerca IBM di Pisa (Italy).
odini.

In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G. C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y. p 199-207, 1975. 6 ref.

Descriptors: *River basins, *Model studies, *Flood routing, *Rainfall-runoff relationships, *Simulation analysis, Behavior, Hydrology, Methodology, Research, Water levels, Discharge(Water), Equations, Operations research.
Identifiers: Channel reach, *Arno River(Italy), Prediction.

Presented are the main aspects of the problems that arise when an entire river basin has to be simulated with mathematical models, and some of the original algorithms and techniques used to set up a flood simulation model of the Arno River in Italy are illustrated. Considered are a surface runoff model, a rainfall-runoff model, and the flood routing process. For the rainfall-runoff modeling, a linear approximation allowing for the identification of the behavior of the basin as an impulse response function based only on the input and the output functions of the system is regarded as the most convenient. The technique gives very good results even for basins where long drought periods are present provided that a long continuous record of input and output functions is available. The flood routing process is studied with the De Saint Venant equations whose validity for unidimentional flows is widely recognized. Saint Venant equations whose validity for unidimentional flows is widely recognized. A similar approach to the flood routing problem is the linear system approach, chosen for the Arno River modeling because of its capability of giving the discharges and the levels at any cross section and hence allowing the simulation of the possible benefits that hydraulic works can produce in order to prevent flood effects. (See also W77-10806) (Bell-Cornell)
W77-10809

MODELING THE CONJUNCTIVE AVAILABILITY OF SURFACE-AND GROUNDWATER OF A GRABEN IN THE ARID SOUTHWEST OF THE UNITED STATES,
Maine Univ., Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-10810

A DYNAMIC-STOCHASTIC MODEL FOR WATER QUALITY IN PART OF THE BEDFORD-OUSE RIVER SYSTEM,
Cambridge Univ. (England). Control and Systems Div.
For primary bibliographic entry see Field 5B.
W77-10811

PRACTICAL EXPERIENCES IN FORMULATING A WATER QUALITY MODEL FOR THE RIVER NECKAR,
Karlsruhe Univ. (West Germany).
For primary bibliographic entry see Field 5B.
W77-10812

A WASTE CONTROL PROGRAM FOR A RIVER WITH HIGHLY VARIABLE CONCENTRATION OF CONSERVATIVE SUBSTANCE,
Hydraulic Research Inst., Brno (Czechoslovakia).
For primary bibliographic entry see Field 5G.
W77-10813

DYNAMIC MODELS AND COMPUTER SIMULATION OF WASTEWATER TREATMENT SYSTEMS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5D.
W77-10814

SIMULATION AIDED MODELING OF THE DYNAMIC BEHAVIOR FOR SOME ELEMENTS OF A SURFACE WATER TREATMENT PLANT,
Philips Forschungslaboratorium G.m.b.H., Hamburg (West Germany).
For primary bibliographic entry see Field 5F.
W77-10815

SIMULATION AND OPTIMISATION OF A BIOLOGICAL WATER TREATMENT PLANT,
Eidgenoessische Technische Hochschule, Zurich (Switzerland); and Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5D.
W77-10816

DESCRIPTION OF AN INTENDED PROJECT ON WATER QUALITY ESTIMATION,
Eidgenoessische Technische Hochschule, Zurich (Switzerland); and Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5B.
W77-10817

THE INFLUENCE OF THE QUALITY OF WATER ON ECOLOGICAL SYSTEMS,
Liege Univ. (Belgium). Institut de Mathematique.
For primary bibliographic entry see Field 5C.
W77-10818

SYSTEMS ENGINEERING APPROACH TO AGRICULTURAL AND RURAL DEVELOPMENT SYSTEMS,
Nairobi Univ. (Kenya). Dept. of Electrical Engineering.
For primary bibliographic entry see Field 3F.
W77-10819

DYNAMIC MODEL FOR LONG-TERM DEVELOPMENT OF WATER RESOURCES MANAGEMENT,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W77-10820

NEW TECHNIQUES IN PLANNING A WATER MANAGEMENT SYSTEM: A CASE STUDY OF COOPERATIVE RESEARCH BETWEEN HUNGARY AND THE USA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6A.
W77-10821

PLANNING MODEL FOR SIMULATING DISTRIBUTION AND COST IN A REGIONAL WATER SUPPLY SYSTEM,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 6A.
W77-10822

A CATCHMENT SIMULATION MODEL DEVELOPED FOR URBAN AND URBANISING CATCHMENTS WITH PARTICULAR REFERENCE TO THE USE OF AUTOMATIC OPTIMIZATION TECHNIQUES,
Anglian Water Authority(England).
For primary bibliographic entry see Field 2E.
W77-10823

INTEGRATED SURVEYS OF LAND AND WATER RESOURCES FOR DEVELOPMENT PURPOSES,
International Inst. for Aerial Survey and Earth Sciences, Enschede (Netherlands).
For primary bibliographic entry see Field 6A.
W77-10824

KEY NOTES AND IMPACTS OF SIMULATION AND MODELING TECHNIQUES FOR DECISION MAKING WATER RESOURCES PROJECTS IN DEVELOPING AREAS,
Madhya Pradesh Government Control Board for Major Projects, Raipur (India).
For primary bibliographic entry see Field 6A.
W77-10825

THE DEVELOPMENT OF MODELLING AND SIMULATION TECHNIQUES APPLIED TO A COMPUTER-BASED TELECONTROL WATER SUPPLY SYSTEM,
Cambridge Univ. (England).
For primary bibliographic entry see Field 4A.
W77-10826

WATERLO, A DATA BANK AND COMPUTER SYSTEM FOR RIVER CHANNEL NETWORKS AND RIVER BASINS IN BELGIUM,
Vrije Universiteit Brussels (Belgium). Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-10827

STATIC AND DYNAMIC SIMULATION OF WATER TRANSPORT IN A COMPLEX NETWORK SYSTEM,
Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W77-10828

OPTIMIZING A PRESSURIZED PIPE-LINE NETWORK USING A NEW METHOD,
Dwars, Heederik and Verhiey Ltd., Amersfoort (Netherlands).
For primary bibliographic entry see Field 5D.
W77-10829

WATER RESOURCES DATA BANK IN NEW JERSEY AND COMPUTATIONS OF EXTREME FLOWS,
Columbia Univ., New York. Seminars on Pollution and Water Resources.
For primary bibliographic entry see Field 7C.
W77-10830

SEASONAL AND NONSEASONAL ARMA MODELS IN HYDROLOGY,
Hackensack Water Co., Weehawken, N. J.; and Purdue Univ., Lafayette, Ind.
P-C. Tao, and J. W. Delleur.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. HY10, Proceedings paper No. 12477, p 1541-1559, October 1976. 7 fig, 4 tab, 16 ref. OWRT B-036-IND(17).

Descriptors: *Hydrology, *Stochastic processes, *Statistical methods, *Model studies, Runoff, Watersheds(Basins), Gaging stations, *Simulation analysis, Equations, Systems analysis, *Seasonal.
Identifiers: Probability distribution functions, *Non-seasonal models.

The ARMA (autoregressive moving average) processes may be fitted to stationarized series obtained by subtraction of the seasonal means and division by the seasonal standard deviations. This standardization is effective in removing the cyclicities in the means and in the variances, but the ensemble cross-correlations are virtually unchanged. A modified family of ARMA models is presented in which the seasonality of the means, variances, and cross-variances is preserved. The model has seasonally varying coefficients based upon seasonally varying serial correlation coefficients. To further preserve the characteristics of the historical series, the probability distribution of the random numbers used for data generation should be similar to those of the residuals of the stochastic model. The ARMA models have been applied to 20 daily, weekly, and monthly runoff series for watersheds in the lower Ohio Basn. It is concluded that the logarithmic transformation of the runoff data has the merit of reducing the periodicities in the seasonal standard deviations because the seasonal means and standard deviations of the runoff series are approximately proportional. (Bell-Cornell)
W77-10843

THEORETICAL ANALYSIS OF FLUID FLOW AND ENERGY TRANSPORT IN HYDROTHERMAL SYSTEMS,
Geological Survey, Louisville, Ky. Water Resources Div.; and Geological Survey, Reston, Va. Water Resources Div.
C. R. Faust, and J. W. Mercer.
Open-file report 77-60, 1977. 85 p, 7 fig, 46 ref.

Descriptors: *Geothermal studies, *Energy transfer, *Mathematical models, *Flow, Thermal water, Equations, Porous media, Pressure, Enthalpy, Dimensional analysis, Analytical techniques.
Identifiers: *Three-dimensional flow, *Heat transport.

A mathematical derivation for fluid flow and energy transport in hydrothermal systems is presented. Specifically, the mathematical model describes the three-dimensional flow of both single- and two-phase, single-component water and the transport of heat in porous media. The derivation begins with the point balance equations for mass, momentum, and energy. These equations are then averaged over a finite volume to obtain the macroscopic balance equations for a porous medium. The macroscopic equations are combined by appropriate constitutive relationships to form two similified partial differential equations posed in terms of fluid pressure and enthalpy. A two-dimensional formulation of the simplified equations is also derived by partial integration in the vertical dimension. (Woodard-USGS)
W77-10861

FINITE-DIFFERENCE MODEL OF TWO-DIMENSIONAL, SINGLE-, AND TWO-PHASE HEAT TRANSPORT IN A POROUS MEDIUM--VERSION I,
Geological Survey, Louisville, Ky. Water Resources Div.; and Geological Survey, Reston, Va. Water Resources Div.
C. R. Faust, and J. W. Mercer.
Open-file report 77-234, 1977. 84 p, 9 fig, 2 tab, 12 ref.

Descriptors: *Heat transfer, *Geothermal studies, *Model studies, *Finite element analysis, Steam, Thermal water, Analytical techniques, Equations, Porous media, Heat flow, Pressure, Enthalpy.
Identifiers: *Finite-difference techniques, *Heat transport.

Model documentation is presented for a two-dimensional (areal) heat-transport model capable of simulating both water- and vapor-dominated geothermal reservoirs that conform with the assumptions of the model. Finite-difference techniques are used to solve for the dependent variables pressure and enthalpy. The program is designed to simulate time-dependent problems such as those associated with geothermal reservoirs undergoing exploitation, and can treat the transition from compressed water to two-phase flow. In order to simulate more complicated field problems the present program is being extended, and therefore the model described in this report is referred to as VERSION I. A listing of the computer code is included. (Woodard-USGS)
W77-10862

SIMULATION STUDIES OF FLOW AND SEDIMENT TRANSPORT USING A MATHEMATICAL MODEL, ATCHAFALAYA RIVER BASIN, LOUISIANA,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.; and Geological Survey, Miami, Fla. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-10867

U.B.C. WATERSHED MODEL,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
M. C. Quick, and A. Pipes.
Hydrological Sciences Bulletin, Vol. 22, No. 1, p 153-161, March 1977. 5 fig, 7 ref.

Descriptors: *Model studies, *Watersheds(Basins), *Snowmelt, *Rocky Mountain Region, Snowpacks, Meteorological data, Soil moisture, Streamflow, Groundwater, Temperature, Mountains, Forecasting.
Identifiers: *Watershed models, *Fraser River System, *Sub-basins, *British Columbia, *Saskatchewan River System, U.B.C. watershed model.

The U.B.C. Watershed Model was used operationally for forecasting daily streamflows in 13 sub-basins of the Fraser River system which is subject to snowmelt floods from the mountain snowpacks of the Coast, Columbia and Rocky Mountains in British Columbia. The model also was being tested and adopted by the Prairie Provinces Water Board for mountain snowmelt forecasting in the Saskatchewan River system headwaters. The model estimated snowpack accumulation and depletion and operated entirely from meteorological inputs of daily maximum and minimum temperatures and precipitation. Account was kept of soil moisture, groundwater, and evapotranspiration. Facilities were available in the model for lake storages and lake routing. The model also was used in planning studies for the Peace River system. A 30-year sequence of missing streamflow data was generated by the model from the measured meteorological data. Snowpacks were estimated by the model from measured valley precipitation. The model was tested against a 12-ayear period of measured flows, and correlation coefficients of 0.95 were achieved for monthly flows. (Roberts-ISWS)
W77-10969

THE EVOLUTION OF THE AUSTRALIAN DESERTS,
Sydney Univ. (Australia). Dept. of Geography.
T. Langford-Smith.
Arid Lands Newsletter No. 5, University of Arizona, Tucson, Office of Arid Lands Studies, p 1-7, March 1977. 8 fig, 6 ref.

Descriptors: *Australia, *Deserts, *Evolution, *Geologic time, Tertiary period, Pleistocene epoch, Recent epoch, Playas, Arid climates, Erosion, Weathering.
Identifiers: Mesas, Duricrust.

Australia is tectonically the most stable of the world's large land masses, and many of its landscape features are inherited from events remote in geological time. Australian deserts can be traced to the onset of drier climates in the late Tertiary period, some 2-7 million years ago. The dominant desert types discussed are mountain, shield, stony and sand. Sand deserts constitute almost half of the arid lands, with shield deserts accounting for another 23%. Intrazonal desert landforms impose on these major types are duricrust-capped mesas and playas. Duricrust-capped mesas, which can be associated with any of the main desert types, are remnants of a large erosional land surface which reached its peak development in the early Tertiary period. The duricrust is an ancient pan formation created when the climate was more humid. Playas are normally dry, retaining water only after unusually heavy and prolonged rainfall. Desert geology evolution is traced chronologically

through the Late Jurassic, Cretaceous, Tertiary, Pleistocene and Holocene periods. (Jahns-Arizona)
W77-11112

FLOOD DISCHARGES OF RIVERS DRAINING ACROSS PLAINS TO OCEANS USING THE SARTHE AND THE MAYENNE (IN WESTERN FRANCE) AS EXAMPLES (CONTRIBUTION TO THE METHODOLOGY OF FLOOD FLOWS BY AN EXTENSION OF THE GRADEX METHOD), (LES DEBITS DE CRUE DES RIVIERES DES PLAINES OCEANIQUES A TRAVERS L'EXEMPLE DE LA SARTHE ET DE LA MAYENNE (FRANCE DE L'OUEST) (CONTRIBUTION A LA METHODOLOGIE DES DEBITS DE CRUE PAR UN ESSAI D'EXTENSION DE LA METHODE DU GRADEX),
Tours Univ. (France).
A. Schule.
Hydrological Sciences Bulletin, Vol. 22, No. 1, p 103-114, March 1977. 18 fig, 2 ref.

Descriptors: *Watersheds(Basins), *Flood discharge, *Runoff, *Discharge(Water), Rainfall, Rainfall disposition, Hyetographs, Hydrographs, Hydrologic aspects, Time of concentration, Analytical techniques, Analysis, Isohyets, Statistical methods, River flow, Foreign research, Foreign countries, Data processing, Frequency, Probabilities.
Identifiers: *France, *Sarthe River(France), Mayenne River(France), Isochrones.

Regional planning implies rational utilization of water resources. Rational water utilization depends on the exact knowledge of fluctuations of river flow and, particularly, on computations of very exceptional discharges; these data being necessary when planning civil engineering features or developments in valleys. In the plants of western France, knowledge of flood discharges is poor because data from direct measurements frequently are absent. To get a better idea of the values, the 'Gradex' method-a computing method for extreme value probabilities based upon the exponential behaviour of rainfall-was applied to basins where flood runoff extends for several days. The examples of the Mayenne and the Sarthe, drainage basins typical of rivers draining to oceans, proved that rainfall data of average quality regarding network and duration are a valuable tool for estimating the 100-year and even the 1000-year flood discharges. (Humphreys-ISWS)
W77-11205

HYDROLOGY OF SMALL WATERSHEDS IN WISCONSIN'S DRIFTLESS AREA,
North Central Forest Experiment Station, La Crosse, Wis.
H. S. Sartz, W. R. Curtis, and D. N. Tolsted.
Water Resources Research, Vol. 13, No. 3, p 524-530, June 1977. 6 fig, 14 ref.

Descriptors: *Small watersheds, *Hydrology, *Runoff, *Wisconsin, Demonstration watersheds, Groundwater, Hydrographs, Rainfall, Water table, Base flow, Overland flow, Water levels, Discharge(Water), Streamflow, Seasonal, Perched water, Evapotranspiration, Snowmelt, Land use, Cultivation, Hydrologic aspects.

Deep unglaciated terrain and a peculiar land use pattern give the upper Mississippi Valley's unglaciated region a distinctive hydrology. Watchments smaller than 250 ha normally have no perennial streams but may have many springs that flow for short distances and then reenter the ground. Land use has been shown to influence the surface hydrology greatly. Tilled cropland is the principal source of flood runoff and stream sediment. Runoff from forest land is minimal, regardless of its slope or condition. The occurrence and movement of groundwater are complex, with perched water bodies and dry pockets being intermixed with water tables that rise and fall in rapid response to rainfall and snowmelt and in close synchronization with spring flow. Snowmelt produces a distinctive diurnal pattern of both overland flow and groundwater rise, sometimes in midwinter. Overland flow usually peaks about midafternoon and diminishes to near zero a few hous later. The groundwater peak comes early in the morning of the next day. Little difference was found in the daily timing of overland flow from north- and south-facing catchments once the melt period had begun. Larger catchments responded to both rainfall and snowmelt much the same as smaller experimental catchments. (Humphreys-ISWS)
W77-11209

ADVANCES IN BOX-JENKINS MODELING, 1. MODEL CCONSTRUCTION,
Waterloo Univ. (Ontario). Dept. of Systems Design.
K. W. Hipel, A. I. McLeod, and W. C. Lennox.
Water Resources Research, Vol 13, No 3, p 567-575, June 1977. 37 ref, 1 append.

Descriptors: *Model studies, *Statistical models, *Water resources development, *Statistical methods, Stochastic processes, Correlation analysis, Theoretical analysis, Analytical techniques, Mathematical studies, Mathematical models, Estimating, Statistics, Foreign research.
Identifiers: *Box-Jenkins modeling, Model construction.

Box-Jenkin modeling of time series data can be improved and simplified by adhering to contemporary modeling procedures. This paper gave the theory and techniques of the application of many recent advances that have been made at the identification, estimation, and diagnostic check stages of model development. The inverse autocorrelation function and the inverse partial autocorrelation function were demonstrated to be useful identification tools for both nonseasonal and seasonal models. Parameters can be estimated more efficiently by employing the modified sum of squares technique. At the estimation stage, it is also possible to obtain a maximum likelihood estimate for a Box-Cox power transformation. The Akaike information criterion was introduced to formalize mathematicaly the concept of model parsimony. When checking for model adequacy, knowing the distribution of the residual autocorrelation allows for a sensitive test for residual whiteness. Diagnostic checks were given for verifying the assumption of homoscedasticity of the model residuals. In practice, heteroscedasticity and nonnormality of the residuals can often be removed by a Box-Cox transformation. It was recommended that any researcher who deals with Arima modeling use the contemporary procedures that were outlined. Since all the techniques can be programmed, this means that for practical applications the methods can be implemented easily. (See also W77-11215) (Humphreys-ISWS)
W77-11214

ADVANCES IN BOX-JENKINS MODELING, 2. APPLICATIONS,
Waterloo Univ. (Ontario). Dept. of Statistics.
A. I. McLeod, K. W. Hipel, and W. C. Lennox.
Water Resources Research, Vol 13, No 3, p 577-586, June 1977. 20 fig, 4 tab, 21 ref.

Descriptors: *Model studies, *Water resources development, *Statistical methods, *Application methods, Statistical models, Stochastic processes, Streamflow, Forecasting, Time series analysis, Analytical techniques, Mathematical models, Correlation analysis, Annual, Seasonal, Estimating, Foreign research.
Identifiers: *Box-Jenkins modeling, *Saint Lawrence River.

Recent Box-Jenkins techniques were employed to determine both nonseasonal and seasonal models for actual time series. The applied examples were explained carefully in order to demonstrate the utility of the new procedures that have been developed for use at the identification, estimation, and diagnostic check stages of model development. Even though more methods are now available for model building, it was demonstrated that this fact enhances rather than complicates the model construction phases. Furthermore, for all three applications considered, better models were obtained than it was previously possible to obtain. A new technique was described for optimal forecasting of the original time series when the data have been transformed by a nonlinear transformation. (See also W77-11214) (Humphreys-ISWS)
W77-11215

ISOCHRONES OF TRAVEL TIME AND DISTRIBUTION OF FLOOD STORAGE FROM A TRACER STUDY ON A SMALL WATERSHED,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
D. H. Pilgrim.
Water Resources Research, Vol 13, No 3, p 587-595, June 1977. 8 fig, 1 tab, 26 ref.

Descriptors: *Travel time, *Small watersheds, *Hydrographs, *Floods, *Australia, Tracers, Storage, Watersheds(Basins), Streamflow, Water, Flood waves, Velocity, Analysis, Analytical techniques, On-site investigations, Foreign research, Foreign countries.
Identifiers: *Sydney(Australia), Isochrones, Hydraulic geometry.

In the practical application of many methods of flood hydrograph synthesis, it is necessary either to space isochrones of travel time over the watershed or to allocate the distribution of storage. The available evidence for guiding the procedure was reviewed, but most information applies to large stream systems and to flows lower than the flood discharges of interest. Times of travel data from tracing of flood runoff on a small watershed were compared with the evidence from large streams. Average velocities were found to increase slightly in a downstream direction through the watershed, despite decreasing slope. The increase conforms with published hydraulic geometry relationships. Five geomorphological parameters were tested as methods for spacing isochrones. Field ispection to determine mean depths, and possibly roughness, at bank-full stages should lead to greatest accuracy, but simple parameters based on stream length also gave good results. The results provided direct information on the distribution of travel time, and hence storage on a small watershed, of a type not previously available. The results serve the important function of extending the range of applicability of the information previously available. (Humphreys-ISWS)
W77-11216

DISTRIBUTED NUMERICAL MODEL FOR ESTIMATING RUNOFF AND SEDIMENT DISCHARGE OF UNGAGED RIVERS, 1. THE INFORMATION SYSTEM,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
S. K. Gupta, and S. I. Solomon.
Water Resources Research, Vol 13, No 3, p 613-618, June 1977. 6 fig, 11 ref. NRC A-7832.

Descriptors: *Model studies, *Hydrologic systems, *Input-output analysis, *Methodology, *Canada, Runoff, Sediment discharge, Hydrology, Hydrologic aspects, Watersheds(Basins), River basins, Systems analysis, Numerical analysis, Estimating, Hydrographs, River basins.
Identifiers: *Ontario(Canada), Ungaged rivers.

This is the first of a series of three papers describing a distributed hydrologic model which has been applied in various areas of Ontario for estimation of runoff and sediment yield at any point of a river

basin. The moel is capable of synthesizing the hydrology of the basin under current and modified conditions. Inputs to the models are precipitation and temperature data, in addition to data on the topography, river network, and land use and land cover, soil, and geologic characteristics. Measured flow and sediment discharge data are required for calibration and validation tests, although the model gives reasonably good results with parameters estimated in neighboring river basins. The first paper described the information system for setting up the model, the second was devoted to the description of the runoff and sediment model, and the third analyzed in detail the results of the model as compared with other more conventional techniques and discussed work in progress to extend its use to the analysis of several water resources problems. (See also W77-11219 and W77-11220) (Humphreys-ISWS)
W77-11218

DISTRIBUTED NUMERICAL MODEL FOR ESTIMATING RUNOFF AND SEDIMENT DISCHARGE OF UNGAGED RIVERS, 2. MODEL DEVELOPMENT,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
S. I. Solomon, and S. K. Gupta.
Water Resources Research, Vol 13, No 3, p 619-629, June 1977. 10 fig, 1 tab, 24 ref, 1 append. NRC A-7832.

Descriptors: *Model studies, *Hydrologic aspects, *Methodology, *Input-output analysis, *Canada, Hydrographs, Estimating, Sediment discharge, Sediment transport, Hydrology, Systems analysis, Hydrologic systems, Runoff, Calibrations, River basins, Numerical analysis, Water balance, Research and development, Mathematical models, Evaporation, Streamflow, Subsurface runoff.
Identifiers: *Ontario(Canada), Ungaged rivers, Model development.

This is the second of a series of three papers describing the methodology of development of a distributed model for estimating runoff and sediment discharge of ungaged rivers. This paper presented the design of the model which permits its application to watersheds of any size and the obtaining of runoff and sediment time series at any point of the river basin which is being modeled. The model requires inputs which are usually available for most areas and/or can easily be synthesized from secondary sources or by transposition. The model was designed with the aim of keeping the number of model parameters at a minimum. It permits the simulation of the nonlinear response of the watershed elements to the meteorological input. The model calibration and validation were carried out by using data available in a river basin in southern Ontario. A more detailed analysis of the calibration-validation results was presented in the third paper of the series. (See also W77-11218 and W77-11220) (Humphreys-ISWS)
W77-11219

DISTRIBUTED NUMERICAL MODEL FOR ESTIMATING RUNOFF AND SEDIMENT DISCHARGE OF UNGAGED RIVERS, 3. COMPARISON WITH OTHER SIMPLE TECHNIQUES,
McGill Univ. Montreal (Quebec), Department of Civil Engineering and Applied Mechanics.
S. K. Gupta, and S. I. Solomon.
Water Resources Research, Vol 13, No 3, p 631-636, June 1977. 3 fig, 5 tab, 7 ref. NRC A-7832.

Descriptors: *Model studies, *Hydrologic aspects, *Methodology, *Input-output analysis, *Canada, Hydrographs, Estimating, Analysis, Evaluation, Rating curves, Statistical methods, Mathematical models, Sediment transport, Runoff, Flow, Streamflow, Water balance, Numerical analysis, Calibrations, Hydrologic systems, Subsurface runoff, River basins, Sediment discharge, Systems analysis, Evaporation.
Identifiers: *Ontario(Canada), Ungaged rivers.

This is the third of a series of three papers describing the methodology of development of a distributed model for estimating runoff and sediment discharge of ungaged rivers. This paper compared, in detail, the results obtained in estimating flows and sediment discharged by means of the model at two stations with estimates of the same hydrologyc characteristics obtained by means of other simpler techniques. The results of the comparison indicated improvement over the simpler techniques, the indication being that the application of the model is justified where a higher accuracy of flow and sediment data is required or where lack of basic measurement data makes it impossible to apply the simpler techniques. In cases when changes in land use-land cover are contemplated and it is necessary to estimate the resulting modified hydrology, it seems advisable to apply the distributed model described in this series of papers. (See also W77-11218 and W77-11219) (Humphreys-ISWS)
W77-11220

REGIONALIZED DROUGHT FLOW HYDROGRAPHS FROM A MATURE GLACIATED PLATEAU,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2E.
W77-11221

THE CEQUEAU MODEL: DESCRIPTION AND EXAMPLES OF ITS USE IN PROBLEMS RELATED TO WATER RESOURCE MANAGEMENT,
National Inst. of Scientific Research, Quebec.
R. Charbonneau, J-P. Fortin, and G. Morin.
Hydrological Sciences Bulletin, Vol. 22, No. 1, p 193-202, March 1977. 8 fig, 1 tab, 3 ref.

Descriptors: *Model studies, *Mathematical models, *Watersheds(Basins), Runoff, Rainfall, Precipitation(Atmospheric), Meteorological data, Temperature, Evaporation, Evapotranspiration, Storage, Streamflow, Snow, Snowmelt, Reservoirs, Hydrology.
Identifiers: *Hydrophysiographic models.

Because the CEQUEAU hydrophysiographic model is able to simulate natural or modified discharges simultaneously in time and space, it is suited to multiple applications. By using such a model, one can study the hydrological repercussions, all over a basin, resulting from natural or man-made modifications to its characteristics. For instance, the various effects originating from the site, type, and characteristics of intended dams (flood control, diversion, storage, etc.) can be simulated with satisfaction. Moreover, the model provides the basic hydrological data required for design purposes. The effect of deforestation on floods produced by snowmelt can be simulated at any point in a basin. Flood risk mapping is also an application for which the model can be very useful. (Sims-ISWS)
W77-11239

STATUS OF PROJECTS IN MINNESOTA, FISCAL YEARS 1976 AND 77.
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 9D.
W77-11367

CORRELATION CONSTRAINTS FOR GENERATING PROCESSES,
Geological Survey, Reston, Va. Water Resources Div.; and IBM Thomas J. Watson Research Center, Yorktow Heights, N.Y.
N. C. Matalas, and J. R. Wallis.
In: Mathematical Models in Hydrology, Vol 1; Proceedings of the Warwaw Symposium July 1971: International Association of Hydrological Sciences Publication No 100, p 372-376, 1974. 1 fig, 6 ref.

Descriptors: *Streamflow, *Model studies, *Mathematical models, *Synthetic hydrology, Equations, Analytical techniques, Correlation analysis, Evaluation.

A correlation matrix pertaining to sequences of flows for a set of sites must be positive definite in order to generate synthetic flows at the sites. Moreover, the correlations must satisfy a set of constraints that are consistent with the correlation structure of the multivariate generating process. The correlation constraints for lag-one Markov and fractional noise processes are derived. The constraints offer an additional criteria for choosing among generating processes. (Woodard-USGS)
W77-11385

FREQUENCY DOMAIN ANALYSIS OF HYDROLOGICAL SYSTEMS WITH MONTHLY DATA,
Universidad del Zulia, Maracaibo (Venezuela) and Geological Survey, Lakewood, Colo. Water Resources Div.
I. Rodriguez-Iturbe, and C. F. Nordin.
In: Mathematical Models in Hydrology, Vol 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 343-354, 1974. 1 fig, 2 tab, 12 ref.

Descriptors: *Streamflow, *Water yield, *Sediment yield, *Model studies, *Rio Grande River, New Mexico, Analytical techniques, Equations, Data collections.
Identifiers: *Linear autoregressive processes.

Spectral and cross-spectral analyses are applied to monthly water-discharge and sediment-discharge records as exploratory tools for systems identification to suggest possible models for describing the interrelation of water and sediment discharge. Each series can be modelled separately by linear first-order autoregressive schemes, but considered as a system with water discharge as input and sediment discharge as output, a second-order linear scheme is appropriate. The random component does not behave as white noise, but can be represented by a first-order Markov process. The vector process describing the system has the advantage of providing a technique for bivariate simulation of the two series. (Woodard-USGS)
W77-11386

STOCHASTIC POINT-RAINFALL SIMULATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering; and Geological Survey, Menlo Park, Calif. Water Resources Div.
P. Todorovic, and D. R. Dawdy.
In: Mathematical Models in Hydrology, Vol 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 188-195, 1974. 3 fig, 3 tab, 7 ref.

Descriptors: *Model studies, *Rainfall-runoff relationships, *Streamflow, Small watersheds, Urban hydrology, Analytical techniques, Equations, Stochastic processes.

This model, which uses stochastic processes, can be used to study the distributions of number of storms and the amount of precipitation of storms in any arbitrary time period. The model can be used to simulate those critical storms desired for rainfall-runoff simulation studies for small watersheds, and in particular, for studies of urban hydrology. (Woodard-USGS)
W77-11387

2B. Precipitation

AUTOCORRELATION CHARACTERISTICS OF HYDROMETEOROLOGICAL DATA OF THE UNITED STATES,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
A. N. Shahane, D. Thomas, and P. Bock.
Water Resources Research, Vol. 13, No. 1, p 93-100, February 1977. 4 fig, 7 tab, 15 ref.

Descriptors: *Time series analysis, *Correlation analysis, *Meteorological data, Precipitation(Atmospheric), Runoff, Storage, Water vapor, Evapotranspiration, Spatial distribution, Analytical techniques, Data processing, Weather data, Hydrologic data, Meteorology, Hydrology.
Identifiers: *Correlation coefficients.

Serial correlation coefficients for the 5 years mean monthly time series of precipitation, runoff, change in storage, atmospheric vapor divergence, and evapotranspiration were computed for 76 small and 10 large combined drainage basins of the United States. An effort was made to explore first the characteristic behavior of these serial correlation numbers and then to compare their geographic distribution with physical factors. The results suggest that the geographic variation of these statistical characteristics shows correspondence with various climatological factors. (Sims-ISWS)
W77-10805

HOURLY CUMULATIVE TOTALS OF RAINFALL, BLACK HILLS FLASH FLOOD JUNE 9-10, 1976,
National Weather Service, Rapid City, S.D.
D. K. Halligan, and L. L. Longsdorf.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 087, Price codes: A02 in paper copy, A01 in microfiche. NOAA Technical Memorandum NWS CR-59, April 1976. 17 p, 10 fig, 1 tab, 3 ref.

Descriptors: *Flash floods, *Precipitation intensity, *Rainfall, *South Dakota rain, Floods, Storms, Storm runoff, Storm water, Storm surge, Precipitation excess, Networks, Warning systems.
Identifiers: *Hourly cumulative rainfall, *Black Hills, Bucket survey, Precipitation rates, Radar observations.

Heavy rains over the East Central Black Hills area on the night of June 9, 1972, produced flood waters that grew into the greatest natural disaster in terms of human life in the history of South Dakota. As much as 15 inches of rain fell near the village of Nemo on Box Elder Creek and 14.5 inches near Sheridan Lake, all within a period of less than five hours. Over an area of about 50 miles long and about 10 miles wide, the rainfall averaged times the 6-hour amounts that might be expected to occur once in a hundred years. Record floods were produced in the streams running eastward out of the Black Hills from Bear Butte Creek, which flowed through the City of Sturgis, to Grace Coolidge Creek, which emerged just east of the Mount Rushmore National Memorial. A careful and extensive survey was made from which several conclusions could be drawn. Steps were taken to improve the flash flood warning system for the Black Hills. A rain gage network of 30 observers was established, and several recommendations were made regarding radar monitoring, flash flood alarms, self help networks, community action plans, and the need for communities to hold drills to assure operational readiness. (Roberts-ISWS)
W77-10986

COMPARISON OF ENVIRONMENTS OF RAIN FORESTS IN DOMINICA AND PUERTO RICO,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2G.
W77-10988

STUDY OF A HEAVY PRECIPITATION OCCURRENCE IN REDDING, CALIFORNIA,
National Weather Service, Salt Lake City, Utah. Western Region.
C. E. Fontana.
NOAA Technical Memorandum NWS WR-123, June 1977. 21 p, 25 fig, 14 tab, 5 ref.

Descriptors: *Thunderstorms, *Precipitation(Atmospheric), *Rain, Synoptic analysis, Oregon, *California, *Rainfall intensity.
Identifiers: Synoptic patterns.

On August 14 and 15, 1976, heavy thunderstorms moved through northern California. The heaviest area of precipitation was in the area west and north of Redding, California. The rain fell at such a rapid rate that normal drains could not handle the water, and several areas of the city received water and mud damage from the overflow. The Army Corps of Engineers findings showed rain amounts in excess of 8 inches, with rainfall rates of 2-1/2 inches per hour. This paper discusses the synoptic pattern preceding and during the thunderstorms. The precipitation pattern is discussed, using the radar displays from the WSR-57 radars at Medford, Oregon and Sacramento, California. (NOAA)
W77-11050

GREAT LAKES ICE COVER, WINTER 1975-76,
National Oceanic and Atmospheric Administration, Boulder, Colo. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2C.
W77-11054

POSSIBLE RAINFALL REDUCTION THROUGH REDUCED SURFACE TEMPERATURES DUE TO OVERGRAZING,
Tel-Aviv Univ. (Israel). Dept. of Environmental Sciences.
J. Otterman.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-28648, Price codes: A03 in paper copy, A01 in microfiche. NASA Goddard Space Flight Center, June 1975. (NASA-TM-X-70927) 43 p, 6 fig, 3 tab, 43 ref.

Descriptors: *Rainfall intensity, *Soil temperature, *Grazing, *Arid lands, *Vegetation effects, *Soil erosion, Air-earth interfaces, Albedo, Soil mechanics, Soil stability, Convection, Air circulation, Rainfall disposition, Local precipitation, Weather modification.
Identifiers: *Overgrazing, Desertification, Plant debris.

Overgrazing can initiate a desertification mechanism and thus cause reduced rainfall in many areas, including Mediterranean lands. Plant reduction in overgrazed areas causes soil instability and covering of plant debris with dust, resulting in a high area albedo. Trampling by grazing herds tends to bury the debris in such denuded areas, while the higher albedo reduces surface temperatures when compared to the vegetated regions under sun-illumined conditions. Lower surface temperature result in decreased air convection, cloudiness and rainfall probability during weak meteorological disturbances. The resultant reductions in land-sea daytime temperature differences caused decreased daytime circulation of thermally driven locl winds. The effect is a drop in localized spotty precipitation which is important in arid and semi-arid regions. It is suggested that the desertification of Mediterranean lands from the late prehistoric times was mainly due to overgrazing and its consequences. (Jahns-Arizona)
W77-11114

ACIDITY IN RAINFALL,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5A.
W77-11138

DETERMINATION OF REGIONAL EVAPOTRANSPIRATION FROM UPPER AIR METEOROLOGICAL DATA,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2D.
W77-11211

STORM DEPTH-AREA RELATIONS FROM DIGITIZED RADAR RETURNS,
National Weather Service, Silver Spring, Md. Office of Hydrology.
R. H. Frederick, V. A. Myers, and E. P. Auciello.
Water Resources Research, Vol. 13, No. 3, p 675-679, June 1977. 7 fig, 16 ref.

Descriptors: *Depth-area curves, *Rainfall disposition, *Remote sensing, *Rainfall, Storms, Radar, Rainfall intensity, Rates, Frequency, Frequency analysis, Analysis, Data processing, Duration curves.

The point-derived precipitation frequency values depicted on maps must be converted to areal values for engineering and design work. Sparsity of data for quantifying this relation will be overcome as the National Weather Service (NWS) implements its program to digitize radar return at its primary radar sites. A prototype project converted digitized radar data to precipitation. By averaging precipitation thus derived over discrete area sizes, depth-area reduction curves were derived. While the data sample was limited, the prototype can be applied to the expected accumulation of data from the future NWS operational program. A sample of digitized radar data of the type expected to be available from operational radars was processed to depth-area reduction curves. Digital radar data can be expected to provide both spatial resolution and geographical coverage far in excess of coverage from dense network gage data. It appears to be feasible to develop depth-area reduction curves of this type separately for different climatic regions of the country after a few years' accmulation of digitized radar data, in spite of the inherent lesser absolute accuracy of radar precipitation measurements as compared to gage measurements. (Humphreys-ISWS)
W77-11226

2C. Snow, Ice, and Frost

A METHOD FOR CUTTING AND PREPARING THIN SECTIONS OF FROZEN SOILS,
Alaska Univ., College. Geophysical Inst.
T. E. Osterkamp.
Journal of Glaciology, Vol. 18, No. 78, p 143-144, 1977. 3 ref.

Descriptors: *Frozen soils, *Laboratory equipment, *Equipment, Ice, Permafrost, Soils, Frozen ground, Laboratory tests, Photography, Analytical techniques, Frost, Frost heaving.
Identifiers: Thin sections, Soil cutting.

A diamond wire saw was modified for cutting thin sections of frozen soil, and suitable operating conditions were determined experimentally. It was found that a lubricated wire, 0.34 mm in diameter, operated at cutting velocities of 100-300 mm/s and cutting forces 0.02-0.1 kg produced smooth cut surfaces on thin sections 0.4-0.5 mm in thickness. The temperature and wire size were not critical operating parameters, and the wire tensions recommended by the manufacturer were satisfactory. A method of mounting the thin sections also was described. (Sims-ISWS)
W77-10802

AN INTEGRATED APPROACH TO THE REMOTE SENSING OF FLOATING ICE,
Geological Survey, Tacoma, Wash. Water Resources Div.
W. J. Campbell, R. O. Ramseier, W. F. Weeks, and P. Gloersen.
In: Proceedings of the XXVI International Astronautical Congress, held in Lisbon, Portugal, September 1975: Published by Pergamon Press, New York, New York, p 445-487, 1976. 24 fig, 2 tab, 63 ref.

Descriptors: *Remote sensing, *Sea ice, *Iced lakes, *Aerial photography, *Microwaves, Satellites(Artificial), Analytical techniques, Instrumentation, Radar, Evaluation, Tracking techniques.
Identifiers: *Floating ice.

The current increase of scientific interest in all forms of floating ice - sea ice, lake ice, river ice, ice shelves and icebergs - has occurred during a time of rapid evolution of both remote-sensing platforms and sensors. The application of these new research tools to ice studies has generally been both piecemeal and sporadic. Remote-sensing requirements for floating-ice studies are given, and capabilities of various existing and future sensors and sensor combinations in meeting these requirements are discussed. Desirable future sensors also are discussed from both the research and operational points of view. (Woodard-USGS)
W77-10866

ENVIRONMENTAL STUDIES OF AN ARCTIC ESTUARINE SYSTEM - FINAL REPORT.
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10893

FAST ICE ON THE NORTHERN COAST OF ALASKA,
Alaska Univ., Inst. of Marine Science.
T. E. Osterkamp, and R. D. Seifert.
In: Environmental Studies of an Arctic Estuarine System, Environmental Protection Agency Ecological Research Series No. EPA-660/3-75-026, June 1975. p 225-232, 4 fig, 9 ref. Grant R801124-03.

Descriptors: *Ice cover, *Resources development, *Baseline studies, *Environmental effects, Alaska.
Identifiers: *Outer Continental Shelf, Beaufort Sea, *Fast ice, Sea ice, Colville River estuary.

Observations indicate that extensive areas of fast ice exist along the northern coast of Alaska each year. The extension of this ice seaward appears to be governed by several factors - including the presence of offshore islands, water depth, storms, and the presence of large grounded ice islands. These factors usually limit the seaward boundary of the fast ice to a distance of 10 to 15 km from the coastline between Barrow and Flaxman Island and much less than this from Camden Bay eastward to Herschel Island. The cores from the fast ice cover were sea ice except for those cores taken from the Colville River estuary which contained brackish ice. All ice cores taken from areas other than Harrison Bay were sea ice. Therefore, it is expected that the shore-fast ice on the north slope of Alaska is primarily sea ice. (See also W77-10893) (Sinha-OEIS)
W77-10898

SEASONAL VARIATION IN THE NUTRIENT CHEMISTRY AND CONSERVATIVE CONSTITUENTS IN COASTAL ALASKAN BEAUFORT SEA WATERS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10899

ON THE USE OF MICROWAVE RADIATION FOR GREAT LAKES ICE SURVEILLANCE,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
B. B. Hagman.
NOAA Technical Memorandum ERL GLERL-13, May 1976. 15 p, 2 tab, 3 fig, 11 ref. Also as; GLERL Contribution No. 92.

Descriptors: *Great Lakes, *Ice cover, *Remote sensing, Lake ice, Surveys, Radar, Monitoring.
Identifiers: *Microwave radiation.

With the desire to extend the Great Lakes shipping season to year-round operation comes the need for up-to-date information on ice conditions. One method being investigated uses microwave (radar) remote sensing for ice surveillance. Microwave systems are advantageous because they can penetrate cloud cover, operate day or night, and provide greater areal coverage at aircraft altitudes than can optical systems. For ice surveillance, radar 'sees' a world of edges and interfaces that correspond (in gray tones) to relative amounts of backscattered radiation. Radar has been shown effective in classifying certain ice types, conditions, and features, and for aiding ships in ice-covered waters or during severe weather. (NOAA)
W77-11052

GREAT LAKES ICE COVER, WINTER 1975-76,
National Oceanic and Atmospheric Administration, Boulder, Colo. Great Lakes Environmental Research Lab.
G. A. Leshkevich.
NOAA Technical Memorandum ERL GLERL-12, June 1977. 38 p, 25 fig, 2 ref. Also as GLERL Contribution No. 104.

Descriptors: *Ice cover, *Great Lakes, *Meteorological data, Lake ice, Weather data, Water temperature.
Identifiers: *Freezeups.

From ice-cover data received at the Great Lakes Environmental Research Laboratory during the past winter, 19 composite ice charts were produced to illustrate estimated ice distributions and concentrations on the Great Lakes at weekly intervals from mid-December 1975 through mid-April 1976 According to the definitions of mild, normal, and severe winters set forth by Rondy (1971), freezing degree-day accumulations indicate that the 1975-76 winter was normal for all lakes. Skim ice was reported during late November. Responding to lower average weekly temperatures, ice growth continued during the week ending 21 December. During the next 2 weeks slightly warmer temperatures retarded ice growth. Ice growth increased substantially during the week ending 11 January and ice covers increased reaching their maximum extents during early February on all lakes except Lake Superior, where it reached maximum near mid-March. Warmer temperatures during the week ending 15 February started the period of ice deterioration on the southern portion of the Great Lakes. On the northern portion of the lakes ice cover continued to grow or remain relatively stable until the week ending 21 March, when warmer temperatures started ice deterioration. Last reports of significant ice on the northern lakes came near mid-April. (NOAA)
W77-11054

ARCTIC CONTINENTAL SHELF PROCESSES AND MORPHOLOGY RELATED TO SEA ICE ZONATION, BEAUFORT SEA, ALASKA,
Geological Survey, Menlo Park, Calif. Geologic Div.
E. Reimnitz, L. Toimil, and P. Barnes.
AIDJEX Bulletin No 36, Washington University Division of Marine Resources, p 15-64, May 1977. 19 fig, 36 ref.

Descriptors: *Sea ice, *Arctic, *Continental shelf, *Alaska, Ice, Movement, Sublimation, Ablation, Sediments, Ice-water interfaces, Shoals, Coasts, Remote sensing, Satellites(Artificial), Aerial photography.
Identifiers: *Beaufort Sea(Alaska), Sea ice zonation.

Landsat-a-1 and NOAA satellite images for winter 1972-73 and ice seafloor data from several sources were used to study sea ice zonation and dynamics and their relation to bottom morphology and geology on the Beaufort Sea continental shelf of arctic Alaska. In early winter the location of the boundary between undeformed fast ice and the westward drifting pack ice of the Pacific Gyre is controlled by major coastal promontories. Pronounced linear pressure ridges, shear ridges, and hummock fields form along this boundary and are stabilized by grounding, generally between the 10 m and 20 m isobaths. Slippage along this boundary occurs intermittently at or seaward of the grounded ridges, forming new grounded ridges in a widening zone, the stamukhi zone, which by late winter extends out to the 40 m isobath. Between intermittent events along the stamukhi zone, pack ice drift and slippage are continuous along the shelf edge, at average rates of 3-10 km per day. A causal relation is seen between the spatial distribution of major ice ridge systems and offshore shoals downdrift of major coastal promontories. The shoals appear to have migrated shoreward under the influence of ice up to 40 m in the last 25 years. (Woodard-USGS)
W77-11383

2D. Evaporation and Transpiration

SAP STREAM VELOCITY AS AN INDICATOR OF THE TRANSPIRATIONAL PROCESS,
Ceskoslovenska Akademie Ved, Prague. Inst. of Hydrodynamics.
J. Balek, and O. Pavlik.
Journal of Hydrology, Vol. 34, No. 1/2, p 193-200, July 1977. 4 fig, 6 ref.

Descriptors: *Transpiration, *Meteorological data, *Temperature, Water circulation, Radiation, Pressure, Rainfall, Heat flow, Foreign countries, Foreign research.
Identifiers: *Czechoslovakia, *Sap stream velocity, *Transpiration process, Spruce trees, Independent variables, Net radiation, Poplar trees, Transpiration variability indicator.

Continuous long-term measurements of the spruce sap stream velocity and meteorological phenomena observed in the Sumava region, Czechoslovakia, indicated two different relationships between sap stream velocity as a dependent variable and meteorological factors as independent variables. For mean daily temperatures above 6 C, the net radiation was found to be the most decisive factor; while for the temperatures below C, the duration of rainfall during each particular day was found to be the most significant. Comparative results for the popular tree were provided. The results served as a transpiration variability indicator for the water balance circulation. (Roberts-ISWS)
W77-10976

EFFECT OF ABSCISIC ACID ON THE TRANSPIRATION OF ZEA MAYS UNDER DIFFERENT LEVELS OF SOIL WATER POTENTIAL,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
M. Talha, and F. Reda.
Egyptian Journal of Soil Science, Vol 16, No 1, 113-119, 1976. 2 fig, 10 ref.

Descriptors: *Transpiration, *Corn(Field), *Soil water, *Crop response, Soil moisture, Available water, Soil-water-plant relationships, Transpiration control, Planting management.
Identifiers: *Abscisic acid, *Soil water potential

Growth chamber experiments on corn (Zea mays) were conducted to study the effects of exogenous abscisic acid (ABA) and soil water potential on transpiration from intact leaves. There was a consistent decline in the transpiration rate as soil water potential decreased, a response which was intensified by ABA application. Exogenous application of different concentrations of ABA reduced transpiration more at low levels of soil water potential. At high levels, the endogenous ABA was increased greatly; thus, exogenous ABA application did not further affect the transpiration rate. Transpiration was decreased for leaves grown under relatively high soil water potential (-5 bar) when sprayed with ABA. Rate of transpiration at his potential was approximately half that of the control, with a 60% depletion of available soil moisture. Results indicate that ABA could be used as an antitranspirant agent under certain soil water potentials. (Jahns-Arizona)
W77-11094

ASSESSMENT OF WATER LOSS PATTERNS WITH MICROLYSIMETERS,
Agricultural Research Service, University Park. Pa. Northeast Watershed Research Center.
A. S. Rogowski, and E. L. Jacoby, Jr.
Agronomy Journal, Vol. 69, No. 3, p 419-424, May-June 1977. 5 fig, 3 tab, 4 ref.

Descriptors: *Evapotranspiration, *Lysimeters, Soil water, *Water loss, Soil water movement, Measurement, On-site tests, Laboratory tests, Nuclear moisture meters, Model studies.
Identifiers: *Microlysimeters.

In order to develop a practical method of evaluating evapotranspiration (ET) in the field, portable cylindrical grass-growing lysimeters were constructed and tested on a 58-ha watershed. A laboratory check indicated there was no loss of flow continuity with periodic lysimeter removal at high soil water levels. A field check proved feasibility for field use and indicated no significant differences in ET between different segments of a small study area. The watershed study also included gamma-probe measurements and ET predictions with a Blackland ET model. A number of strategically placed microlysimeters may estimate an ET component over a larger area as long as the predominant rooting depth is about 30 cm. Only very stony and wooded sites presented ET estimation problems for any of the three methods. (Jahns-Arizona)
W77-11115

CALCULATING POTENTIAL AND ACTUAL EVAPORATION FROM A BARE SOIL SURFACE BY SIMULATION OF CONCURRENT FLOW OF WATER AND HEAT,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
H. M. van Bavel, and D. I. Hillel.
Agricultural Meteorology, Vol. 17, No. 6, p 453-476, December 1976. 9 fig, 5 tab, 25 ref.

Descriptors: *Evaporation, *Mathematical models, *Soil dynamics, *Flow characteristics, Soil surfaces, Soil profiles, Soil water movement, Heat flow, Heat transfer, Soil properties, Soil moisture content, Weather data, Albedo.
Identifiers: *Bare soil.

A numerical method is presented for estimating the instantaneous evaporation rate from bare soil, regardless of wetness, using standard weather data and physical characteristics of the soil profile. Potential evaporation is calculated by combining the surface-energy balance of a bare soil and the transport of heat and water in both the atmospheric boundary layer and in the soil. This dynamic model accounts for soil properties and changes as evaporation proceeds, as well as reflecting the changing surface properties and atmospheric state. Results indicate that soil heat flux and surface emittance may vary enough with soil water content to make the concept of potential evaporation imprecise. However, differences are not great enough to invalidate the simpler combination or energy balance formulas in which surface albedo and roughness are the only non-climatic parameters. The method is especially useful in simulating the evaporation process from drying surfaces. Results support the existence of separate potential and falling rate stages of evaporation but not a third, constant rate stage. Transition between the two stages is described. (Jahns-Arizona)
W77-11120

DETERMINATION OF REGIONAL EVAPOTRANSPIRATION FROM UPPER AIR METEOROLOGICAL DATA,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
J. A. Mawdsley, and W. Brutsaert.
Water Resources Research, Vol 13, No 3, p 539-548, June 1977. 6 fig, 7 tab, 27 ref, 1 append. NSF GA-42569.

Descriptors: *Evapotranspiration, Model studies, *Estimating, *Nebraska, *Iowa, Mathematical models, Atmosphere, Weather data, Meteorological data, Hydrologic aspects, Boundary processes, Boundary layers, Evaporation, Equations, Data processing, Analysis, Theoretical analysis, Analytical techniques, Watersheds(Basins), Correlation analysis, Monthly.

A procedure, recently proposed by the authors to calculate actual evapotranspiration on the basis of parameterization of the atmospheric boundary layer, was applied for the period April through November 1969-1972 with upper air ('rawinsonde') meteorological data from Omaha, Nebraska. The accuracy of the 1-day, 3-day, weekly, and monthly evapotranspiration totals was assessed by comparing them to evapotranspiration data estimated by a suitable adjustment of potential evapotranspiration from a nearby catchment in the Treynor basins. Several alternative methods for determining the height of the boundary layer and the wind speed at the top of the boundary layer were used: as a result, seven variations of the basic procedure were tested. The similarity functions for water vapor D were found to be smaller than the corresponding functions for sensible heat C, not equal as was assumed previously. Difficulties were encountered, since published upper air humidity data were in error: nevertheless, the method was successful on a monthly basis with a correlation coefficient of the order of 0.83, but far less successful on a daily basis. The recommeded version of the method used the height of the temperature inversion as an estimate of the boundary layer height and the measured wind as the estimate of the boundary layer height and the measured wind as the estimate of the wind speed at the top of the boundary layer. (See also W77-04771) (Humphreys-ISWS)
W77-11211

EVAPORATION AND SALT MOVEMENT IN SOILS IN THE PRESENCE OF WATER TABLE,
Alexandria Univ., Alexandria (Egypt). Dept. of Soils and Water Science.
F. A. Hassan, and A. Sh. Ghaibeh.
Soil Science Society of America Journal, Vol. 41, No. 3, p 470-478, May-June 1977. 8 fig, 3 tab, 6 ref.

Descriptors: *Soil moisture, *Evaporation, *Salts, Soil water, Soil water movement, Model studies, Mathematical models, Laboratory tests, Loam, Clays, Foreign countries, Soils, Foreign research, Profiles, Soil profiles, Moisture tension, Hydraulic conductivity, Tensiometers, Soil physics, Soil science.
Identifiers: *Evaporation rates, *Syria, *Egypt, Salt profiles.

Evaporation from homogeneous and stratified columns, in the presence of shallow water table, at steady-state, was examined. Soils from Syria and Egypt were used. The hydraulic conductivity-moisture tension curves of the soils were determined and were fitted to smooth curves represented by Gardner's empirical formula. Solutions obtained by Gardner for the steady flow equations were modified for the boundary conditions of the top and bottom layers, and then the solutions were reduced to a dimensionless form with two variables, the relative flux density and the relative tension at the interface. The resulting equations were used to calculate the evaporation rates. Salt profiles near the surface, at different evaporation rates, also were studied. In case of homogeneous soil columns, the calculated values gave close estimates of the measured evaporation rates. However, the ratio of the calculated to measured rates was 1.3 to 1.6 for stratified columns. The salt profiles in the top dry layer indicated the polyphasic nature of water movement in the top zone. The observed increase in the dispersion coefficient with the solution velocity was more pronounced in soils of wider range of pore size. (Sims-ISWS)
W77-11231

EVAPORATION AND RADIATION MEASUREMENTS AT SALTON SEA, CALIFORNIA,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.
A. M. Sturrock, Jr.
Open-file report 77-74, March 1977. 42 p, 4 fig, 8 tab, 11 ref.

Descriptors: *Evaporation, *Saline water, *Energy budget, *Mass transfer, *Hydrologic budget, Analytical techniques, Radiation, Vapor pressure, Wind velocity, Temperature, Heat transfer, Reservoir evaporation, California.
Identifiers: *Salton Sea(Calif), *Cummings radiation integrator, Flat-plate radiometer, Mass transfer coefficients, Thermal surveys areal variation, Seasonal bias.

Evaporation from the Salton Sea, Calif., was computed for a 539-day period between July 14, 1967, and January 2, 1969, by use of energy-budget, mass-transfer, and water budget methods. The total evaporation computed by the three methods agreed within 5 percent. The values of heat transfer to and from the bed were used in the energy-budget computations. Monthly evaporation computed by the energy-budget method for 1968 showed that the Salton Sea exhibited a double wave evaporation similar to that of oceans in the same latitude. Weekly and montly comparisons were made to determine if radiation measured by the flat-plate radiometer is seasonally biased. These comparisons indicate that the measurements of radiation by the flat-plate radiometer are not seasonally biased, and that the Cummings Radiation Integrator gives reliable measurements of radiation for periods as short as 1 week. An empirical mass-transfer coefficient, N, as determined from energy-budget measurements. The value of this coefficient to give evaporation in inches per day is 0.00245 when the windspeed is expressed in miles per hour and the vapor pressure expressed in millibars. (Woodard-USGS)
W77-11365

MOISTURE RELATIONSHIPS IN TWELVE NORTHERN DESERT SHRUB COMMUNITIES NEAR GRAND JUNCTION, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
F. A. Branson, R. F. Miller, and I. S. McQueen.
Ecology, Vol 57, No 6, p 1104-1124, Autumn 1976. 22 fig, 1 tab, 53 ref.

Descriptors: *Soil-water-plant relationships, *Shrub, *Evapotranspiration, *Arid climates, *Colorado, Plant growth, Phenology.
Identifiers: *Internal-plant stress, *Soil-moisture stress, Soil salinity, Leaf persistence.

Moisture relationship within plants and associated soils of 12 plant communities throughout the growing season near Grand Junction, Colo., were studied. Minimum internal-plant stresses were similar for all species but maximum values differed greatly. Maximum plant stress values ranged from 103 bars for Atriplex nuttallii to only 40 bars for Chrysothamnus nauseosus. Internal-plant stresses were closely related to minimum soil-moisture stresses found within soil profiles at the time of sampling. Similar close relationships were found between internal-plant stress and quantities of moisture stored in soils. Most correlation coefficients for internal-plant stress and atmospheric variables were low and nonsignificant. Evapotranspiration was significantly related to percent live plant cover. The results show that internal-plant stress could be used to obtain estimates of soil-moisture stress and soil-moisture storage. (Woodard-USGS)
W77-11384

EVALUATION OF RESISTANCE AND MASS TRANSPORT EVAPOTRANSPIRATION MODELS REQUIRING CANOPY TEMPERATURE DATA,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering; and Nebraska Univ., Lincoln. Inst. of Agricultural and Natural Resources.
B. L. Blad, and N. J. Rosenberg.
Agronomy Journal, Vol 68, No 5, p 764-769, September-October 1976. 9 fig, 19 ref.

Descriptors: Alfalfa, Satellites, *Canopy, *Temperature, *Evapotranspiration, Hydrology, Water management(Applied), *Model studies, Subsurface irrigation, Remote sensing, Advection.
Identifiers: Thermal scanners, Crop canopy, Irrigation scheduling.

The increasing use of thermal scanners on aircraft and satellites makes it likely that data on surface temperature for large areas will become routinely available. If reliable evapotranspiration methods which incorporates surface temperature data can be developed, an important tool for research and application in hydrology, in irrigation scheduling, and in other water management procedures will result. A 'resistance model' which stems from the work of Brown and Rosenberg and a mass transport (Daltonian) model for estimating evapotranspiration (ET) were tested on large fields of naturally subirrigated alfalfa. Both models make use of crop canopy temperature data. Temperature data were obtained with an IR thermometer and with leaf thermocouples. A Bowen ratio-energy balance (BREB) model, adjusted to account for underestimation of ET during periods of strong sensible heat advection, was used as the standard against which the resistance and mass transport models were compared. Daily estimates by the resistance model were within 10% of estimates made by the BREB model. Daily estimates by the mass transport model did not agree quite as well. Performance was good on clear and cloudy days and also during periods of nonadvection of sensible heat. The performance of the mass transport and resistance models was less satisfactory for estimation of fluxes of latent heat for short term (15 min) periods. Both models tended to overestimate at low LE fluxes. (Skogerboe-Coloado State)
W77-11396

2E. Streamflow and Runoff

THE ARNO RIVER MODEL PROBLEMS, METHODOLOGIES AND TECHNIQUES,
Centro di Ricerca IBM di Pisa (Italy).
For primary bibliographic entry see Field 2A.
W77-10809

A CATCHMENT SIMULATION MODEL DEVELOPED FOR URBAN AND URBANISING CATCHMENTS WITH PARTICULAR REFERENCE TO THE USE OF AUTOMATIC OPTIMIZATION TECHNIQUES,
Anglian Water Authority(England).
S. R. Wood.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 209-218, 1975. 5 fig, 2 tab, 18 ref.

Descriptors: *Urban hydrology, *Simulation analysis, *Optimization, *Watersheds(Basins), Design, Stemflow, Methodology, Mathematical models, Urban runoff, Rural areas, Water quality, Water storage, Equations, Systems analysis.
Identifiers: England.

Described is a part of a study undertaken at Birmingham University, England to develop a readily usable design method for modeling the changes in streamflow regime produced by urbanization. Considered is the structure and development of a simulation model for use in an urban environment, with particular reference to the use of automatic techniques for the optimization of the model parameters. The article discusses the model requirements, the model structure in terms of urban and rural runoff simulation and model flexibility, model optimization trials, and model tests made on the River Rea in Birmingham subrubs and the Crawters Brook catchment in Crawley, Sussex. Several of the shortcomings of the optimization methods are outlined, with reference to ways of overcoming them. Results of the use of the optimized model on the two British catchments are briefly shown. (See also W77-10806) (Bell-Cornell)
W77-10823

RESERVOIRS WITH SEASONALLY VARYING MARKOVIAN INFLOWS, AND THEIR FIRST PASSAGE TIMES,
E. H. Lloyd.
Research Report RR-77-4, International Institute for Applied Systems Analysis, Laxenburg, Austria, March 1977. 46 p, 14 ref.

Descriptors: *Reservoirs, *Behavior, *Inflow, *Stochastic processes, *Markov processes, Probability, Seasonal, Equations, Mathematical models, Systems analysis.
Identifiers: *Markov chains, *First passage times.

In building a realistic mathematical model of a reservoir, a vital component is that which describes the time-dependence of the inflowing water. This must exhibit the seasonal variations, as well as the chance fluctuations and the 'persistence' structure, that are observed in natural geophysical phenomena. Herein, the work is in terms of discrete time units of arbitrary brevity, conventionally called 'seasons,' and in discrete units of water quantity; approximated are seasonally varying stochastic and autocorrelation behavior of the inflow by representing it as a seasonal lag-one Markov chain. The properties of such chains are described and examples are provided of explicitly formulated matrix models where expressions are directly in terms of flow distributions and autocorrelations. The major part of the paper considers the problem of obtaining the probability distributions of recurrence times and first passage times in such chains. Results are obtained both explicity and in terms of probability generating functions. The methods used are generalizations of the classical renewal theory and of a technique known in random walk theory as the absorbing state method. The paper closes with a brief resume of stochastic reservoir theory. It is shown that when the inflow process is a seasonal Markov chain of the type described, then, subject to reasonable restrictions on management policy, the sequence of pairs forms a seasonal lag-one vector Markov chain to which the main results of the paper may be applied to obtain recurrence times and first passage times for the reservoir contents. (Bell-Cornell)
W77-10836

PREDICTING INSTANTANEOUS PEAK DEMAND IN RURAL DOMESTIC WATER SUPPLY SYSTEMS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W77-10838

THE BIG THOMPSON RIVER FLOOD OF JULY 31-AUGUST 1, 1976, LARIMER COUNTY, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.; and Colorado Water Conservation Board, Denver.
R. U. Grozier, J. F. McCain, L. F. Lang, and D. C. Merriman.
Colorado Water Conservation Board, Denver, Department of Natural Resources Flood Information Report, 1976. 78 p, 11 fig, 51 plates, 3 tab.

Descriptors: *Floods, *Flood data, *Flood damage, *Colorado, *Storms, Runoff, Streamflow, Peak discharge, Maps, Rainfall, Photography, Flood profiles, Flood peak, Aerial photography.
Identifiers: *Big Thompson River(Colo).

As much as 12 inches (305 millimeters) of rain fell on the Big Thompson River basin, a favorite summer-home and vacation area in Colorado, during the evening of July 31, 1976, causing a devastating flood on the Big Thompson River and its tributaries between Estes Park and Loveland, Colo. At the latest count (October 1976), Larimer County officials reported 139 persons lost their lives, with 5 still reported missing, and property damage of $16.5 million. Descriptions of the storm and flood, peak discharges, flood elevations, photographs of flooded areas, and aerial photographs of the Big Thompson and the North Fork Big Thompson Rivers, outlining inundated areas are included in this report to assist public officials and private citizens in planning for reconstruction of the roads, homes, and vacation areas in the Big Thompson River basin. (Woodard-USGS)
W77-10859

STREAMFLOW TRANSMISSION LOSSES I WESTERN KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4A.
W77-10966

U.B.C. WATERSHED MODEL,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10969

INTEGRATED AUTOMATIC WATER SAMPLE COLLECTION SYSTEM,
Michigan State Univ., East Lansing. Dept. of Electrical Engineering and Systems Science.
For primary bibliographic entry see Field 7B.
W77-10972

HOURLY CUMULATIVE TOTALS OF RAIN FALL, BLACK HILLS FLASH FLOOD JUNE 10, 1976,
National Weather Service, Rapid City, S.D.
For primary bibliographic entry see Field 2B.
W77-10986

FLOOD DISCHARGES OF RIVERS DRAINING ACROSS PLAINS TO OCEANS USING THE SARTHE AND THE MAYENNE (IN WESTERN FRANCE) AS EXAMPLES (CONTRIBUTION TO THE METHODOLOGY OF FLOOD FLOWS BY AN EXTENSION OF THE GRADEX METHOD) (LES DEBITS DE CRUE DES RIVIERES DES PLAINES OCEANIQUES A TRAVERS L'EXEMPLE DE LA SARTHE ET DE LA MAYENNE (FRANCE DE L'OUES

(CONTRIBUTION A LA METHODOLOGIE DES DEBITS DE CRUE PAR UN ESSAI D'EXTENSION DE LA METHODE DU GRADEX),
Tours Univ. (France).
For primary bibliographic entry see Field 2A.
W77-11205

PULSING FLOW IN STEEP ALLUVIAL STREAMS,
Missouri Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 8B.
W77-11206

ISOCHRONES OF TRAVEL TIME AND DISTRIBUTION OF FLOOD STORAGE FROM A TRACER STUDY ON A SMALL WATERSHED,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-11216

REGIONALIZED DROUGHT FLOW HYDROGRAPHS FROM A MATURE GLACIATED PLATEAU,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
W. Brutsaert, and J. L. Nieber.
Water Resources Research, Vol 13, No 3, p 637-643, June 1977. 9 fig, 1 tab, 29 ref.

Descriptors: *Hydrographs, *Droughts, *Base flow, *New York, *Mathematical models, Model studies, Flow, Low flow, Rivers, Watersheds(Basins), Groundwater, Streamflow, Analysis, Analytical techniques.
Identifiers: *Finger Lakes basins(NY).

The drought or base flow characteristics of six basins in the Finger Lakes region were obtained by considering for each available record the lower envelope of dQ/dt as a function of Q, where Q is the flow rate. The procedure avoids the uncertainty regarding a proper time reference after each rainfall event, and it eliminates the effects of evapotranspiration. The results suggested that among several expressions, Boussinesq's non-linear solution of free surface groundwater flow is suited best to parameterize the observed hydrographs. The obtained parameters can be related to the basin characteristics, namely, drainage area and the total stream length, in accordance with relationships derived on the basis of the Dupuit-Boussinesq aquifer model. The result allowed the determination of drought flow parameters for ungage sites within the region. (Humphreys-ISWS)
W77-11221

IN DETERMINING DISTANCES THROUGH STREAM NETWORKS,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 4A.
W77-11225

THE CEQUEAU MODEL: DESCRIPTION AND EXAMPLES OF ITS USE IN PROBLEMS RELATED TO WATER RESOURCE MANAGEMENT,
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 2A.
W77-11239

WATER-MANAGEMENT MODEL IN FLORIDA FROM LANDSAT-1 DATA,
Geological Survey, Tampa, Fla.; Geological Survey, Miami, Fla. Water Resources Div.; and Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 4A.
W77-11370

CORRELATION CONSTRAINTS FOR GENERATING PROCESSES,
Geological Survey, Reston, Va. Water Resources Div.; and IBM Thomas J. Watson Research Center, Yorktow Heights, N.Y.
For primary bibliographic entry see Field 2A.
W77-11385

FREQUENCY DOMAIN ANALYSIS OF HYDROLOGICAL SYSTEMS WITH MONTHLY DATA,
Universidad del Zulia, Maracaibo (Venezuela); and Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-11386

STOCHASTIC POINT-RAINFALL SIMULATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering; and Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-11387

PREDICTION MODELS FOR MONTHLY RUNOFF,
Regional Engineering Coll., Rourkela (India).
For primary bibliographic entry see Field 4A.
W77-11437

2F. Groundwater

MASS TRANSFER STUDIES IN SORBING POROUS MEDIA I. ANALYTICAL SOLUTIONS,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-10801

MODELING THE CONJUNCTIVE AVAILABILITY OF SURFACE-AND GROUNDWATER OF A GRABEN IN THE ARID SOUTHWEST OF THE UNITED STATES,
Maine Univ., Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-10810

THEORETICAL ANALYSIS OF FLUID FLOW AND ENERGY TRANSPORT IN HYDROTHERMAL SYSTEMS,
Geological Survey, Louisville, Ky. Water Resources Div.; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-10861

FINITE-DIFFERENCE MODEL OF TWO-DIMENSIONAL, SINGLE-, AND TWO-PHASE HEAT TRANSPORT IN A POROUS MEDIUM--VERSION I,
Geological Survey, Louisville, Ky. Water Resources Div.; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-10862

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1977,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10864

GROUND-WATER RESOURCES OF BENSON AND PIERCE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10876

FLOW ANALYSIS OF KARST SYSTEMS WITH WELL DEVELOPED UNDERGROUND CIRCULATION,
Geological Survey, Tallahassee, Fla. Water Resources Div.
G. L. Faulkner.
In: Karst Hydrology and Water Resources: Proceedings of the U.S.-Yugoslavian Symposium, held in Dubrovnik, Yugoslavia, June 2-7, 1975, p 6-1 - 6-28, June 1976. 4 fig, 1 tab, 11 ref.

Descriptors: *Karst hydrology, *Hydrogeology, *Subsurface drainage, *Flow nets, *Springs, *Florida, Groundwater movement, Water yield, Groundwater recharge, Geomorphology, Hydrologic budget, Transmissivity, Aquifer characteristics.
Identifiers: *Silver Springs(Fla), Covered karst, Floridan aquifer.

Flow-net techniques may be a most practical and economical way to analyze the flow regime of a cavernous carbonate aquifer with well developed circulation. Flow-net analysis was applied successfully to the Silver Springs ground-water drainage basin in north-central peninsular Florida by likening the springs to a continuously discharging well whose cone of depression is the entire drainage basin. The Floridan aquifer, from which the springs discharge on the average 821 cfs, is composed of cavernous limestone and dolomite of highly variable porosity and permeability. Recharge is by infiltration of local rainfall through a few to several tens of feet of sand and clayey sand of varying permeability that cover the karst surface of the aquifer. Most flow in the aquifer is in solution channels oriented along a dual system of intersecting tension fractures. The drainage area for the springs is about 730 sq mi. Average annual recharge in the basin is 15.3 inches. Transmissivity as determined from flow-net analyses ranges from 10,000 sq ft/d to 25,400,000 sq ft/d among 25 flow cells within a few miles of the springs. (Woodard-USGS)
W77-10878

STEADY STATE BI-LEVEL SUBSURFACE DRAINAGE THEORY FOR SOILS OF VARYING HYDRAULIC CONDUCTIVITY,
Marathwada Agricultural Univ., Parbhani (India). Dept. of Agricultural Engineering.
H. S. Acharya.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 2, p 276-277, March-April 1977. 3 fig, 1 tab, 4 ref.

Descriptors: *Drainage, *Hydraulic conductivity, *Water table, *Model studies, Mathematical models, Tile drainage, Equations, Subsurface drainage, Groundwater, Groundwater movement, Hydrology.
Identifiers: *Bi-level drainage.

In practice, various situations exist where hydraulic conductivity varies with depth. Soils with varying clay percentage, with varying stone content, or with layers of different types of soils form a few examples of such situations. The aim of this article was to study the steady-state bi-level subsurface drainage problem for soils with varying hydraulic conductivity. Cases of constant hydraulic conductivity follow as special cases of the analysis. (Sims-ISWS)
W77-10961

MATERIAL TRANSPORT THROUGH POROUS MEDIA: A FINITE-ELEMENT GALERKIN MODEL,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
J. O. Duguid, and M. Reeves.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-

4928, Price codes: A09 in paper copy, A01 in microfiche. ESD Publication 733, March 1976. 206 p, 9 fig, 16 ref, 5 append.

Descriptors: *Mathematical models, *Porous media, *Ion transport, Advection, Dispersion, Adsorption, Radioactivity, Computer programs, Finite element analysis, Numerical analysis, Mass transfer, Chemical reactions, Equations, Groundwater.
Identifiers: Galerkin technique, Material-transport model.

A two-dimensional transient model for flow of a dissolved constituent through porous media was developed. Mechanisms for advective transport, hydrodynamic dispersion, chemical adsorption, and radioactive decay were included in the mathematical formulation. Implementations of quadrilateral finite elements, bilinear spatial interpolation, and Gaussian elimination were used in the numerical formulation. The programming language FORTRAN IV was used exclusively in the computer implementation. A listing of the program was included. The material-transport model is compatible with the moisture-transport model for predicting advective Darcy velocities for porous media which may be partly unsaturated. In addition to a description of the mathematical formulation, the numerical treatment and the computer implementation results of two computer simulations were included in the document. One simulation was a comparison with a well-known analytical treatment and was intended as a partial validation. The other simulation, a seepage-pond problem, was more realistic demonstration of the capabilities of the computer model. Complete listings of input and output were given in the appendices so that the simulation may be used for checkout purposes. The report was intended to be a comprehensive description of the material-transport computer mode. (Visocky-ISWS)
W77-10981

BRACKISH GROUNDWATER BODIES AS A RESULT OF GEOLOGICAL HISTORY AND HYDROLOGICAL CONDITIONS,
Rijksinstituut voor Drinkwater voorziening, Delft (Netherlands).
C. R. Meinardi.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben Gurion University of the Negev, p 25-39. 6 fig, 1 tab, 9 ref.

Descriptors: *Brackish water, *Aquifers, *Clorides, *Geologic history, *Hydrologic properties, Hydrologic data, Diffusion, Base flow, Hydrodynamics, Dispersion, Salts, Mathematical models, Groundwater basins, Aquifer testing, Saline water.
Identifiers: Netherlands.

The origin and distribution of salt in aquifers is discussed, examining the behavior of chloride. Geological history has a part in its origin and the deminant processes of distribution are molecular diffusion and hydrodynamical dispersion. These physical processes can be treated mathematically and an analytical solution reached under certain conditions. A study conducted in the Guelders Valley area of the Netherlands, where both hydrological patterns and chloride distribution were known, gave results in good agreement with observations. A complete picture of the chloride distribution in an area can be obtained using geological history, some knowledge of past and actual hydrological conditions, and a few observations on chloride concentrations in groundwater. Conversely, as hydrodynamical dispersion is strongly connected with groundwater flow, knowledge of chloride distribution yields information about the hydrological system. If solved consitutuents of groundwater other than chloride are subject to the same physical factors, some indication of the parameters involved can be deduced from the behavior of chloride-ion. (See also W77-11055) (Jahns-Arizona).
W77-11057

HYDROLOGY OF SMALL WATERSHEDS IN WISCONSIN'S DRIFTLESS AREA,
North Central Forest Experiment Station, La Crosse, Wis.
For primary bibliographic entry see Field 2A.
W77-11209

FLOW IN FRACTURED POROUS MEDIA,
Princeton Univ., N.J. Dept. of Civil Engineering.
J. O. Duguid, and P. C. Y. Lee.
Water Resources Research, Vol 13, No 3, p 558-566, June 1977. 6 fig, 17 ref.

Descriptors: *Porous media, *Mathematical models, *Fracture permeability, *Flow, Model studies, Mathematical studies, Theoretical analysis, Analytical techniques, Numerical analysis, Finite element analysis, Equations, Porosity, Compressibility, Subsurface flow.

The equations governing the flow of fluid through fractured porous media were derived. The equations consist of Darcy's law for fluid flow in the primary pores, equations of motion for fluid flow in the fractures, and two continuity equations. The system of equations was coupled by the interaction of fluid in the primary pores with fluid in the fractures. The coupling terms, which are incorporated in the continuity equations, describe the transient flux of fluid out of the primary pores and into the fractures. The finite element Galerkin method was used to solve the coupled system of equations for transient flow in a confined leaky aquifer. Solutions were obtained for both constant discharge and step drawdown problems. The importance of coupling the primary blocks to the fracture system and the effect of the acceleration term in the equation of motion in the fractures were studied by using the model. The effect of the acceleration term in the equation of motion of fluid in fractures is small, even in the case of step drawdown, where there is a rapid change in the magnitude of velocity during early stages of the flow. Both the incremental pressure in the primary pores and the total incremental pressure in the fractures were obtained from the mathematical model. The two pressures cannot be obtained from an observation well because the level measured in the well is related to total pressure. The pressure in the fractures is nearly equal to the pressure in the primary pores, and the gradients of these pressures are nearly equal. (Humphreys-ISWS)
W77-11213

VISCOELASTIC AQUIFER MODEL APPLIED TO SUBSIDENCE DUE TO PUMPING,
Cornell Univ., Ithaca. N.Y. School of Civil and Environmental Engineering.
M. Y. Corapcioglu, and W. Brutsaert.
Water Resources Research, Vol 13, No 3, p 597-604, June 1977. 2 fig, 3 tab, 46 ref.

Descriptors: *Land subsidence, *California, *Mathematical models, *Aquifers, *Pumping, Model studies, Water level fluctuations, Compaction, Drawdown, Theoretical analysis, Consolidation.
Identifiers: *San Joaquin Valley(Calif), Viscoelastic aquifer model.

A viscoelastic aquifer model was applied to analyze and predict the piezometric drawdown and the compaction observed in a major confined aquifer system in the San Joaquin Valley in California. A field approach was used based on a minimal number of 'bulk' parameters. The parameters, which are the transmissivity, the compressibilities of primary and secondary consolidation, and the viscosity of the secondary consolidation, were derived by calibration of the model by means of trial and error simulation of 2 years of records of drawdown and compaction. It was found that in the absence of drawdown records, the identification also may be accomplished with compaction records in addition to a standard pumping test. Comparison of computed results with available records showed that the viscoelastic model yields a satisfactory prediction of compaction which is far better than that obtainable with the elastic model of the classical Theis-Jacob approach. The elastic model may be adequate to represent the hydraulic properties of the aquifer in the analysis of the piezometric drawdown; however, it appears to be unsatisfactory to represent the mechanical properties of the aquifer as related to surface subsidence. (Humphreys-ISWS)
W77-11217

NUMERICAL MODEL FOR SATURATED-UNSATURATED FLOW IN DEFORMABLE POROUS MEDIA, 1. THEORY,
California Univ., Berkeley. Lawrence Berkeley Lab.; and California Univ., Berkeley. Dept. of Mineral Sciences and Mineral Engineering.
T. N. Narasimhan, and P. A. Witherspoon.
Water Resources Research, Vol 13, No 3, p 657-664, June 1977. 6 fig, 27 ref.

Descriptors: *Porous media, *Mathematical models, *Groundwater movement, Theoretical analysis, Saturated flow, Unsaturated flow, Model studies, Deformation, Numerical analysis, Equations, Flow, Groundwater, Hydrology, Permeability, Compressibility, Pore water, Hydraulic conductivity.

A theory was presented for numerically simulating the movement of water in variable saturated deformable porous media. The theoretical model considered a general three-dimensional field of flow in conjunction with a one-dimensional vertical deformation field. The governing equation expressed the conservation of fluid mass in an elemental volume that has a constant volume of solids. Deformation of the porous medium may be nonelastic. Permeability and the compressibility coefficients may be nonlinearly related to effective stress. Relationships between permeability and saturation with pore water pressure in the unsaturated zone may be characterized by hysteresis. The relation between pore pressure change and effective stress change may be a function of saturation. In the transition zone where pore water pressure is less than atmospheric but greater than air entry value, soil moisture diffusivity as used in soil physics and coefficient of consolidation as used in soil mechanics were shown to be conceptually equivalent. It is believed that the model will be of practical interest in studying saturated-unsaturated systems undergoind simultaineous desaturation and deformation. (Humphreys-ISWS)
W77-11223

FLOWING WELLS IN MICHIGAN 1974,
Geological Survey, Lansing, Mich. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-11375

POTENTIOMETRIC SURFACE OF FLORIDAN AQUIFER MAY 1975, AND CHANGE OF POTENTIOMETRIC SURFACE 1969 TO 1975 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT AND ADJACENT AREAS,
Geological Survey, Tampa, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11376

POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT MAY 1976,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11377

FRESH GROUND WATER STORED IN AQUIFERS UNDER THE CONTINENTAL SHELF: IMPLICATIONS FROM A DEEP TEST, NANTUCKET ISLAND, MASSACHUSETTS,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, Reston, Va. Geologic Div.
F. A. Kohout, J. C. Hathaway, D. W. Folger, M. H. Bothner, and E. H. Walker.
Water Resources Bulletin, Vol. 13, No. 2, p 373-386, April 1977. 7 fig, 29 ref.

Descriptors: *Freshwater, *Aquifers, *Continental Shelf, *Northeast U.S., *Deep wells, Data collections, Test wells, Atlantic Ocean, Islands, Massachusetts, Confined water, Hydrogeology, Glacial aquifers, Glacial sediments, Groundwater movement, Aquifer characteristics, Stratigraphy, Saline water-freshwater interfaces.
Identifiers: *Nantucket Island(Mass).

A deep water-resource and stratigraphic test well near the center of Nantucket Island, about 40 miles off the New England Coast, has encountered freshwater at greater depth than predicted by the Ghyben-Herzberg principle. An uppermost lens of freshwater, which occupies relatively permeable glacial-outwash sand and gravel to a depth of 520 ft, is probably in hydrodynamic equilibrium with the present level of the sea and the height of the water table. However, two zones of freshwater between 730-820 ft and 900-930 ft are anomalously deep. A third zone extending from 1150-1500 ft contains slightly salty ground water (2 to 3 parts per thousand dissolved solids). Several explanations are possible, but the most likely is that large areas of the Continental Shelf were exposed to recharge by precipitation during long periods of low sea level in Pleistocene time. After the last retreat of glacial ice, seawater rapidly drowned the shelf around Nantucket Island. Since then, about 3000 years ago, the deep freshwater zones which underlie dense clay layers have not had time to adjust to a new equilibrium. Under similar circumstances freshwater may remain trapped under extensive areas of the Continental Shelf wherever clay confining beds have not permitted saltwater to intrude rapidly to new positions of hydrodynamic equilibrium. The implications are far reaching because all continental shelfs were exposed to similar hydrologic influences during Pleistocene time. (Woodard-USGS)
W77-11378

SHALLOW AQUIFERS RELATIVE TO SURFACE WATER, LOWER NORTH PLATTE RIVER VALLEY, WYOMING,
National Park Service, Atlanta, Ga. Southeast Regional Office.
For primary bibliographic entry see Field 4B.
W77-11402

G. Water In Soils

MASS TRANSFER STUDIES IN SORBING POROUS MEDIA I. ANALYTICAL SOLUTIONS,
New Mexico State Univ., University Park. Dept. of Agronomy.
M. Th. van Genuchten, and P. J. Wierenga.
Soil Science Society of America Journal, Vol. 40, No. 4, p 473-480, July-August 1976. 6 fig, 26 ref, append.

Descriptors: *Sorption, *Mass transfer, *Porous media, *Model studies, Soils, Porosity, Pore water, Soil aggregates, Soil water, Equations, Adsorption, Absorption, Chemicals, Effluents, Mathematical models, Analytical techniques, Flow, Groundwater, Soil water movement, Path of pollutants.

An analytical solution was presented for the movement of chemicals through a sorbing porous medium with lateral or intra-aggregate diffusion. The liquid phase in the porous medium was divided into mobile and immobile regions. Diffusional transfer between the two liquid regions was assumed to be proportional to the concentration difference between the mobile and immobile liquids. Sorption processes in both the dynamic and stagnant regions of the medium were assumed to be instantaneous, and the adsorption isotherm was assumed to be linear. This analytical model described the extensive tailing observed during flow through an unsaturated, aggregated sorbing medium and explained the often observed early breakthrough of chemicals in the effluent. (Sims-ISWS)
W77-10801

A METHOD FOR CUTTING AND PREPARING THIN SECTIONS OF FROZEN SOILS,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W77-10802

STEADY STATE BI-LEVEL SUBSURFACE DRAINAGE THEORY FOR SOILS OF VARYING HYDRAULIC CONDUCTIVITY,
Marathwada Agricultural Univ., Parbhani (India). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W77-10961

MODELING NITRATE MOVEMENT AND DISSIPATION IN FERTILIZED SOILS,
Agricultural Research Service, Columbia, Mo. Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 5B.
W77-10975

WATER RETENTION IN SOIL UNDERLAIN BY A COARSE-TEXTURED LAYER: THEORY AND A FIELD APPLICATION,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiology Div.
B. E. Clothier, D. R. Scotter, and J. P. Kerr.
Soil Science, Vol. 123, No. 6, p 392-399, June 1977. 8 fig, 1 tab, 22 ref.

Descriptors: *Soil moisture, *Soil water, *Soils, *Model studies, Mathematical models, *Retention, Storage, Soil types, Soil texture, On-site investigations, Infiltration, Hydraulic conductivity, Pore water, Foreign countries, Pores, Pore pressure, Soil pressure, Sands, Foreign research, Groundwater, Groundwater movement, Subsurface drainage.
Identifiers: *New Zealand.

A theoretical development was presented that describes water retention in soils underlain by a coarse-textured stratum and that incorporates the physical characteristics of the overlying soil, the depth to the coarse layer, and the coarseness of the underlay. Field data were presented for the Manawatu fine sandy loam, a soil with a coarse layer at 90 cm. For this soil the layering resulted in an additional 5.5 cm of water storage at field capacity, an increase of 31% over a similar hypothetical soil with the coarse stratum absent. (Sims-ISWS)
W77-10977

A COMPARISON OF ENVIRONMENTS OF RAIN FORESTS IN DOMINICA AND PUERTO RICO,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
M. Soriano-Ressy, A. P. Desmarais, and J. W. Perez.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 901, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper M-70-1, March 1970. 36 p, 13 fig, 5 tab, 5 plate, 5 ref.

Descriptors: *Puerto Rico, *Forest soils, *Rain forests, Forest management, Geologic investigations, Geochemistry, Vegetation, Structure, Soils, Trees, Foreign countries, Environment.
Identifiers: *Dominica, *Caribbean Islands, Vegetation taxonomy, Virgin forests, Volcanic debris.

Pedologic, geologic, and vegetation taxonomy and structure data were collected from tabonuco forests in Dominica and Puerto Rico to characterize rain forests in the mountains of Caribbean Islands. The three Dominica sites were in matured virgin forests; the four Puerto Rico sites were in forests that had been cut selectively. Dominica soils were uniform in profile, consisting largely of volcanic debris subaerially deposited. Soil samples were obtained at 25- to 40-cm depths. Concentrations of Ca, Mg, K, and Mn, in exchangeable ppm, were 786-800, 498-710, 94-626, and 0-15, respectively; pH values were 5.1-5.5. Cation exchange capacities, in me/100 g, were 15.0- 20.5; absolute specific gravities were 2.08-2.27. Puerto Rico soils exhibited A2 and B2 horizons. Generally, the A2 horizon was present to 12-cm depth. The parent material was marine-deposited basalt and tuff breccia. Soil samples were obtained from each horizon. Concentrations of Ca, Mg, and K, pH values, and CEC were less than those of the Dominica soils. On both sites, the age of the large trees was estimated to be 300 years; the dominant species was Dacryodes excelsa Vahl. Large trees on Puerto Rico sites were smaller than those on Dominica sites, the larger trees being approximately 27 m high and 100-cm diameter breast high. Graphs relating basal area, plants per unit area, and stem spacing to plant heights were given. Data were compared and interpreted in terms of ecological implications. (Roberts-ISWS)
W77-10988

IRRIGATION WITH BRACKISH WATER: CHEMICAL AND HYDRAULIC CHANGES IN SOILS IRRIGATED WITH BRACKISH WATER UNDER COTTON ROTATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soils and Water.
For primary bibliographic entry see Field 3C.
W77-11071

SOME FACTORS AFFECTING THE SURVIVAL OF ROOT-NODULE BACTERIA ON DESICCATION,
Tasmania Univ., Hobart (Australia). Dept. of Agricultural Science.
For primary bibliographic entry see Field 2I.
W77-11080

THE NATURAL ABUNDANCE OF N15 IN THE SOIL-WATER SYSTEM OF A SMALL CATCHMENT AREA,
Queensland Univ., Brisbane (Australia). Dept. of Agriculture.
A. S. Black, and S. A. Waring.
Australia Journal of Soil Research, Vol 15, p 51-57, 1977. 4 tab, 15 ref.

Descriptors: *Nitrogen, *Australia, *Nitrates, *Small watersheds, *Soil water fertilizers, On-site investigaions, Distillation, Adsorption, Soil environment.
Identifiers: Mineralization.

Studies were conducted on a 100 ha catchment of uniform soil in southeast Queensland to determine N15 abundance in components. The N15 values (as expressed in parts per thousand) for fertilizer nitrogen ranged from -4.1 to 1.9 and nitrate nitrogen in water from 4.4 to 6.1. Values for total N from three sites ranged from 2.9 to 6.7 and for nitrate released during laboratory incubations from -0.2 to 4.2. There was a small variability in N15 of nitrate released by mineralization between replicates and within each sampling site, while the value for nitrate released under bare fallow was

5.5. Explanations for these variations are presented, along with possible applications. Values for nitrate from soil intervals to 6 M increased with depth, a finding which is discussed in terms of fractionation in a nitrate adsorbing soil. Results indicate variability is great and interpretation complex, even in a small catchment of uniform soil. (Jahns-Arizona)
W77-11081

INTERRELATIONSHIPS OF SEEDLING VIGOR CRITERIA OF WHEAT UNDER DIFFERENT FIELD SITUATIONS AND SOIL WATER POTENTIALS,
Kabul Univ. (Afghanistan). Faculty of Agriculture.
For primary bibliographic entry see Field 3F.
W77-11088

CHEMICAL COMPOSITION AND NUTRIENT UPTAKE OF WHEAT VARIETIES AS INFLUENCED BY MOISTURE REGIMES,
Soil and Water Management Research Station, Kota (India).
For primary bibliographic entry see Field 3F.
W77-11092

PENETRABILITY AND SORPTIVITY IN CALCAREOUS SOILS,
National Research Centre, Cairo (Egypt).
M. Y. Tayel.
Egyptian Journal of Soil Science, Vol 15, No 2, p 141-150, 1975. 6 fig, 2 tab, 9 ref.

Descriptors: *Permeability, *Sorption, *Calcareous soils, Soil properties, *Soil chemistry, Soil dynamics, Soil analysis, Soil water movement, Calcium carbonate, Magnesium, Clays, Silts, Sands, Soil texture, Pores.
Identifiers: Mediterranean Sea coast.

Four calcareous soils from the Mediterranean coast were laboratory tested to determine the effect of some soil properties on sorptivity and penetrability. Both those parameters increased with greater sand fraction and soluble Ca + Mg, while decreasing with greater bulk density and CaCO3 in the sand fraction. Possible explanations for these responses are presented. However, changes in sorptivity and penetrability due to the effects of clay, silt and total CaCO3 showed no specific trend. The coarse texture of sandy and sandy loam soils overshadows the role of clay and silt fractions. It is suggested that CaCO3 added to coarse soil may save irrigation water and fertilizers. Presence of CaCO3 due to precipitation occurs mainly in the micropores which are available to macroscopic flow. Its cementing effect reinforces the capillary walls and results in a reduction of the inner diameter of capillary pores. (Jahns-Arizona)
W77-11095

SOIL SURFACE SEALING CAUSED BY RAIN DROP IMPACT,
Alexandria Univ. (Egypt). Dept. of Soil and Water Science.
Y. Z. El-Shafei, and R. A. Ragab.
Egyptian Journal of Soil Science, Vol. 16, No. 1, p 47-68, 1976. 9 fig, 9 tab, 21 ref.

Descriptors: *Soil surfaces, *Surface sealing, *Impact(Rainfall), *Rainfall intensity, *Soil analysis, Clay loam, Sprinkler irrigation, Irrigation effects, Laboratory tests, Soil stability, Ponding, Soil aggregates, Porosity, Raindrops.

A laboratory study was conducted on clay soil under four sprinkler intensities higher than the hydraulic conductivity (1.2, 2.1, 3.2 and 4.1 cm/hour), four drop diameters and four falling distances (5, 50, 100 and 200 cm). The first cm layer was subjected to aggregate analysis and thin section studies after surface ponding occurred. The structure coefficient proposed was the ratio of percent content of the total amount of fractions larger than 0.25 mm in diameter to the content of fractions smaller than that. This was supported by results indicating that aggregates larger than 0.25 mm were responsible for aggregate stability. The percentage of large aggregates declined sharply due to the breakdown action of the impact energy. In general, the surface layer should have the same prerequisite structural condition to achieve surface sealing; the effect of drop size or falling distance is to hasten or delay this condition. The sealing phenomenon can be considered a final stage of sprinkler infiltration followed by the building up of the water head and then the occurrence of surface ponding or runoff as that surface containing a volume of pores less than 10%. (Jahns-Arizona)
W77-11107

ASSESSMENT OF WATER LOSS PATTERNS WITH MICROLYSIMETERS,
Agricultural Research Service, University Park. Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2D.
W77-11115

CALCULATING POTENTIAL AND ACTUAL EVAPORATION FROM A BARE SOIL SURFACE BY SIMULATION OF CONCURRENT FLOW OF WATER AND HEAT,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 2D.
W77-11120

HYSTERETIC STEADY STATE SOIL WATER PROFILES,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
A. Poulovassilis, and W. M. El-Ghamry.
Water Resources Research, Vol 13, No 3, p 549-557, June 1977. 11 fig, 9 ref.

Descriptors: *Soil water, *Hysteresis, *Soil water movement, *Model studies, Soil moisture, Profiles, Theoretical analysis, Mathematical models, Laboratory tests, Analysis, Hydraulic conductivity, Unsaturated flow, Hydraulic models, Porous media, Capillary water, Fringe water, Pressure head, Moisture content, Data collections, Foreign research.
Identifiers: *England.

The shape of the hysteretic steady-state soil water profile was examined theoretically. It was shown that the hysteretic steady-state profile which results after wetting aquires usually minimum values of the soil water pressure head, of the hydraulic conductivity, and of the water content, values smaller than the asymptotic values approached at large heights. In contrast, the hysteretic steady-state profiles which result after drying do not show such minimum values. Experimental hysteretic steady-state profiles established in a vertical sand column confirmed the theoretical predictions and were in agreement with the predictions calculated numerically from the flow equation. It was concluded that the effects of hysteresis on the soil water profile development may influence seriously the retention and movement of water in and out of the soil zone between the soil surface and the water table and, therefore, may modify the environment of plant root growth. (Humphreys-ISWS)
W77-11212

INFLUENCE OF SOIL PROPERTIES, LEACHING FRACTION, AND PLANT WATER UPTAKE ON SOLUTE CONCENTRATION DISTRIBUTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
W. A. Jury, H. Fluhler, and L. H. Stolzy.
Water Resources Research, Vol 13, No 3, p 645-650, June 1977. 9 fig, 1 tab, 10 ref.

Descriptors: *Leaching, *Soil water movement, *Soil properties, *Laboratory tests, Moisture content, Lysimeters, Solutes, Soil water, Water quality, Soil moisture, Model studies, Mathematical models, Simulation analysis, Profiles, Distribution patterns, Soils, Hydraulic conductivity, Clay loam, Loam, Water balance, Salt balance, Water.
Identifiers: Sandy loam, Greenfield sand.

Studies of salt movement through 24 cropped lysimeters receiving high-salinity irrigation were reported. A great deal of variability was found between depth-equivalent salinity sensor readings during the experiment, both between different lysimeters receiving the same water and salt inputs and among lateral replicates within each lysimeter. A computer simulation of the first 75 days of the experiment, using the measured soil properties and external inputs, alternately varied the hydraulic conductivity-water content relation, the irrigation flux, and the water uptake distribution by an amount consistent with the uncertainty in their measurement to see the effect on solute concentrations. It was found that large varaitions in the conductivity-water content relations and 10% uncertainty in the input flux had little effect on solute concentrations, but that variations in the water uptake patterns within the top 60 cm created a large distribution of concentrations at a given depth and time. (Humphreys-ISWS)
W77-11222

ESTIMATING THE EFFECTIVE CAPILLARY PRESSURE IN THE GREEN AND AMPT INFILTRATION EQUATION,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
D. L. Brakensiek.
Water Resources Research, Vol. 13, No. 3, p 680-682, June 1977. 1 fig, 1 tab, 7 ref.

Descriptors: *Infiltration, *Mathematical models, *Pore pressure, *Capillary water, Capillary conductivity, Model studies, Loam, Moisture content, Soils, Pressure, Groundwater movement, Wetting, Estimating.
Identifiers: Plainfield sand, Columbia sandy loam, Guelph loam, Ida salt loam, Yolo light clay.

A considerable amount of research indicates that the Green and Ampt infiltration equation can be used in hydrologic modeling with confidence. The parameters, however, still require considerable field and/or laboratory effort to determine estimated values. Reported were afiternatives for determining the average wetting front capillary pressure parameter. Only a moisture characteristi would be require. (Humphreys-ISWS)
W77-11227

MODELING SOIL WATER HYDROLOGY UNDER A POST OAK (QUERCUS STELLATA WANGENH.) - SHORTLEAF PINE (PINUS ECHINATA MILL.) STAND IN EAST TEXAS,
Agricultural Research Center, Beltsville, Md. Hydrograph Lab.
C. B. England.
Water Resources Research, Vol. 13, No. 3, p 683-686, June 1977. 3 fig, 1 tab, 20 ref.

Descriptors: *Soil water, *Model studies, *Forest watersheds, *Texas, Computer models, Mathematical models, Soil water movement, Oak trees, Pine trees, Hydrology, Hydrologic aspects, Hydrologic systems, Infiltration, Evapotranspiration, Watersheds(Basins), On-site investigations.
Identifiers: Soil water hydrology.

A digital model of watershed hydrology successfully computed daily soil water contents of the two upper layers in a Boswell soil under an east Texas post oak - shortleaf pine stand throughout 4 years (1957-1960). The experiment demonstrated th

idelity of the model components to the prototype ystem elements. In addition, the experiment pro-ided parameters useful in applying the model for lucidating the hydrology of watersheds contain-ng oak-pine forests. (Humphreys-ISWS)
W77-11228

UTOMATIC FEEDBACK CONTROL TO MAINTAIN CONSTANT SOIL MOISTURE TEN-ION IN THE STUDY OF DROUGHT OLERANCE IN RICE,
nternational Rice Research Inst., Los Banos, aguna (Philippines). Dept. of Agronomy.
. I. Alvarez, and S. K. De Datta.
oil Science Society of America Journal, Vol. 41, o. 3, p 452-454, May-June 1977. 3 fig, 2 tab, 9 ref.

escriptors: *Moisture tension, *Soil moisture, Rice, *Soil-water-plant relationships, Green-ouses, Evapotranspiration, Laboratory equip-ent, Moisture stress, Perlite, Osmotic pressure, ensiometers, Analytical techniques.
dentifiers: Porous cups, Reproductive stress, olyethylene glycol.

greenhouse technique was developed by which a osen soil moisture tension can be maintained ntinuously. The setup for supply water at rela-vely constant soil moisture tension in pots in-udes five major components: water tank, W-be, water distribution system, soil moisture ten-on sensors, and pots. The W-tube, which con-ins a predetermined amount of Hg, controls the il moisture tension in the pots. Water can flow eely from the tank to the pots through the dis-bution system whenever the soil moisture ten-on exceeds that desired. Response to the sen-rs' demand for water is rapid. This setup was ed successfully to compare relative drought lerance of rice varieties and breeding lines. nother use of the setup might be to measure apotranspiration (ET) almost instantaneously; e technique might be useful in some soil-plant-nosphere-water relationship studies. (Visocky-WS)
77-11229

ODEL CALCULATIONS FOR THE EXTRAC-ON OF SOIL WATER BY CERAMIC CUPS ND PLATES,
ettingen (West Germany). Inst. of Soil Science d Forest Nutrition.
R. van der Ploeg, and F. Beese.
il Science Society of America Journal, Vol. 41, . 3, p 466-470, May-June 1977. 5 fig, 2 tab, 20

scriptors: *Soil water, *Soil water movement, n-site investigations, Percolation, Unsaturated w, Seepage, Sampling, Soil moisture, Model dies, Mathematical models, Soils, Soil science, l physics.
ntifiers: *Suction units, Suction cups, Suction tes, Ceramic cups.

umerical method was developed with which flow of moisture towards suction units in soil be evaluated. For a number of selected blems, the unsaturated moisture flow equation solved twice: (1) for radial flow towards a suc-plate or suction cup; and (2) for vertical nwards flow under the same conditions, but out a suction unit in the soil. The calculations e performed for a flat soil without a plant er. It was found that even for little vacuum, e differences may exist between the seepage as determined from a suction unit as com-ed to the seepage rate of the unextracted soil. It shown also that the radius of influence of a ion unit, which extracts water continuously, be several feet wide. It was concluded that in r to be reliable, data collected with suction s should be analyzed with care. (Sims-ISWS)
-11230

EVAPORATION AND SALT MOVEMENT IN SOILS IN THE PRESENCE OF WATER TABLE,
Alexandria Univ., Alexandria (Egypt). Dept. of Soils and Water Science.
For primary bibliographic entry see Field 2D.
W77-11231

LYSIMETER AND FIELD MEASUREMENTS OF CHLORIDE AND BROMIDE LEACHING IN AN UNCULTIVATED LOAMY SAND,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-11232

EXPERIMENTAL STUDIES OF WETTING FRONT INSTABILITY INDUCED BY GRADUAL CHANGE OF PRESSURE GRADIENT AND BY HETEROGENEOUS POROUS MEDIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
I. White, P. M. Colombera, and J. R. Philip.
Soil Science Society of America Journal, Vol. 41, No. 3, p 483-489, May-June 1977. 7 fig, 3 tab, 15 ref.

Descriptors: *Infiltration, *Porous media, *Laboratory tests, Soil water, Soil water movement, Model studies, Mathematical models, Soils, Pressure, Hydraulic conductivity, Soil science, Soil physics.
Identifiers: *Wetting fronts, Delta-function models, Fingering, Hele-Shaw cells, Air pressure, Layered soils.

The stability of infiltration flows in Hele-Shaw cells was examined. Flows were perturbed either by gradually increasing G, the pressure gradient behind the wetting front, or by heterogeneities in the cells. Two methods were used to increase G gradually through zero: (1) by allowing the air ahead of the front to be compressed by the flow, and (2) by monotonically increasing the hydraulic conductivity of the cell with depth. In the other class of experiments, the flow was instantaneously perturbed by a step-increase in conductivity at selected depths. It was found that Philip's stability analysis adequately predicted both the onset of instability and the wavelength of the initial disturbances. For quadratic increase in conductivity with depth, the observed growth rate of disturbances was faster than expected from the linear theory. Examination of the data of Peck and of Hill and Parlange showed that Philip's analysis is also adequate for coarse sands. (Sims-ISWS)
W77-11233

WATER AND SALT FLOW THROUGH COMPACTED CLAYS: I. PERMEABILITY OF COMPACTED ILLITE AND MONTMORILLONITE,
Western Australia Univ., Nedlands. Extension Service.
P. F. Rolfe, and L. A. G. Aylmore.
Soil Science Society of America Journal, Vol. 41, No. 3, p 489-495, May-June 1977. 4 fig, 3 tab, 47 ref.

Descriptors: *Permeability, *Clays, *Salts, Laboratory tests, Montmorillonite, Illite, Chlorides, Cations, Pressure, Soil water movement, Solutions, Sodium chloride, Cesium, Calcium chloride, Chemistry, Soil water, Soil science.
Identifiers: *Clay permeability, Barium chloride, Lanthanium chloride, Electronkinetics.

Studies have been made of the pressure-induced flow of the chloride solutions of various monovalent, divalent and trivalent cations, at various concentrations, through compressed Wyoming bentonite and Willalooka illite cores. The majority of the measurements were carried out on the Willalooka illite core, and its permeability has been shown to depend markedly on the nature and concentration of the cations present, with three- to fourfold variations being observed in some instances. At the lower electrolyte concentrations, permeability increases in the order Na less than Ca less than Ba less than La less than Cs at a given concentration. In addition, the permeability increases linearly with flow pressure to an extent ranging from some 15% for the Na systems to 97% for the 3.0 M LaC13 system over the pressure range examined. The contributions to the permeability changes arising from mechanical expansion of the flow cell, particle rearrangements and the electroviscous effect have been shown to be quite inadequate to account for the major changes observed. It was suggested that the most significant effects arise as a result of the influence of cationic size, charge, and concentration of the vicosity of the several layers of coerced water which form adjacent to the clay surfaces. Coercion of water may arise partly through its association with the exchangeable cations adsorbed on the surface or forming diffuse double layers, but mainly from the preferred or unique water structure developed in proximity to the clay surface. In particular, increasing concentrations of Cs, Ca and La cations appear to cause a pronounced breakdown in water structure within the pores. (Sims-ISWS)
W77-11234

A COMPARISON OF IN SITU EXTRACTORS FOR SAMPLING SOIL WATER,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
M. J. Levin, and D. R. Jackson.
Soil Science Society of America Journal, Vol. 41, No. 3, p 535-536, May-June 1977. 1 fig, 1 tab, 3 ref.

Descriptors: *Soil water, *Sampling, *Aqueous solutions, Solvents, Lysimeters, Tensiometers, Laboratory tests, Evaluation, Equipment, Leaching, Leachate, Soil science.
Identifiers: Ceramic cups, Hollow fibers.

Comparisons were made between two in situ extractors for collection of soil water samples: Amicon hollow fibers and porous ceramic cup lysimeters. Intact soil cores removed from a fescue pasture were fitted with lysimeters and fibers at 10 and 20 cm depth. Cores were leached by adding increments of water in excess of field capacity weekly. After drainage, soil solutions were extracted using lysimeters and fibers. Concentrations of Ca and Mg in soil solutions were greater at 10-cm than at 20-cm soil depths. Neither extractor altered the concentrations of Ca, Mg, or PO4-P during collection. The studies suggest that lysimeters and hollow fibers are viable devices for extracting of soil water samples. Porous ceramic cup lysimeters are preferable for field plots, while hollow fibers are advantageous for intact soil cores. A major advantage of the hollow fiber technique is the small soil displacement required for installation. (Sims-ISWS)
W77-11235

HYDRAULIC AND THERMAL PROPERTIES OF A SANDY SOIL AS INFLUENCED BY INCORPORATION OF SEWAGE SLUDGE,
Minnesota University, St. Paul; and Agricultural Research Service, St. Paul, Minn.
For primary bibliographic entry see Field 5B.
W77-11236

USE OF A VERSATILE EXPERIMENTAL SYSTEM FOR SOIL EROSION STUDIES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
For primary bibliographic entry see Field 2J.
W77-11237

FALL SOIL WATER: EFFECT ON SUMMER SOIL TEMPERATURE,
Agricultural Research Service, Fort Collins, Colo.
W. O. Willis, P. J. Wierenga, and R. T. Vredenburg.
Soil Science Society of America Journal, Vol. 41, No. 3, p 615-617, May-June 1977. 5 fig, 10 ref.

Descriptors: *Soil temperature, *Soil water, *Effects, *North Dakota, Soil moisture, Crops, Wheat, On-site investigations, Model studies, Mathematical models, Forecasting, Analytical techniques, Soil properties, Thermal properties, Soil-water-plant relationships, Soil investigations, Soil science, Agriculture.

Soil temperature with depth (to 150-cm) and time (April through September) was measured in field plots in North Dakota to determine the effect of three depths of wetting in late fall before freezing on the growing season soil temperature the following year. All plots were planted with spring wheat and received identical treatment during the growing season. The data indicated that a high soil water content in the fall may cause soil temperature in the 30- to 120-cm depth to be 1 to 2 C lower than normal during the next year's growing season, particularly if that season has lower-than-normal precipitation. By using soil temperature values from the 15-cm and 120-cm depths as the upper and lower boundaries, calculated soil temperatures agreed better with measured values than when 0.2-cm and 120-cm depths were used as boundaries. (Sims-ISWS)
W77-11238

WATER TRANSPORT FROM ROOTS TO SOIL,
Auburn Univ., Ala. Dept. of Civil Engineering.
F. J. Molz, and C. M. Peterson.
Agronomy Journal, Vol 68, No 6, p 901-904, November 1976. 4 fig, 20 ref.

Descriptors: *Root systems, Root zone, *Soil water, *Soil moisture, Cotton, Soil water movement, Mathematical models, Model studies, Hystersis.

Numerous studies have indicated that water can flow from roots to soil (negative direction) but little can be concluded about the magnitude of such a flow. Therefore, experiments were performed on potted cotton plants to compare the magnitude of water transport in the positive (soil to roots) and negative directions. Experimental results were also compared qualitatively with the predictions derived from mathematical models simulating root water uptake. Each plant was left unwatered in an environmental chamber to dry the soil from field capacity to near the –15 bar percentage. After drying, the stem was severed under water and the resulting water flow from roots to soil recorded by weight changes. Results indicated that water flow in the negative direction is small (1:36 during a 110-hour period) compared to flow in the positive direction. This difference is thought to be due to a hysteretic, unsaturated, and possibly non-Darcian flow phenomenon or the generation of growth-related water potentials. Contemporary mathematical water extraction models ignore both phenomena and, therefore, would be expected to overestimate flows in the negative direction if 'calibrated' to predict correctly flows in the positive direction. (Skogerboe-Colorado State)
W77-11391

COMPARISON OF THE RESULTS OF AN EXPERIMENTAL STUDY ON THE SOIL WATER SYSTEM USING COMPUTER ANALYSIS, (IN RUSSIAN),
V. P. Emets, L. L. Zhuravleva, V. Ya. Kulki, and N. V. Pichugina.
Pochvovedenie 5, p 101-103, 1976.

Descriptors: *Soil water, *Soil moisture, *Computers, Irrigation, Precipitation(Atmospheric), Methodology, Evaporation, Groundwater level.

A preliminary calculation of soil moisture was made by means of an electronic computer, according to precipitation, irrigation, evaporation and groundwater table data. The process of analysis of these observations and of revealing gross and methodical errors was partly mechanized.--Copyright 1977, Biological Abstracts, Inc.
W77-11392

SOIL SOLUTION CONCENTRATIONS: EFFECT OF EXTRACTION TIME USING POROUS CERAMIC CUPS UNDER CONSTANT TENSION,
Geological Survey, Denver, Colo.
R. C. Severson, and D. F. Grigal.
Water Resources Bulletin, Vol 12, No 6, p 1161-1170, December 1976. 4 fig, 2 tab, 12 ref.

Descriptors: *Soil water, Potassium, Calcium, Phosphorus, *Moisture tension, *Soil moisture, Lysimeters, Soil investigations, Laboratory studies.
Identifiers: Soil columns.

Porous ceramic cups under constant tension (0.45 bar) were used to extract solutions from undisturbed soil columns. Solution concentration changed with length of extraction time. Significant relationships were found between extraction time and concentrations of P, Ca, and K in soil solution for two sample depths in an Omega loamy sand oil column. At two extraction time classes and at two sample depths, combined data from 12 soil columns representing two soil series reinforce the relationship. As time to extract a sample increases, the sample probably represents solution held by soil at tensions approaching those applied to the ceramic cup. We recommend that the choice of an extraction tension be given consideration in studies using porous ceramic cups under constant tension for monitoring constituents of soil solution. In addition, care must be taken to attain good physical contact between the cups and the soil material. (Skogerboe-Colorado State)
W77-11397

ANATOMICAL RESPONSE OF POTATO STEMS AND ROOTS TO SOIL MOISTURE AND RATES OF FERTILIZER,
Maine Univ. at Orono. Dept. of Soils.
For primary bibliographic entry see Field 3F.
W77-11398

SAMPLING THE UNSATURATED ZONE IN IRRIGATED FIELD PLOTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
P. F. Pratt, J. E. Warneke, and P. A. Nash.
Soil Science Society of America Journal, Vol 40, No 2, p 277-279, March-April 1976. 6 tab, 7 ref.

Descriptors: *Nitrates, *Chlorides, Drainage water, *Salinity, Electrical conductance, Farm wastes, Soils, Soil investigations, Irrigation, Irrigation effects, *Sampling.

Data obtained from samples from each of 10 holes/plot for one plot from each of three soils were subjected to statistical analysis and used to formulate plans for sampling the 1.5- to 4.5 -cm depth of 48 experimental plots that had received animal manures. The statistical analysis of these three plots suggested that 10 holes/plot and 10 samples/hole would provide plot means within about 20% of the true means for nitrate and chloride concentrations and electrical conductivity of saturation extracts, except for one soil which had residual salts in highly variable concentrations at the 3.0- to 4.5-cm depth. The sampling procedure developed gave satisfactory results when statistical analysis of the effects of manure treatments, soils ad irrigation levels on nitrate, chloride and EC(e) were measured. (Skogerboe-Colorado State)
W77-11400

COMPOSITION OF MINERAL PHOSPHATES AND CONVERSION OF PHOSPHORUS FERTILIZERS IN FLOODPLAIN SOILS, (IN RUSSIAN),
Belorusskii Nauchno-Issledovatelskii Institut Pochvovedeniya i Agrokhimii, Minsk (USSR).
L. I. Korableva.
Pochvovedenie 8, p 56-65, 1976.

Descriptors: *Phosphates, *Fertilizers, *Phosphorus, Soils, Flood plains, Mineralogy, Oxides.

By means of a new method of mineral Ph fractionation, large differences were found in the composition of mineral phosphates of flood-plain soils. In acid, neutral and calcareous soils the quantity of sesquioxide phosphates decreases, whereas the amount of Ph, bound with Ca, increases. In acid soils more tha 60-65% of P2O5 from calcium diphosphates are fixed in the form of almost nonavailable iron phosphates. In flooded soils with a neutral reaction Ph is almost completely transferred from fertilizers into available phosphates.--Copyright 1977, Biological Abstracts, Inc.
W77-11405

GRAIN SORGHUM RESPONSE TO INUNDATION AT THREE GROWTH STAGES,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-11408

PREDICTING PARTICLE-SIZE COMPOSITION OF ERODED SOIL,
Agricultural Research Service, Morris, Minn.
For primary bibliographic entry see Field 2J.
W77-11409

ORTSAND: ORIGIN AND DIAGNOSTIC VALUE, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physical and Moscow State Univ. (USSR). Dept. of Soil Melioration.
F. R. Zaidel'man, and R. P. Narokova.
Biol Nauki 17(3), p 104-109, 1974.

Descriptors: *Soil horizons, *Soil analysis, *Soil profiles, *Iron, Groundwater.
Identifiers: Eluvial, Illuvial, *Ortsand, *Hydrogenic processes.

Ortsand horizons in light soils are formed as a result of hydrogenic processes. Hydrogenic ortsand, which is widespread, has a rust-brown color. It is formed in zones of shallow groundwater (usually not deeper than 3-4 m), in soils of different origin depths and on the gley horizon. Hydrogenic ortsand has a distinct horizontal true Illuvial dark-colored nodules are formed only in the profile of podzolic soils, directly under the eluvial horizon, duplicating exactly eluvial configuration. The illuvial nodules are enriched with humus, Al and Mn and are dark. They are usually formed in the presence of deep groundwaters or, more rarely, in the presence of shallow waters not containing ferrous oxide. Hydrogenic ortsand is a reliable indicator of Fe-containing groundwaters and can be used for diagnosing their distribution during soil reclamation surveys. Hydrogenic ortsand after mechanical fracturing can be regarded as a favorable substrate for the development of the root systems of plants.--Copyright 1977, Biological Abstracts, Inc.
W77-11424

TIMING OF GROUND TRUTH ACQUISITION DURING REMOTE ASSESSMENT OF SOIL WATER CONTENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. D. Jackson, R. J. Reginato, and S. B. Idso.
Remote Sensing of Environment, Vol 4, No 3, p 249-255, 1976. 6 fig, 5 ref.

Descriptors: *Soil water, *Remote sensing, *Arizona, *Water level fluctuations, *Soil surfaces, *Time, *Diurnal, *Loam, Fluctuat

ampling, Arid lands, Irrigated land, Soil physical roperties, Measurement, Agriculture, Air temerature, Soil temperature, Albedo, Soil tests, easonal, Surfaces.
lentifiers: *Avondale loam, Phoenix(Ariz).

ecause water content in surface soil undergoes ide diurnal fluctuation, the time of day that round truth in remote sensing of soil-water conent is obtained can be an important factor in emote sensing experiments. Data from five exeriments on a local agricultural soil (Avondale am) at Phoenix, Arizona showed that soil sames taken at four soil depth increments between 00 and 1200 hours (MST) best represented the 24 our average soil-water content for different easons of the year. Additional information on difrent soil types at other locations is required to etermine applicability to other soils of 'once-a-y' soil sampling for average daily water content. illery-Arizona)
77-11433

ON ACTIVITY PRODUCTS OF CALCIUM ARBONATE IN WATERS BELOW THE ROOT ONE,
gricultural Research Service, Riverside, Calif. linity Lab.
or primary bibliographic entry see Field 2K.
77-11438

HEMICAL COMPOSITION OF LYSIMETRIC ATERS OF PODZOLIC SOILS IN THE KOMI SSR, (IN RUSSIAN),
kademiya Nauk SSSR, Syktyvkar. Institut ologii.
B. Archegova.
chvovedenie 5, p 66-76. 1976.

escriptors: Soils, *Podzols, Soil chemistry, ysimeters, Acidic soils, Mineralogy.
entifiers: Illuvial, *Komi-ASSR, Taiga, USSR.

ghtly acid solutions, the acid properties of ich are due to the presence of water soluble ornic compounds, migrate in the profile of a typi- strongly-podzolic loamy soil of the middle subne in the taiga zone (Komi ASSR (USSR). emical composition of lysimetric waters is arly differentiated in the upper part of the soil file on the boundary between the organogenic l mineral layers. There is good correlation ween the distribution of water soluble organic bstances and soil humus indicating that the mus of the soil under study is illuvial.--Copyht 1977, Biological Abstracts, Inc.
7-11442

NOTE ON SOIL AND WATER MERCURY VELS IN ISRAEL AND THE SINAI,
waii Univ., Honolulu. Dept. of Botany and crobiology.
primary bibliographic entry see Field 5A.
7-11443

TUDY OF SALT LEACHING BY PONDING D SPRINKLING IN UNSATURATED SOIL LUMNS,
xandria Univ. (Egypt). Dept. of Soil and Water ence.
primary bibliographic entry see Field 3C.
7-11444

ILTRATION AND REDISTRIBUTION OF TER IN SOILS, (IN DUTCH),
icultural Univ., Wageningen (Netherlands). groep Bodemkunde Bemestingsleer.
troosnijder.
l Landbouwkd Onderz (Agric Res Rep) 847, p 3, 1976.

criptors: *Infiltration, *Distribution, Soils, sure, Soil conductivity, Flow, *Soil water, s, Diffusivity, *Forecasting.
Identifiers: *Pressure gradients(Soils).

The flow of the liquid phase through a soil can be predicted from pressure gradients. Different ways of predicting infiltration for irrigation of a basin were compared: numerical approximation, semi-analytical and analytical. A partly empirical equation was developed for description of rate of infiltration after examination of existing equations. Under certain conditions, infiltration was influeced by under or over pressure of the trapped gas phase and by swelling of clays. Complex models for redistribution were of little value in practice, since they could not be generalized that grouped techniques for estimating physical properties of soil according to cost and expertise required.--Copyright 1977, Biological Abstracts, Inc.
W77-11471

2H. Lakes

ORGANIC MATTER AND NITROGEN DISTRIBUTION IN SOME MOUNTAIN HEATH COMMUNITIES OF THE SOURCE LAKE BASIN, WASHINGTON,
Oregon State Univ., Corvallis. Forest Research Lab.
For primary bibliographic entry see Field 5B.
W77-10803

HEAVY METAL DISCHARGES INTO SHASTA LAKE AND KESWICK RESERVOIRS ON THE UPPER SACRAMENTO RIVER, CALIFORNIA: A RECONNAISSANCE DURING LOW FLOW,
Geological Survey, Menlo Park, Calif.; Water Resources Div.; and Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-10860

AN ANALYSIS AND COMPARISON OF LANDSAT-1, SKYLAB (S-192) AND AIRCRAFT DATA FOR DELINEATION OF LAND-WATER COVER TYPES OF THE GREEN SWAMP, FLORIDA,
Geological Survey, Miami, Fla. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-10871

APPENDIX V. SHORELINE DAMAGE SURVEY: AN APPRAISAL WITH RECOMMENDATIONS,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
E. D. Rothman, S. Bartold, R. Butler, M. Coffey, and L. W. Huang.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 259, Price codes: A07 in paper copy, A01 in microfiche. Summary Report to Army Corps of Engineers, Pilot Study Program, Great Lakes Shoreland Damage Study, Appendix V., May 1976. 150 p, 8 fig, 11 tab. DAC23-75-C-0027.

Descriptors: *Great Lakes, *Data collections, *Statistical methods, *Damages, Coasts, Shores, Erosion rates, Assessmen..
Identifiers: Coastal Zone Management.

An appraisal of the data collection techniques and statistical procedures used in the six Michigan counties studied is given in this appendix to the Summary Report. The methods of data collection, coding of this data are examined and the methods of summarizing the data in a form which is convenient, yet comprehensive is discussed. It is recommended that a sampling procedure be used for larger counties while a census procedure could be used in smaller rural counties. The methodology necessary to extrapolate the evaluation of the expanded totals to the entire county based on the results of the questionnaire is provided. (See also W77-10905) (Sinha-OEIS)
W77-10904

ENGINEERING-ECONOMIC ANALYSIS OF SHORE PROTECTION SYSTEMS: A BENEFIT/COST MODEL,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
J. M. Armstrong, M. R. McGill, R. B. DenUyl, and M. G. Ferrick.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 260, Price codes: A04 in paper copy, A01 in microfiche. Report to Army Corps of Engineers, Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study, Appendix VI, May 1976. 54 p, 10 fig, 2 tab, 10 ref. DACW23-75-C-0027.

Descriptors: *Great Lakes, *Shore protection, *Cost-benefit analysis, Erosion, Water level fluctuations, Coasts.
Identifiers: Coastal zone management, Economic analysis.

The decision to invest in a shore protection structure is influenced by a number of variables. To enable shoreline property owners to examine the factors in making investments in shoreline protective structures, the study employs benefit/cost analysis. This economic tool evaluates the net benefits property owners derive from shoreline structures. The model ties together these factors in a computer program that determines the economic worth of the various protective measures available. (See also W77-10904) (Sinha-OEIS)
W77-10905

GREAT LAKES: CHEMICAL MONITORING,
Wisconsin Univ., Madison, Lab. of Hygiene.
For primary bibliographic entry see Field 5B.
W77-10924

ACUTE TOXICITY OF SELECTED ORGANIC COMPOUNDS, TO FATHEAD MINNOWS,
Environmental Research Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W77-10934

ON THE AQUATIC INSECT COMMUNITIES IN SHORE ZONES AND INFLUENTS AS WELL AS EFFLUENTS OF LAKES IN SHINSHU, (IN JAPANESE),
Y. Chino.
New Entomol 24(1), p 8-18, 1975.

Descriptors: Lakes, Asia, *Aquatic insects, Effluents, Lake shores, *Stoneflies, *Mayflies, Water pollution.
Identifiers: Ephemera-sp, Glyphotaelius-admorsis, *Japan(Shinshu), Limnophilus-fuscovittatus, Neuronia-regina, Perla-gibba, Perla-tibialis, Phryganea-japonica, Siphlurus-sp, Stenopsyche-griseipennis, *Trichoptera.

A survey of aquatic insect communities was made in the shore zones of 7 lakes in Nagano Prefecture (Japan) (Aoki, Nakatsuna, Kizaki, Matsubara, Tatenoumi, Shirakaba, Suwa) and in the rivers flowing from or into the lakes. Only 2 spp. of Trichoptera (Limnophilus fuscovitatus, Glyphotaelius admorsus) were collected, although 2 spp. of Ephemeroptera (Ephemera sp., Siphlureus sp.), 2 spp. of Plecoptera (Perla tibialis, P. gibba) and 3 spp. of Trichoptera (Neuronia regina, Phryganea japonica, Stenopsyche griseipennis) were recorded from here in 1918. In the rivers flowing from or into the lakes, aquatic insect communities were comparatively abundant except in Lake Suwa.--Copyright 1977, Biological Abstracts, Inc.
W77-10949

ION STIMULATION OF METABOLISM IN FISH ADAPTING TO GROWTH IN WARM WATER, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.

W77-10971

A UNIVERSAL FORM FOR SHORELINE RUN-UP SPECTRA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-10973

ACCELERATION OF SEXUAL MATURATION OF THE RAINBOW TROUT SALMO GAIRDNERI RICH. UNDER THE EFFECT OF AN ELEVATED WATER TEMPERATURE, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khoziaistva, Rybnoe (USSR).
For primary bibliographic entry see Field 5C.
W77-10987

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT: VOLUME 8, RESERVOIR YIELD,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 8B.
W77-10991

DEVELOPMENT OF PLANKTON ORGANISMS OF AN EUTROPHIC RESERVOIR AND THEIR INTERACTION WITH A RADIOACTIVE ENVIRONMENT, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
For primary bibliographic entry see Field 5C.
W77-11020

ON THE USE OF MICROWAVE RADIATION FOR GREAT LAKES ICE SURVEILLANCE,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2C.
W77-11052

GREAT LAKES ICE COVER, WINTER 1975-76,
National Oceanic and Atmospheric Administration, Boulder, Colo. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2C.
W77-11054

DYNAMICS OF TREMATODE FAUNA OF MOLLUSKS FROM THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
M. I. Chernogorenko.
Gidrobiol Zh Vol 12, No 3, p 48-55, 1976.

Descriptors: *Reservoirs, Invertebrates, Trematodes, Larvae, Mollusks.
Identifiers: Kremenchug reservoir.

At the 1st stages of formation of the reservoir (Ukrainian SSR, USSR) biological regime, the species composition of trematode larvae under gosharp changes. During the 1st 3 yr the number of cercaria species and their numbers were low. Subsequently the parasite fauna became richer. On the 8th yr a tendency toward stabilization of the species composition was observed in the deep part; in shallow waters the fauna of trematode larvae was variable, correlating with considerable variation of the water level.--Copyright 1977, Biological Abstracts, Inc.
W77-11103

WATER RESOURCES RESEARCH PROGRAM - NEARSHORE CURRENTS AND WATER TEMPERATURES IN SOUTHWESTERN LAKE MICHIGAN, (JUNE-DECEMBER 1975),
Argonne National Lab., Ill. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5A.
W77-11131

RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIVISION ANNUAL REPORT, ECOLOGY, JANUARY-DECEMBER 1975.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W77-11132

THE ASSOCIATION OF TRANSURANIC ELEMENTS WITH LACUSTRINE SEDIMENTS,
Argonne National Lab., Ill. Radiological and Environmental Research Division.
For primary bibliographic entry see Field 5C.
W77-11136

BIOLOGICAL UTILIZATION AND REGENERATION OF SILICON IN LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W77-11139

DISSOLUTION OF AMOPHOUS SILICON ON LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-11140

SEASONAL DEVELOPMENT OF PHYTOPLANKTON POPULATIONS IN OFFSHORE LAKE MICHIGAN IN 1975,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W77-11141

VERTICAL DISTRIBUTION, COMPOSITION, AND ABUNDANCE OF CRUSTACEAN ZOOPLANKTON IN THE OFFSHORE WATERS OF LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W77-11142

THE UTILIZATION OF DIATOMS AS A FOOD SOURCE BY CALANOID COPEPODS AND THE ABUNDANCE AND DISTRIBUTION OF ZOODETRITUS IN SOUTHEASTERN LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W77-11143

EFFECT OF ARSENIC AND CADMIUM ON THE GROWTH RATE AND NUTRIENT UTILIZATION RATES OF ASTERIONELLA FORMOSA,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W77-11144

THERMAL DISCHARGE RESIDENCE BY LAKE MICHIGAN SALMONIDS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W77-11145

SUMMARY OF RECAPTURES OF FISH TAGGED AT TWO POWER PLANTS BETWEEN 1972 AND 1974,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W77-11147

THE SEASONAL THERMAL STRUCTURE OF DEEP TEMPERATURE LAKES,
Hydronautics, Inc., Laurel, Md.
T. R. Sundaram, and R. G. Rehm.
Tellus. Vol 25 No 2, p 157-168, 1973.

Descriptors: *Thermal stratification, Model studies, Deep water, Equilibrium, *Lakes, Stratification, Temperature.

A theoretical description is given of the seasonal variation of the thermal structure of deep, temperature lakes. The influence of the unsteady and nonlinear interaction between the windinduced turbulence and the stable buoyancy gradients due to surface heating on the thermal eddy diffusivities is assumed to be given by a product of the eddy diffusivities under conditions of neutral stability and an appropriate function of a stratification parameter, which, in this case, is taken to be the gradient Richardson number. An implicit account is taken of the interaction between the current and thermal structures within the lake, and free convection is also included implicitly during the cooling portion of the annual cycle. The basic equation, which is integrated by finite difference means, is an unsteady, nonlinear diffusion equation describing the vertical temperature structure. The boundary condition on the heat exchange at the lake surface is formulated in terms of the concept of an equilibrium temperature. The seasonal stratification cycle of a lake is determined as the response of the lake to certain imposed 'external parameters' which specify the exchange of mechanical and thermal energies between the lake and the environment. The results of calculations of the vertical thermal structure using this model agree with the observed qualitative features of the stratification cycle. For the one case in which quantitative comparisons are made, good agreement with observations is obtained. A brief discussion comparing the features of the present theory with those of other existing theories is also given. Copyright 1974, Biological Abstracts, Inc.
W77-11151

ACIDIFICATION OF LAKES IN CANADA BY ACID PRECIPITATION AND THE RESULTING EFFECTS ON FISHES,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
For primary bibliographic entry see Field 5C.
W77-11257

THE PERFORMANCE OF DIVERSITY INDICES IN DESCRIBING THE ZOO-BENTHOS OF TWO LAKES,
University of East Anglia, Norwich (England). School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-11275

STUDIES ON A KENTUCKY KNOBS LAKE: SOME ASPECTS OF THE VERTICAL TRANSPORT OF HEAT IN THE HYPOLIMNION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, and G. A. Cole.
J Ecol. Vol 61 No 2, p 413-420, 1973.

Descriptors: Epilimnion, *Lakes, Heat flux, Winds, Heat, Hypolimnion, Kentucky, Turbulence.
Identifiers: Clinolimnion, Tom Wallace Lake(Ken).

Analyses of 2 time series of temperature profiles obtained in Tom Wallace Lake, Kentucky, during the warming periods of 1951 and 1952 indicated the presence of a well-developed epilimnion, clinolimnion, and bathylimnion in both years. The mean clinolimnetic coefficient of turbulence (eddy conductivity), corrected for molecular conductivity, was 0.94 x 10-2 g cm -1 s-1. The small number of data required to derive this coefficient reinforced the validity of Hutchinson's solution technique as one applying to a real heat transfer mechanism in bodies of water well sheltered from the wind. For the few such lakes that have been similarly treated, the clinolimnetic coefficient of turbulence was found to be inversely related to clinolimnetic volume. For lakes more exposed to the wind, however, turbulence was more directly related to surface area. For lakes of this type Hutchinson's technique requires an enormous number of data in order to average out the intermittent and irregular effects of the internal seiche-induced transfer to heat. Turbulence calculations were also made by the procedure of Dutton and Bryson. The resulting clinolimnetic turbulence coefficient for Tom Wallace Lake was 30% greater than that derived by Hutchinson's technique. However, it was shown that Dutton and Bryson's technique was not completely consistent with certain experimental observations and that this fair agreement was largely fortuitous.--Copyright 1974, Biological Abstracts, Inc.
W77-11322

EFFECT OF A PULP AND PAPER MILL EFFLUENT ON THE PRODUCTIVITY OF PERIPHYTON AND PHYTOPLANKTON,
Canada Centre for Inland Waters, Burlington Ontario).
For primary bibliographic entry see Field 5C.
W77-11328

RELATION BETWEEN NIPIGON BAY BENTHIC MACROINVERTEBRATES AND SELECTED ASPECTS OF THEIR HABITAT,
Ontario Ministry of the Environment, Thunder Bay.
For primary bibliographic entry see Field 5C.
W77-11329

EXTENT OF EFFLUENT INFLUENCE ON LAKE WATER DETERMINED BY BACTERIAL POPULATION DISTRIBUTIONS,
Ontario Ministry of the Environment, Rexdale. Lab Service Branch.
For primary bibliographic entry see Field 5B.
W77-11350

ORGANIC CONTAMINANT RESIDUES IN FISHES FROM NIPIGON BAY, LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington Ontario).
For primary bibliographic entry see Field 5C.
W77-11355

ASSESSMENT OF THE ACUTE TOXICITY, GROWTH IMPAIRMENT, AND FLESH TAINTING POTENTIAL OF A BLEACHED KRAFT MILL EFFLUENT ON RAINBOW TROUT (SALMO GAIRDNERI),
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5C.
W77-11357

DENSITY, DISTRIBUTION AND MOVEMENT OF NIPIGON BAY FISHES IN RELATION TO A PULP AND PAPER MILL EFFLUENT,
Fisheries and Marine Service, Ottawa (Ontario). Great Lakes Biolimnology Lab.
For primary bibliographic entry see Field 5C.
W77-11358

THE EFFECT OF CATCHMENT GEOCHEMISTRY AND GEOMORPHOLOGY ON THE PRODUCTIVITY OF A TROPICAL AFRICAN MONTANE LAKE (LITTLE CONNEMARA DAM NO. 3, RHODESIA),
Rhodesia Univ., Salisbury. Hydrobiology Research Unit.
For primary bibliographic entry see Field 5C.
W77-11414

ZOOPLANKTON AND PHYTOPLANKTON STUDIES IN THE WATERTON LAKES, ALBERTA, CANADA,
For primary bibliographic entry see Field 5C.
W77-11415

THE ARGILLOTROPHIC LAKE SYSTEM,
Alberta Univ., Edmonton. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-11416

SEASONAL CHANGES OF PLANKTONIC CRUSTACEA IN TWO NEWFOUNDLAND LAKES,
For primary bibliographic entry see Field 5C.
W77-11417

THE OCCURRENCE AND BEHAVIOUR OF ADULT CHAOBORUS AND PROCLADIUS (DIPTERA: NEMATOCERA) FROM LAKE GEORGE, UGANDA,
Ghana Univ., Legon. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-11419

TEMPERATURE LIMITATION OF METHANOGENESIS IN AQUATIC SEDIMENTS,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W77-11422

CHROMATOGRAPHIC INVESTIGATION OF INOSITOL PHOSPHATE ESTERS IN LAKE WATERS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5A.
W77-11477

2I. Water In Plants

A COMPARISON OF ENVIRONMENTS OF RAIN FORESTS IN DOMINICA AND PUERTO RICO,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2G.
W77-10988

BIOMETRIC CHANGES OF PINETUM IEDOSUM UNDER THE EFFECT OF DRAINAGE, (IN RUSSIAN),
T. K. Kapustinskaite.
Lesovedenie Vol 3, p 20-30, 1976.

Descriptors: *Mosses, Schrubs, Statistics, Bogs, Biomass, Drainage.
Identifiers: Biometric, Pinetum-ledosum, Sphagnum.

Biometrical indices of Pinetum ledosum on poor peaty soils (Lithuanian SSR, USSR) change to a great degree under the influence of draining. In 30-70 yr old Pinetum ledosum the quantity of phytomass of all the parts of woody story (stems, crowns, needles, roots) is 3-5.7 times greater and the current increment reaches its peak 20 yr earlier on drained areas than on undrained ones. The weight of individual needles is greater in drained pine stands than in undrained ones. Needle surface area in drained Pinetum is 2.1-2.8 times larger than in undrained stands. The weight of the current stem increment/kg of needles changes with the age of stems, much smaller in undrained pine stands than in drained ones. The main portion (34-49) of the annual increment of phytomass in drained Pinetum is the stem wood, but in undrained stands the increment of sphagnum moss and boggy bushes is 56-70%.--Copyright 1977, Biological Abstracts, Inc.
W77-11059

AGROTECHNICAL PRINCIPLES FOR WATER AND SALINITY CONTROL IN THE ROOT ZONE,
Technion-Israel Inst. of Tech., Haifa. Dept. of Soil Science.
For primary bibliographic entry see Field 3C.
W77-11064

ON THE ROLE OF LEAF WATER IN REGULATING METABOLISM,
Ben Gurion Univ. of the Negev, Beersheba (Israel). Research and Development Authority.
S. Arad, and A. E. Richmond.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 165-173. 4 fig, 3 tab, 31 ref.

Descriptors: *Moisture stress, *Plant physiology, *Metabolism, *Water requirements, Enzymes, Cytological studies, Drought tolerance, Moisture deficit, Stomata, Saline water, Chlorophyll, Humidity, Osmotic pressure.
Identifiers: *Leaf water, Leaf water saturation deficit, RNase, Protease, Kinetin, Abscisic acid, Hormone activity.

Studies conducted on the interrelationship between leaf water saturation deficit (WSD), enzyme activity and hormone effects in water-stressed plants indicate that cell-water content supersedes hormone regulation of enzyme activity and becomes a regulatory factor in cellular metabolism under conditions of water stress. The leaves of barley plants subjected to increasing drought-induced water shortage had progressively increased WSD, with a good correlation established between RNase activity and leaf-WSD. In plant exposed to salt-induced water stress, there was also good correlation between RNase or protease activity and either leaf-WSD or leaf water potential. This correlation persisted regardless of hormonal treatments--which by themselves affect leaf-WSD--due to an inversion Kinetin and ABA effects on leaf chlorophyll were also reversed in the stressed plants, with these hormones having opposite effects on leaf-WSD. The leaves of ABA-treated plants contained appreciably more chlorophyll per leaf area than those of kinetin-treated plants. Increased leaf-WSD and elevations of RNase activity and ABA content were essentially prevented when plants exposed to high osmoticum were transferred to an environment of high relative humidity. (See also W77-11055) (Jahns-Arizona)
W77-11070

SOME FACTORS AFFECTING THE SURVIVAL OF ROOT-NODULE BACTERIA ON DESICCATION,
Tasmania Univ., Hobart (Australia). Dept. of Agricultural Science.
H. V. A. Bushby, and K. C. Marshall.
Soil Biology and Biochemistry, Vol 9, p 143-147, 1977. 2 fig, 4 tab, 16 ref.

Descriptors: *Dehydration, *Soil bacteria, *Rhizosphere, *Legomes, On-site investigations, Soil chemistry, Montmorillonite, Protection, Plastics, Root zone, Bacteria.
Identifiers: *Desiccation, *Rhizobia, Maltose, Sucrose, Polyvinylpyrrolidone.

Fast-growing root-nodule bacteria were found to be more susceptible to desiccation than slow-growing species. After desiccation of sandy soil inoculated with 1,000,000 bacteria/g soil, the average number of survivors of fast-growing medic rhizobia (3 strains) and Rhizobium leguminosarum types (6 strains) and slow-growing species (9 strains) was 727, 795 and 15,682 bacteria/g soil, respectively. The degree of extracellular polysaccharide production in strains of R. trifolii did not influence survival in desiccated soil, nor did growth of R. meliloti and slow-growing species in media of low water activity before desiccation. Increasing concentrations of powdered montmorillonite added to the soil caused a progressive increase in the survival of fast-growing rhizobia after desiccation, but not when added as a suspension to the soil. Concentrations above 10% montmorillonite had little effect on survival except with R. trifolii TA1. The clay had a detrimental effect or no effect on the survival of slow-growing rhizobia. Better protection for both fast- and slow-growing rhizobia was provided by maltose, sucrose and polyvinylpyrrolidone. Polyethylenealycal 6000, like montmorillonite, protected only the fast-growing rhizobia. (Jahns-Arizona)
W77-11080

ENERGY REGIME AND WATER BALANCE OF AN ALPINE DWARF SHRUB COMMUNITY DURING A FOEHN PERIOD, (IN GERMAN),
Innsbruck (Austria). Institut Allegemeine Botanik.
A. Cernusca.
Arch Meterol Geophys Bioklimatol Ser B Klimatol Umweltmeteorol Strahlungsforsch Vol 24, No 3, p 219-241, 1976.

Descriptors: *Shrubs, Evapotranspiration, *Vegetation effects, *Chinook, Alpine, Humidity, Stomata, Winds.
Identifiers: Austria, Loiselleuria.

Because of high wind velocities and low air humidity during Foehn, this wind from the south is of special ecological importance in the central Alps. The effect of a 5-day Foehn period on the radiation, heat and water economy of an alpine dwarf shrub community (Loiseleurietum cetrariosum) at Mt. Patscherkofel near Innsbruck (Austria) is discussed. In the course of a several-day Foehnstorm, evapotranspiration decreses remarkably and heat convection increases. Decrease in evapotranspiration is due to the closure of the stomata of the leaves caused by the wind. The effect of the wind on the vegetation layer depends not only on the relief of the ground but also on the growth habit of the plants and the community structure. The dense Loiseleuria carpet creeping along the ground causes a large community exchange resistance which is an advantage to plant communities growing on windswept habitats. Loiseleuria is thus able to create within the vegetation layer a favorable microclimate which is relatively calm, warm and humid even during strong wind.—Copyright 1977, Biological Abstracts, Inc.
W77-11089

EFFECTS OF PLANT WATER STATUS ON STOMATAL ACTIVITY, PHOTOSYNTHESIS, AND NITRATE REDUCTASE ACTIVITY OF FIELD GROWN COTTON,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science.
R. C. Ackerson, D. R. Krieg, C. L. Haring, and N. Chang.
Crop Science, Vol 17, p 81-84, January-February 1977. 5 fig, 1 tab, 29 ref. OWRT C-6273(5225)(2).

Descriptors: *Moisture stress, *Stomata, *Photosynthesis, *Plant physiology, *Cotton, *Drought tolerance, Plant response, Dry farming, Soil-water-plant relationships, On-site tests, Plant growth, Stress analysis, *Nitrates, Leaves.
Identifiers: *Nitrate reductase activity, Leaf water potential, Leaf diffusive resistance.

The effects of water stress on stomatal activity, photosynthesis and nitrate reductase activity (NRA) were determined in studies on field grown cotton (Gossypium hirsutum L., cv 'Dunn 56C'). Results indicate cotton stomata are relatively insensitive to water stress within the range of leaf water potentials observed. Leaf diffusive resistances appeared to be virtually independent of leaf water potential; afternoon resistance values were greater than morning ones irrespective of leaf water potential. Photosynthesis in vegetative and reproductive leaves was substantially reduced by water stress. Photosynthetic rates of each leaf type responded differently to decreased leaf water potentials; results suggest photosynthesis reduction was not attributable to stomatal closure. Stress caused NRA declines; nocturnal activity of nitrate reductase (respiratory linked) was also reduced, although the decline from maximum daily activity to minimum night time activity was similar in both stressed and nonstressed plants. Inhibition of NRA may be due to long term water stress effects rather than temporal changes in water status. Measurement of one or more physiological processes may be a better index of plant water status than stomatal activity, and also provides sensitive selection criteria for breeding more drought tolerant varieties. (Jahns-Arizona)
W77-11098

WATER RELATIONS OF FIELD GROWN COTTON AND SORGHUM: TEMPORAL AND DIURNAL CHANGES IN LEAF WATER, OSMOTIC, AND TURGOR POTENTIALS,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science.
R. C. Ackerson, D. R. Krieg, T. D. Miller, and R. E. Zartman.
Crop Science, Vol 17, p 76-80, January-February 1977. 4 fig, 2 tab, 29 ref. OWRT C-6273(5225)(1).

Descriptors: *Soil-water-plant relationships, *Drought tolerance, *Cotton, *Sorghum, *Plant physiology, Diurnal distribution, Stomata, Moisture stress, Osmotic pressure, Osmosis, Turgidity, Available water.
Identifiers: *Leaf water potential, *Osmotic potential, *Turgor potential.

The mechanisms accounting for drought tolerance in sorghum and cotton are distinctly different, with species specific relationships in leaf water potential components being responsible. Cotton (Gossypium hirsutum L., cv. 'Dunn 56C') and sorghum (Sorghum bicolor L. Moench, cv. 'RS671') planted on a Friona coarse sandy loam had trends in leaf water, osmotic and turgor potentials monitored on a seasonal and diurnal basis. The differences in water relations were determined by studying the effects of differential soil water availability on leaf water potential components. Soil water depletion caused reduced morning and afternoon leaf water potentials, with a greater magnitude of digression in cotton. When soil water was adequate, declines in osmotic potentials maintained positive turgor in both species; as water stress increased, turgor potentials became zero because osmotic potentials did not decline more than water potentials. Sorghum leaf water potentials reached approximate equilibrium with soil water potential in the early morning, while cotton leaf water potentials did not. Concomitant diurnal changes in leaf osmotic potentials caused specific trends of increasing turgor in sorghum, while cotton leaf turgor potentials registered anomalous fluctuations. Cotton had a greater change in relative water content per unit change. (Jahns-Arizona)
W77-11099

RESPONSE OF OATS TO WATER DEFICIT. I PHYSIOLOGICAL CHARACTERISTICS,
South Dakota State Univ., Brookings. Dept. of Plant Science.
B. S. Sandhu, and M. L. Horton.
Agronomy Journal, Vol. 69, No. 3, p 357-360, May-June 1977. 6 fig, 21 ref. OWRT B-004-SDAK(2).

Descriptors: *Oats, *Moisture stress, *Moisture deficit, *Plant physiology, *Crop response, Growth stages, Stomata, Soil-water-plant relationships, Photosynthesis, Irrigation practices, Plant growth, Planting management, Leaves.
Identifiers: Boot stage, Anthesis, Leaf diffusion resistance.

A study was conducted to determine the effects o water stress on certain physiological processes o spring oats (Avena sativa L.) under field condi tions. Plants were subjected to water deficits for to 11 days at the boot stage, at anthesis throug early grain formation stage and at both stages i combination. Relative leaf water content (RLWC according to the relative turgidity method wa used as a measure of water deficit, and a diffusio porometer was used to monitor lead diffusion re sistance (LDR). An 80% decline in the ne photosynthetic rate (NPR), as measured using a infrared gas analyzer, resulted from severe wate stress at all stages. A decline in RLWC was fo lowed by LDR increases, due to stomatal closur induced by water deficits. Both LDR and RLWC recovered in 1 to 6 days after rewatering. Stres during the boot stage reduced photosynthetic sen sitivity to subsequent stress at the anthes through early grain formation stage, with NP recovering more gradually and incompletely aft that. Plants stressed only during the boot stag then adequately watered, had higher NPR tha controls. Since the LDR and NPR of oats hav acute sensitivity to plant water deficits, thes parameters may help determine permissible wat deficit limits and irrigation scheduling. (See al W77-11101) (Jahns-Arizona)
W77-11100

RESPONSE OF OATS TO WATER DEFICIT. I GROWTH AND YIELD CHARACTERISTICS,
South Dakota State Univ., Brookings. Dept. Plant Science.
B. S. Sandhu, and M. L. Horton.
Agronomy Journal, Vol. 69, No. 3, p 361-36 May-June 1977. 5 tab, 19 ref. OWRT B-00 SDAK(3).

Descriptors: *Crop response, *Oats, *Moistu deficit, *Plant growth, *Crop productio Moisture stress, Plant physiology, Growth stag Root development, Root distribution, On-site vestigations, Height, Planting management, So water-plant relationships, Stomata.
Identifiers: Boot stage, Anthesis, Florets, K nels, Panicles.

Spring oats (Avena sativa L.) were subjected water stress for 9 to 11 days under field conditio to evaluate growth and yield response to wa deficits at certain stages. Plants were grown pachic udic haploborolls soil (Lismore silty c loam) in large pots (120-litre garbage cans) bur in the center of a field. Water stress applied at boot stage and/or the anthesis through early gr formation stage decreased plant height number of florets per panicle. Stress at anthe through early grain formation caused more flo sterility and fewer heads at maturity. Deficits at stages decreased the yield of straw, tops with panicles, panicles, kernels and dehulled kern Kernel yield was depressed 20% and 58%, resp tively, with stress at booting and anthesis throu grain filling; combined stress caused 67% yi decline. Plants under soil water stress rooted greater depth and had accelerated growth profuse tillering when rewatered. Managem under both dryland and irrigated conditions sho emphasize irrigation during the anthesis thro early grain formation stage, when water stres especially dangerous. (See also W77-111 (Jahns-Arizona)
W77-11101

DESICCATION-INDUCED DAMAGE TO THE CELL ENVELOPE OF ROOT-NODULE BACTERIA,
Tasmania Univ., Hobart (Australia). Dept. of Agricultural Science.
H. V. A. Bushby, and K. C. Marshall.
Soil Biology and Biochemistry, Vol. 9, p 149-152, 1977. 1 fig, 2 tab, 10 ref.

Descriptors: *Dehydration, *Cytological studies, Soil bacteria, *Rhizosphere, *Laboratory tests, Biological membranes, Fluorescence, Plant morphology, Root zone, Legumes.
Identifiers: *Desiccation, *Cell envelope, Rhizobia.

Desiccation and rehydration of clover, pea and lotus root-nodule bacteria induced leakage of internal contents reacting with the fluorescent probe 1-anilino-8-naphthalene sulphonate (ANS), suggesting the death of these bacteria is associated with changes in membrane permeability. The slow-growing rhizobia and fast-growing Rhizobium meliloti showed little fluorescence in the presence of ANS, unlike other fast-growing bacteria of the R. leguminosarum group. This probably indicates differences in the polar/non-polar nature of the outer cell envelopes. After desiccation, all bacteria fluoresced strongly when rehydrated in a solution of ANS. Following removal of bacteria by centrifugation, the rehydration medium gave a high fluorescence (50-60%) on addition of ANS, suggesting induced leakage of internal contents. Using a range of screening agents, repair of significant numbers of lysozyme-sensitive bacteria was observed with R. leguminosarum TAl01 within an hour of rehydration. Results suggest that rhizobia desiccation does not drastically change the susceptibility of survivors to various anti-bacterial agents. (Jahns-Arizona)
W77-11105

CAVITATION AND RESISTANCE TO WATER FLOW IN PLANT ROOTS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
J. F. Byrne, J. E. Begg, and G. K. Hansen.
Agricultural Meteorology, Vol. 18, No. 1, p 21-25, April 1977. 3 fig, 12 ref.

Descriptors: *Cavitation, *Xylem, *Root systems, Flow resistance, Transpiration, Cotton, Moisture stress, Plant physiology, Stomata, Equations, Laboratory tests.

Cavitation in root xylem may cause large variations in resistance to water flow in plants. Under conditions of low stress, resistance may decrease with transpiration, while severe stress may involve rapid increases due, at least in part, to cavitation. A relationship was found between resistance to air flow through frozen cotton root segments and plant stress, suggesting a potential method for determining cavitation and its effect on plant resistance. Five cotton seedlings grown in a mixture of perlite and vermiculite in pots in a greenhouse with daily watering were then subjected to different degrees of water stress. Results indicated that flowing through cavitated xylem vessels and that the extent of cavitation was a function of water stress. The largest conducting element is the first to cavitate. Equations are presented to describe resistance to water flow in the empty stem vessels, total resistance with all vessels water-filled and resistance of uncavitated vessels to water flow. (Jahns-Arizona)
W77-11106

SEASONAL VARIATIONS IN STOMATAL RESISTANCE IN COTTON,
Queensland Univ., Brisbane (Australia). Dept. of Agriculture.
For primary bibliographic entry see Field 3F.
W77-11108

INFLUENCE OF SOIL PROPERTIES, LEACHING FRACTION, AND PLANT WATER UPTAKE ON SOLUTE CONCENTRATION DISTRIBUTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W77-11222

MOISTURE RELATIONSHIPS IN TWELVE NORTHERN DESERT SHRUB COMMUNITIES NEAR GRAND JUNCTION, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2D.
W77-11384

PERFORMANCE OF THE SILVER-PSYCHROMETER FOR MEASURING LEAF WATER POTENTIAL IN SITU,
Agricultural Research Service, Riverside, Calif. Western Region.
G. J. Hoffman, and A. E. Hall.
Agronomy Journal, Vol 68, No 6, p 872-875, November-December 1976. 4 fig, 17 ref.

Descriptors: *Moisture stress, Temperature, Humidity, Radiation, Soil moisture, Soil water, Moisture content, Soil-water-plant relationships.
Identifiers: *Leaf water potential, *Thermocouple psychrometer, Silver-foil psychrometer, Pinto bean, Thermal gradients.

Continuous in situ measurements of leaf water potential are often needed in studies of the soil-plant-atmosphere continuum. The development of the silver-foil thermo-couple psychrometer has made these measurements possible. The objective of the investigation was to evaluate the performance of the silver-foil psychrometer under various steady-state and dynamic conditions. Leaf water potential measurements were made in situ on pinto bean in a controlled-environment plant chamber where temperature, relative humidity, CO2 concentration, radiation, and photoperiod were precisely controlled. Typically, the psychrometer will reach equilibrium with an intact leaf 2 hours after attachment. Consistent leaf water potentials are attainable when the leaf temperature varies by as much as 0.25 C/min. This thermal stability is as good as that of any multijunction psychrometer described to date. At radiation levels below 50 Wm(-2), leaf water potential readings can be made on unshaded leaves; above this level, the leaf must be shaded to prevent thermal gradients across the leaf and psychrometer. The silver foil psychrometer responded to rapid oscillations in leaf water potential. During oscillations, leaf water potential preceded lead conductance and transpiration by one-third of the oscillation period. Net photosynthesis oscillated in phase with leaf conductance, indicating that net photosynthesis is limited by the internal CO2 concentration, even at very low irradiances. (Skogerboe-Colorado State)
W77-11388

WATER STRESS AND PHENOLOGY IN WHEAT,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 3F.
W77-11427

IRRIGATION AND NITROGEN STUDIES IN S.23 RYEGRASS GROWN FOR SEED, 1. GROWTH, DEVELOPMENT, SEED YIELD COMPONENTS AND SEED YIELD,
Nottingham Univ. (England). School of Agriculture.
For primary bibliographic entry see Field 3F.
W77-11432

2J. Erosion and Sedimentation

DETERMINATION OF SEDIMENT YIELD BY TRANSFERRING RAINFALL DATA,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
J. H. Smith, D. R. Davis, and M. Fogel.
Water Resources Bulletin, Vol. 13, No. 3, p 529-541, June 1977. 2 fig, 17 ref.

Descriptors: *Sediment yield, *Reservoir silting, *Model studies, *Arizona, Rainfall, Reservoir storage, Reservoirs, Dead storage, Decision making, Equations, Risks, Mathematical studies, Numerical analysis, Methodology, Estimating, Sediment discharge.
Identifiers: Bayesian decision theory, Data transfer.

A methodology for obtaining the optimal design value to allow for sediment storage in a reservoir was presented for the situation where no data on sediment loads in the incoming streams are available. Information concerning the amount of sediment delivered to the reservoir over its life-time was obtained by a sediment yield model which uses data on rainfall amount and duration obtained from a nearby experimental watershed. Bayesian Decision Theory was used to obtain the optimal storage requirements in order to consider the natural variation of rainfall and the sampling error due to the short rainfall record available. The normally difficult calculations involved were made tractable by the use of simplifications and approximations which were valid in the context of the problem. Results showed that sediment storage requirements can be calculated in this manner and that consideration of the uncertainties involved leads to a shortage requirement substantially larger than that calculated without such consideration. (Humphreys-ISWS)
W77-10804

SIMULATION STUDIES OF FLOW AND SEDIMENT TRANSPORT USING A MATHEMATICAL MODEL, ATCHAFALAYA RIVER BASIN, LOUISIANA,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.; and Geological Survey, Miami, Fla. Water Resources Div.
M. E. Jennings, and L. F. Land.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 707, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-14, May 1977. 55 p, 22 fig, 8 tab, 9 ref.

Descriptors: *Sedimentation rates, *Mathematical models, *Aggradation, *Sediment transport, Gradually varied flow, Streamflow, Flow rates, Flow profiles, Simulation analysis, Sediment distribution, Mississippi River basin.
Identifiers: *Atchafalaya River basin(La).

Simulation studies were made of flow and sediment transport for the Atchafalaya River basin, Louisiana using a mathematical model calibrated and supplied by the Hydrologic Engineering Center and the New Orleans District, U.S. Army Corps of Engineers. The study results are based on three, 50-year computer simulations for the following alternatives: (1) no-action alternative, (2) channelization with a center-channel flow area of 80,000 sq ft, and (3) channelization with a center-channel flow area of 100,000 sq ft. Analyses of the simulated data base for depth-frequency, inundated-area, floodway cross-section and water-surface profile relationships were made for 10 flow rates. The analyses indicate a general trend of aggradation in the lower part of the floodway with a consequent trend toward increasing the inundated area, especially at higher flood flows. (Woodard-USGS)
W77-10867

APPARATUS FOR COLLECTING DEEP-SEA SEDIMENT PORE WATER,
Office of Naval Research, Arlington, VA.
For primary bibliographic entry see Field 7B.
W77-10881

SEDIMENT SUSPENSION AND TURBULENCE IN AN OSCILLATING FLUME,
California Univ., Berkeley. Hydraulic Engineering Lab.
T. C. MacDonald.
Army Coastal Engineering Research Center, Ft. Belvoir, Va., Technical Paper No. 77-4, April 1977. 80 p, 28 fig, 3 tab, 23 ref. DACW72-71-C-0024.

Descriptors: *Sediments, *Water quality, *Sediment transport, *Turbulence, *Baseline studies, Flumes.
Identifiers: *Outer Continental Shelf, *Suspended sediments, Wave action, Coastal zone.

An experimental study measured suspended-sediment concentrations and turbulence above the bottom of a specially designed oscillating flume. A total of 73 concentration distributions was measured for a single fixed-bottom roughness and the same specific gravity (1.25) of sediment. Three different sediment sizes were used, 65 experiments with the same size. These experiments show a simple exponential distribution, except near the bottom, as previously found by other investigators. The slope of the concentration distribution is in the range of -5 to -15 per foot for the experiments. For the limited data on other sizes, the slope of the concentration distribution becomes more negative as fall velocity increases. Turbulent velocity fluctuations measured with a hot-film anemometer are normally distributed with mean zero for measurements at two elevations above the bed, well outside the viscous boundary layer. The root mean square of the velocity fluctuations decreases exponentially with distance above the bed, and at the bed, increases approximately linearly with increase in flume velocity. When extrapolated to typical field conditions seaward of the breaker, these experiments demonstrate the importance of fall velocity, maximum wave-induced bottom velocity, and turbulent velocity fluctuations in controlling sediment suspension by shoaling waves. However, comparisons of data obtained with the lightweight sediment in these experiments and the probable motion of quarts sand in the field suggest that sediment suspensions caused by shoaling waves offshore of the breaker are likely to be limited. (Sinha-OEIS)
W77-10887

SUSPENDED SEDIMENT IN THE LITTORAL ZONE AT VENTNOR, NEW JERSEY, AND NAGS HEAD, NORTH CAROLINA,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W77-10888

ASPECTS OF SIZE DISTRIBUTIONS, MINERALOGY AND GEOCHEMISTRY OF DELTAIC AND ADJACENT SHALLOW MARINE SEDIMENTS, NORTH ARCTIC ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10897

APPENDIX V. SHORELINE DAMAGE SURVEY: AN APPRAISAL WITH RECOMMENDATIONS,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 2H.
W77-10904

ENGINEERING-ECONOMIC ANALYSIS OF SHORE PROTECTION SYSTEMS: A BENEFIT/COST MODEL,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 2H.
W77-10905

WATER MANAGEMENT FOR SHORELINE EROSION CONTROL ON THE CHIPPEWA FLOWAGE,
Wisconsin Univ., Madison. Environmental Resources Unit.
For primary bibliographic entry see Field 4D.
W77-10925

THE SEDIMENT ENVIRONMENT OF PORT VALDEZ, ALASKA: THE EFFECT OF OIL ON THIS ECOSYSTEM,
Alaska Univ., College.
For primary bibliographic entry see Field 5C.
W77-10944

DREDGED MATERIAL AS A NATURAL RESOURCE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W77-10962

NONUNIFORM FLOW IN AGGRADING CHANNELS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-10963

DEVELOPMENT OF BED CONFIGURATIONS IN COARSE SANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 8B.
W77-10980

GENERAL SCOUR AND FILL ALONG A STREAM REACH,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 8B.
W77-10982

DREDGED MATERIAL AS A NATURAL RESOURCE–CONCEPTS FOR LAND IMPROVEMENT AND RECLAMATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 4A.
W77-10983

REMOTE MEASUREMENT OF 'TURBIDITY' AND OTHER WATER QUALITY PARAMETERS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 5A.
W77-10985

PULSING FLOW IN STEEP ALLUVIAL STREAMS,
Missouri Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 8B.
W77-11206

MATHEMATICAL MODELING OF SCOUR AND DEPOSITION,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 8B.
W77-11207

BED LOAD SAMPLER FOR STREAMS WITH SANDY BED,
Technion-Israel Inst. of Tech. Haifa. Faculty of Agricultural Engineering.
A. Racotch, and R. Sagi.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 103, No. HY8, p 923-928, August 1977. 3 fig, 9 ref, 1 append. USDA FG-Is-242.

Descriptors: *Bed load samplers, *Sampling *Equipment, *Sediment transport, Bed load Beds, Streams, Streamflow, Sands, Sediments Sedimentation, Sedimentology.

Technical and operational considerations led t the idea of using a simple pit sampler in combina tion with a weighting instrument as a possible an inexpensive arrangement for bed load measurin purposes. In order to avoid large construction an collecting containers, it was decided to design th opening/instrument combination for particles hav ing nominal (diameter of spheres that equal th number of particles considered and their tot volume) diameters less than 3 mm, making the un suitable for streams with sandy beds. Th proposed instrument was described. The sensin element is built in the form of a bucket, subdivide into two compartments and pivoted over a kni edge. The bucket tips whenever one of the cor partments fills up to a preset quantity of materi The material is tipped into the collecting contain and the empty compartment is simultaneously e posed to the material entering the opening. Th design of the shape and the dimensions of t bucket were based on an analytical investigati of a mathematical model. The analysis permitt determination of the parameters of the bucket a the position of the pivot. Emphasis was placed automatic performance of the whole system in t sense that no person has to assist the measuri unit at the time of operation. (Sims-ISWS)
W77-11208

ASSESSING THE ACCURACY OF SUSPEND SEDIMENT RATING CURVES FOR A SMA BASIN,
Exeter Univ. (England). Dept. of Geography.
D. E. Walling.
Water Resources Research, Vol 13, No 3, p 5 538, June 1977. 9 fig, 3 tab, 33 ref.

Descriptors: *Rating curves, *Suspended lo *Small watersheds, *Stage-discharge relatio Sediment discharge, Data collections, On-site vestigations, Sediments, Analysis, Analyt techniques, Estimating, Seasonal, Summ Winter, Foreign research, Foreign countries.
Identifiers: *England, *River Creedy(Engla Rising stage, Falling stage.

Sediment rating curves often are used to estim suspended sediment loads where the sampling gram is insufficient to define the continu record of sediment concentration. Use of technique will involve errors in the values of s ment load produced, and comparison with m sured daily values has been employed to assess magnitude of the errors. Comparisons are n difficult for small- and medium-sized catchm because of the general lack of direct meas ments of loads. Recording turbidity meters c be employed to provide a continuous recor sediment concentration which can be used to culate sediment loads. Results were presented the river Creedy in which the values o sedi load calculated from the continuous concentr record were compared with estimates der from rating curves. The rating-curve data grouped according to season and stage tenden provide various rating relationships. Values o nual sediment load estimated by using a r curve could involve errors of up to +2 whereas the errors for monthly loads could r between +900% and -90%. Careful consider should be given to possible error terms befor ing-curve estimates of sediment load are us statistical and other analyses. (Humphreys-IS

W77-11210

DISTRIBUTED NUMERICAL MODEL FOR ESTIMATING RUNOFF AND SEDIMENT DISCHARGE OF UNGAGED RIVERS, 1. THE INFORMATION SYSTEM,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 2A.
W77-11218

DISTRIBUTED NUMERICAL MODEL FOR ESTIMATING RUNOFF AND SEDIMENT DISCHARGE OF UNGAGED RIVERS, 2. MODEL DEVELOPMENT,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-11219

DISTRIBUTED NUMERICAL MODEL FOR ESTIMATING RUNOFF AND SEDIMENT DISCHARGE OF UNGAGED RIVERS, 3. COMPARISON WITH OTHER SIMPLE TECHNIQUES,
McGill Univ. Montreal (Quebec), Department of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 2A.
W77-11220

USE OF A VERSATILE EXPERIMENTAL SYSTEM FOR SOIL EROSION STUDIES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
D. H. Walker, J. Hutka, A. J. Moss, and P. I. A. Pinnell.
Soil Science Society of America Journal, Vol. 41, No. 3, p 610-612, May-June 1977. 3 fig, 10 ref.

Descriptors: *Soil erosion, *Simulated rainfall, Laboratory tests, Sheet erosion, Erosion rates, Raindrops, Slopes, Streams, Runoff, Sediment transport, Bed load, Discharge(Sediments), Rainfall, Rainfall simulators, Impact(Rainfall), Soil science.

A laboratory facility for the study of soil erosion was described. Rainfall from a modular system applied raindrops at near terminal velocity to prepared soil beds set in a flume with slope adjustable up to 30%. A comparison was made of erosion under overland flow alone and of storm flows of the same intensity (discharge), but of different energy levels. Raindrop impact in runoff flow was a powerful agency in promoting soil transport and inhibiting rill formation. Bed load movement was important in the transport of sand grains, even where the runoff was disturbed by raindrops. (Sims-ISWS)
W77-11237

FLUVIAL SEDIMENT IN THE ARKANSAS RIVER BASIN, KANSAS,
Geological Survey, Lawrence, Kans. Water Resources Div.
R. Osterkamp.
Kansas Geological Survey, (Topeka), Bulletin No 209, 1977. 91 p, 17 fig, 3 tab, 20 ref, 5 append.

Descriptors: *Sediment transport, *Fluvial sediments, *Sediment yield, *Runoff, *Environmental effects, Climates, Geology, Topography, Vegetation, Land use, Evaluation, Hydrologic data, Suspended load, Particle size.
Identifiers: *Arkansas River basin(Kan).

Measured sediment yields in the Arkansas River basin of Kansas show large areal variation. Climate, geology, topography, and to a lesser extent vegetation and land use, are variables controlling yields. Average annual precipitation increases from 15 inches in the west to 41 inches in the east. The surficial geology is dominated by alluvium and eolian sand and silt in the western two-thirds of the basins and by limestone and shale in the east. Topography varies with geology so that slopes are gentlest in the west and in lowland areas, and greatest where stream dissection is occurring. Vegetation is least effective in controlling erosion in the west owing to the strong influence by climate and land use. Runoff, which increases from west to east similar to precipitation, combines the effects of climate, vegetation and, in part, geology and land use. Runoff, when combined with slope, is the prime indicator of sediment yields. Total sediment yields in excess of 600 tons per square mile per year occur where the Flint Hills are underlain by gypsiferous shale. Similar yields occur in the western part of the basin where slopes are relatively high and vegetation is inadequate to control dissection. Yields in the eastern two-thirds of the basin range from 100 to 600 tons per square mile per year depending on slope, runoff, and stresses of land use or hydraulic structures. Where slopes are low, yields may be less than 100 tons per square mile per year. (Woodard-USGS)
W77-11364

FREQUENCY DOMAIN ANALYSIS OF HYDROLOGICAL SYSTEMS WITH MONTHLY DATA,
Universidad del Zulia, Maracaibo (Venezuela); and Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-11386

PREDICTING PARTICLE-SIZE COMPOSITION OF ERODED SOIL,
Agricultural Research Service, Morris, Minn.
R. A. Young, and C. A. Onstad.
In: Transactions of the American Society of Agricultural Engineers, Soil and Water, p 1070-1075, Special Edition 1976. 2 fig, 3 tab, 22 ref.

Descriptors: *Particle size, Erosion, Organic matter, Pore pressure, Soils, Soil investigations, Sediments, *Soil erosion, *Forecasting.

A set of equations was developed for predicting particle-size distribution of eroded soil, based on soil surface area and texture and considering organic matter enrichment and the tendency of a soil to rill. Three parameters--particle-size distribution of the matrix soil, organic matter, and water content at -15 bars pore presure gave a good estimate of the expected particle-size distribution. (Skogerboe-Colorado State)
W77-11409

2K. Chemical Processes

TOXIC METALS IN GROUND WATER OF THE FRONT RANGE, COLORADO,
Colorado School of Mines, Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
For primary bibliographic entry see Field 5A.
W77-10853

HYDROLOGIC MAPS AND DATA IN THE MIMBRES BASIN, NEW MEXICO,
Geological Survey, Albuquerque, N.M. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10858

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR BURAS, LOUISIANA (NEW ORLEANS TO VENICE, LOUISIANA, HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 8G.
W77-10865

EFFECTS OF PHREATOPHYTE REMOVAL ON WATER QUALITY IN THE GILA RIVER PHREATOPHYTE PROJECT AREA, GRAHAM COUNTY, ARIZONA, WITH A SECTION STATISTICAL ANALYSIS,
Geological Survey, Phoenix, Ariz. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-10868

USE OF AN AIRBORNE FRAUNHOFER LINE DISCRIMINATOR FOR THE DETECTION OF SOLAR STIMULATED LUMINESCENCE,
Geological Survey, Flagstaff, Ariz. Water Resources Div.; and Geological Survey, Reston, Va. Water Resources Div.
R. D. Watson, and W. R. Hemphill.

Descriptors: *Solar radiation, *Light intensity, *Reflectance, *Fluorescence, Surface waters, Vegetation, Soils, Mineralogy, Sediments, Oil, Data collections, Tracking techniques, Water pollution sources, Path of pollutants, Instrumentation, Aircraft, Analytical techniques.
Identifiers: *Electro-optical device, *Luminescence, Solar stimulated luminescence.

Luminescence is the property of some materials to emit light when excited by external stimuli such as ultraviolet or visible light or by chemical or mechanical action. The Fraunhofer line discriminator (FLD) is an airborne electro-optical device which operates as a non-imaging radiometer and permits detection of solar stimulated luminescence several orders of magnitude below the intensity detectable with the human eye. Procedures employing a laboratory fluorescence spectrometer permit prediction of the detectivity with an FLD prior to monitoring an airborne test. Luminescence spectra of the material are corrected for wavelength variation in spectrometer source, detector sensitivity, and solar illumination. By comparing these results with the luminescence of a rhodamine WT dye standard, the luminescence of the material may be expressed in term of rhodamine dye equivalency at the wavelength of several Fraunhofer lines. The FLD detectivity may be assessed at each Fraunhofer line, and the optimum line for field observation of the material may be selected. (Woodard-USGS)
W77-10869

HYDROGEN ION EXCHANGE ON AMORPHOUS SILICA IN SEAWATER,
Oregon State Univ., Corvallis. School of Oceanography.
C. H. Culberson, R. M. Pytkowicz, and E. L. Atlas.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 163, Price codes: A02 in paper copy, A01 in microfiche. Report No. 75-16, March 1975. 12 p, 3 fig, 1 tab, 22 ref. N00014-67-A-0360-0007, NSF GA-17011.

Descriptors: *Ion exchange, *Silica, *Sea water, *Water quality, *Cation exchange, Clays, Water chemistry, Temperature, Physical properties, Water properties, Chemical properties, Hydrogen ion concentration, Inorganic compounds, Silicates, Analytical techniques, Connate water.
Identifiers: *Amorphous silica, *Hydrogen ion exchange, *Ion exchange reactions, Siliceous oozes, Exchange reactions, Marine sediments, Reactive silicate.

The amount of hydrogen ion exchange on the surface of amorphous silica in seawater was measured as a function of pH at 2 and 25 C. Hydrogen ion exchange with the cations present in seawater is pH dependent, and at 25 C the fraction of the surface in the cation form increases from 9% at pH 7 to 22% at pH 8. The exchange is temperature dependent; and at 2 C and pH 8, 14% of the exchange sites are occupied by cations, as opposed to 22% of the exchange sites at 15 C. The results were

used to calculate the buffer capacity of a model sediment consisting of pore water and amorphous silica. For a sediment of 70% porosity, pH 7.7, and 25 C, the buffer capacity of sediment plus pore water is 67 times the buffer capacity of pure seawater. (Henley-ISWS)
W77-10979

MATERIAL TRANSPORT THROUGH POROUS MEDIA: A FINITE-ELEMENT GALERKIN MODEL,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 2F.
W77-10981

BRACKISH GROUNDWATER BODIES AS A RESULT OF GEOLOGICAL HISTORY AND HYDROLOGICAL CONDITIONS,
Rijksinstituut voor Drinkwater voorziening, Delft (Netherlands).
For primary bibliographic entry see Field 2F.
W77-11057

PENETRABILITY AND SORPTIVITY IN CALCAREOUS SOILS,
National Research Centre, Cairo (Egypt).
For primary bibliographic entry see Field 2G.
W77-11095

WATER QUALITY IN VICINITY OF FENTON HILL SITE, 1975,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5A.
W77-11129

ORTSAND: ORIGIN AND DIAGNOSTIC VALUE, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
For primary bibliographic entry see Field 2G.
W77-11424

ION ACTIVITY PRODUCTS OF CALCIUM CARBONATE IN WATERS BELOW THE ROOT ZONE,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
D. L. Suarez.
Soil Science of America Journal, Vol 41, No 2, p 310-315, March-April 1977. 4 fig, 3 tab, 27 ref.

Descriptors: *Ions, *Soil water, *Calcium carbonate, *Arizona, *Calcareous soils, Calcite, Soil chemistry, Irrigation wells, Irrigation water, On-site investigations, Chemical precipitation.
Identifiers: Wellton-Mohawk Irrigation District(Ariz).

A study was conducted to determine the pH, Ca(2+) and HC03(-) relations in 28 well waters obtained from beneath fields in the Wellton-Mohawk Irrigation District of Arizona. Based on field measurements of pH, the mean CaCO3 ion activity product (IAP) was 11.3 x 10 to the minus 9th power (pIAP 7.95) with a standard error of 0.7 x 10 to the minus 9th power at field water temperatures of about 25C. The residence time of waters in the soil varies widely; results indicate a longer residence time is associated with greater ionic strength. The lack of a trend in pIAP vs. ionic strength indicates the kinetics of calcite equilibration (from supersaturation) is slow in soil-water systems. Further support for this was an average pIAP of 7.97 calculated from 35 water analyses obtained from wells in the Grand Valley of Colorado and by a pIAP value of 7.96 in a soil water sample from a lysimeter study. A pIAP value of 7.95 is suggested for use in predictive models when CaCO3 precipitation occurs. Waters experiencing rapid CO2 degassing (e.g., surface exposure of drainage waters) would have higher IAP values and measurable rates of precipitation. (Jahns-Arizona)
W77-11438

A NOTE ON SOIL AND WATER MERCURY LEVELS IN ISRAEL AND THE SINAI,
Hawaii Univ., Honolulu. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5A.
W77-11443

2L. Estuaries

SALT-WATER ENCROACHMENT IN AQUIFERS NEAR THE HOUSTON SHIP CHANNEL, TEXAS,
Geological Survey, Houston, Tex. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-10872

APPARATUS FOR COLLECTING DEEP-SEA SEDIMENT PORE WATER,
Office of Naval Research, Arlington, VA.
For primary bibliographic entry see Field 7B.
W77-10881

MARINE ENVIRONMENTAL PROTECTION PROGRAM: AN ANALYSIS OF MISSION PERFORMANCE.
Coast Guard, Washington, D.C. Marine Environmental Protection Div.
For primary bibliographic entry see Field 5G.
W77-10882

AN ANALYSIS OF COASTAL ZONE MANAGEMENT PROGRAM PROPOSALS TO DETERMINE THEIR EFFECT ON THE UNITED STATES AIR FORCE,
Air Force Inst. of Tech., Wright-Patterson A.F.B., Ohio. School of Systems and Logistics.
For primary bibliographic entry see Field 5G.
W77-10883

WAVE INDUCED OSCILLATIONS IN HARBORS WITH CONNECTED BASINS,
California Inst. of Tech., Pasadena. W.M. Keck Lab. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 8B.
W77-10884

NOTE CONCERNING THE CORRELATIONS IN SPACE AND TIME OF SURFACE WAVE AMPLITUDES,
Physical Dynamics, Inc., Berkeley, Calif.
K. M. Watson, and B. J. West.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A002 100, Price codes: A03 in paper copy, A01 in microfiche. Air Force Systems Command, Rome Air Development Center, Technical Report No. RADC-TR-74-267, July 1974. 26 p, 1 fig, 7 ref.

Descriptors: *Ocean waves.
Identifiers: Surface waves, Scattering, Wave-wave interaction, Doppler spectrum, Backscattered radiation.

A calculation of the de-correlation time of the ocean surface wave spectrum at large wavenumbers is given. This is based on a simple model of wave-wave interactions. The results are expressed in terms of an expected Doppler spread of scattered electromagnetic waves in the microwave regime. A calculation is also given of the distance over which de-correlation of surface waves occurs. (Sinha-OEIS)
W77-10886

SEDIMENT SUSPENSION AND TURBULENCE IN AN OSCILLATING FLUME,
California Univ., Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 2J.
W77-10887

SUSPENDED SEDIMENT IN THE LITTORAL ZONE AT VENTNOR, NEW JERSEY, AND NAGS HEAD, NORTH CAROLINA,
Coastal Engineering Research Center, Fort Belvoir, Va.
J. C. Fairchild.
Coastal Engineering Research Center, Technical Paper No. 77-5, May 1977. 97 p, 26 fig, 1 tab, 2 ref, 4 append.

Descriptors: *Baseline studies, *Coastal engineering, *New Jersey, *North Carolina, Littoral, Sediments, Coasts.
Identifiers: *Outer Continental shelf, Suspended sediments.

Suspended-sediment samples were collected in and near the surf zone from Jennette's Pier, Nags Head, North Carolina, and the City Pier, Ventnor, New Jersey, using a tractor-mounted pump sampler. Maximum suspended-sediment concentrations at Ventnor ranged up to 2.6 parts per thousand by weight, and at Nags Head up to about 4.0 parts per thousand. As in previous studies, the log of concentration decreased linearly with elevation above bottom for samples away from the bottom, but near-bottom concentration was higher than the extrapolated log trend. Concentration increased as local height-to-depth ratio increased, to a maximum near the theoretically predicted maximum height-to-depth ratio. Plunging breakers appear to suspend more sediment than spilling breakers. Median sand size at Ventnor ranged from 0.12 to 0.15 millimeter and at Nags Head averaged about 0.21 millimeter. The median size of suspened-sediment samples was lower than bottom samples. Potential applications, including for example on longshore transport, are discussed. The results of this report are based on a total of 850 samples, each pumped for 2.5 to 3 minutes and more than half collected in the 0.2 to 0.5 foot range above the bottom. (Sinha-OEIS)
W77-10888

INVESTIGATION OF THE BEHAVIOR OF TRACE ELEMENTS IN OCEAN WATER BY THE DESORPTION METHOD,
For primary bibliographic entry see Field 5B.
W77-10889

WATER QUALITY DATA DURING SEPTEMBER 10-13, 1974 AT WARD COVE AND TONGASS NARROWS, ALASKA.
Environmental Protection Agency, Anchorage, Alaska. Alaska Operations Office; Environmental Protection Agency, Seattle, Wash. Region X.; and Environmental Protection Agency, Seattle, Wash. Analysis Div.
For primary bibliographic entry see Field 5C.
W77-10890

ENVIRONMENTAL STUDIES OF AN ARCTIC ESTUARINE SYSTEM - FINAL REPORT.
Alaska Univ., College. Inst. of Marine Science.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-10371, Price codes: A13 in paper copy, A01 in microfiche. U.S. Environmental Protection Agency Office of Research and Development, Ecological Research Series, No. EPA-660/3-75-026, June 1975, 549 p. Grant R801124-03.

Descriptors: *Estuarine environments, *Freshwater, *Baseline studies, *Resource development, Environmental effects, Water pollution, *Alaska, Fisheries.
Identifiers: *Outer Continental Shelf, Beaufort Sea, *Colville River estuary(Alas).

The Colville River estuarine system was studied over a period of four years. Physical, chemical, geomorphological and biological features were included. North slope river deltas differ significantly from those elsewhere, due to climatological extremes and a log, cold, dark winter with continuous ice-cover and continuous daylight during the summer with melting ice or open water. Basic information has been obtained on the winds, waves and currents. Predominant current directions are from the west, with wind drift currents with a periodicity of 4 to 5 days. Beach sediments are characterized as poorly sorted gravelly sandy sediment in a relatively low energy environment. The ice-free biological regime is strongly influenced by the river input of low salinity water containing relatively high concentrations of nitrogen nutrients. An annual primary production in the estuary is estimated at 10-15 g-C sq. m. Crustaceans, molluscs and polychaetes characterize the macrofauna at depths exceeding 2 m, with but few species responsible for most of the biomass. Interesting features of the chemical regime are connected with the isolation of hyperhaline water in the shallow estuarine and river system. Fresh water systems were included in the study. (See W77-10894 thru W77-10903) (Sinha-OEIS)
W77-10893

INTRODUCTION: RATIONALE, OBJECTIVES AND LOGISTICS,
Alaska Univ., College. Inst. of Marine Science.
D. M. Schell.
In: Environmental Studies of an Arctic Estuarine System, Environmental Protection Agency Ecological Research Series No. EPA-660/3-75-026, June 1975. p 5-13, 1 fig, 1 ref. Grant R801124-03.

Descriptors: *Baseline studies, *Resources development, *Ecosystems, *Environmental effects, Alaska, Arctic, Oil pollution.
Identifiers: *Outer Continental Shelf.

In anticipation of the extensive developmental activity associated with the Alaskan north slope oil resources and the reestablishment of native communities consequent to the settlement of the Alaska Native Land Claims Act, this study was designed to provide baseline information on both marsh and estuarine environments along the Alaskan arctic coast. Because of the scarcity of existing knowledge, this effort has included basic descriptive work of the aquatic ecosystems. The remoteness and extreme climatic conditions of the study area rquired that the projects be combined into a single coherent interdisciplinary effort, with no distinction being drawn between freshwater or marine environments as to application of effort. This allowed an integrated program that in several cases aided in understanding the interrelationships that occurred across the marine-freshwater boundary. (See also W77-10813) (Sinha-OEIS)
W77-10894

STUDY OF WIND, WAVES AND CURRENTS IN SIMPSON LAGOON,
Alaska Univ., College. Inst. of Marine Science.
D. C. Dygas.
In: Environmental Studies of an Arctic Estuarine System, Environmental Protection Agency Ecological Research Series No. EPA-660/3-75-026, June 1975. p 15-44, 15 fig, 3 tab, 13 ref. Grant R801124-03.

Descriptors: *Polar regions, *Arctic Ocean, *Estuaries, *Winds, *Waves(Water), *Currents(Water), Cold regions, Environmental effects, Baseline studies, Water pollution.
Identifiers: *Outer Continental Shelf, Beaufort Sea, *Simpson Lagoon(Alas).

Coastal wind, wave and current patterns in a coastal polar environment are described and an interpredictive capacity for some future applied problems is provided, especially the transport of natural and man-made materials. Wave and current patterns in Simpson Lagoon are affected predominantly by prevailing local meteorological conditions. Northeasterly and northwesterly winds are responsible for predominantly northwesterly and northeasterly flowing currents and the meteorological tidal range is generally greater than the astronomical tidal range. Prevailing wind drift currents control the general current pattern in Simpson Lagoon. Although lunar tidal periodicities may be distinguished in current records from Simpson Lagoon, they are considered to be subsidiary to the wind drift currents in controlling overall current patterns in Simpson Lagoon. (See also W77-10893) (Sinha-OEIS)
W77-10895

BEACH MORPHOLOGY AND SEDIMENTOLOGY OF SIMPSON LAGOON,
Alaska Univ., College. Inst. of Marine Science.
D. C. Burrell, J. A. Dygas, and R. W. Tucker.
In: Environmental Studies of an Arctic Estuarine System, Environmental Protection Agency Ecological Research Series No. EPA-660/3-75-026, June 1975. p 45-139, 42 fig, 13 tab, 58 ref. Grant R801124-03.

Descriptors: *Sedimentology, *Barrier islands, *Sediment transport, *Baseline studies, *Resources development, *Environmental effects, Arctic, Polar regions, Beaches, Lagoons.
Identifiers: *Outer Continental Shelf, Beaufort Sea, Beach morphology, *Simpson Lagoon(Alas).

Geological investigations were conducted as part of the overall baseline study program in an effort to determine both the static and dynamic sedimentological regime of the lagoon - barrier island environment immediately east of the Colville River delta. In particular the surficial sedimentary deposits within Simpson Lagoon are characterized and both long and short term sediment movements with particular emphasis upon the beach and barrier island deposits are evaluated. Sediment transport along this particular section of the Alaska arctic coast is from east to west. This transportation appears to be predominantly a function of the prevailing northeasterly wind regime which is the driving force for the generation of both waves and currents. (See also W77-10893) (Sinha-OEIS)
W77-10896

ASPECTS OF SIZE DISTRIBUTIONS, MINERALOGY AND GEOCHEMISTRY OF DELTAIC AND ADJACENT SHALLOW MARINE SEDIMENTS, NORTH ARCTIC ALASKA,
Alaska Univ., College. Inst. of Marine Science.
A. S. Naidu, and T. C. Mowatt.
In: Environmental Studies of an Arctic Estuarine System, Environmental Protection Agency Ecological Research Series No. EPA-660/3-75-026, June 1975. p. 143-223, 15 fig, 6 tab, 60 ref, append. Grant R801124-03.

Descriptors: *Sediments, *Mineralogy, *Geochemistry, *Bottom sediments, Alaska, Arctic, Polar regions.
Identifiers: *Outer Continental Shelf.

In order to detect pollution in an environment it is necessary to have in hand baseline ecological data of that environment in its pristine or unpolluted state. The north slope deltaic and shallow marine environments of north Alaska are now apparently free from any appreciable pollution. This report presents preliminary results of baseline studies on the size distributions, mineralogy and chemistry of bottom sediments of the continental margin and the adjacent shallow marine regime of this region. The results presented in this report are based on analyses of surface sediment samples that were collected either by a van Veen/Shipek grab sampler or a short gravity corer. (See also (W77-10893) (Sinha-OEIS)
W77-10897

FAST ICE ON THE NORTHERN COAST OF ALASKA,
Alaska Univ., Inst. of Marine Science.
For primary bibliographic entry see Field 2C.
W77-10898

SEASONAL VARIATION IN THE NUTRIENT CHEMISTRY AND CONSERVATIVE CONSTITUENTS IN COASTAL ALASKAN BEAUFORT SEA WATERS,
Alaska Univ., College. Inst. of Marine Science.
D. M. Schell.
In: Environmental Studies of an Arctic Estuarine System, Environmental Protection Agency Ecological Research Series No. EPA-660/3-75-026, June 1975. p 233-298, 27 fig, 2 tab, 26 ref. Grant R801124-03.

Descriptors: *Cold regions, *Nutrients, Baseline studies, Resources development, Alaska, Arctic Ocean.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, Wind mixing, Seasonal variations.

The seasonal response of nutrient concentrations and conservative parameters to the extremes of winter and summer along the Alaskan arctic coast are reported. Information was obtained over the period September 1969 to April 1973, although most data collected was during late spring when conditions are good for travelling over the ice and during the short open water period of late July and August. The freeze-induced rise in surface salinity appears to be the principle driving force for turnover in the nearshore water column, contrasting the Beaufort Sea with waters such as in southeastern Alaska where turnover is due primarily to cooling and wind-mixing. However, during autumns marked by strong southwesterly storms with the pack-ice well offshore, the process of wind-mixing may become of primary importance. (See also W77-10893) (Sinha-OEIS)
W77-10899

STUDIES OF PRIMARY PRODUCTIVITY AND PHYTOPLANKTON ORGANISMS IN THE COLVILLE RIVER SYSTEM,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-10900

THE NEARSHORE BENTHOS,
Alaska Univ., College. Inst. of Marine Science.
J. J. Crane, and R. T. Cooney.
In: Environmental Studies of an Arctic Estuarine System, Environmental Protection Agency Ecological Research Series No. EPA-660/3-75-026, June 1975. p 427-482, 17 fig, 10 tab, 38 ref. Grant R801124-03.

Descriptors: *Benthos, *Baseline studies, *Environmental effects, Alaska, Cold regions, Arctic Ocean.
Identifiers: *Outer Continental Shelf, Beaufort Sea, Simpson Lagoon, Harrison Bay, Nearshore.

Forty-seven species were identified from 53 trawl hauls and 33 grab samples taken in three study areas; 15 species were common to all. In the trawl samples, Simpson Lagoon and Harrison Bay had 18 species in common, Simpson Lagoon and the nearshore Beaufort Sea shared 19 species, and Harrison Bay and the nearshore Beaufort Sea were characterized by 18 species in common. In the grab samples, 3 species were common to both Harrison Bay and Simpson Lagoon. The fauna collected by the trawl was dominated numerically by isopods, amphipods, mysids, and sumaceans; crustaceans were of lesser importance in the grab samples. (See also W77-10893) (Sinha-OEIS)
W77-10901

COLVILLE RIVER DELTA FISHERIES RESEARCH,
Alaska Univ., College. Inst. of Marine Science.

D. Kogl, and D. Schell.
In: Environmental Studies of an Arctic Estuarine System, Environmental Protection Agency Ecological Research Series No. EPA-660/3-75-026, June 1975. p 483-504, 3 fig, 4 tab, 9 ref. Grant R801124-03.

Descriptors: *Fisheries, *Cold region, *Alaska, *Baseline studies, *Environmental effects, Resources development, Arctic.
Identifiers: *Outer Continental Shelf, Colville River.

The Colville River, as the largest river on the Alaska north slope, has the most extensive and commercially valuable fishery resources. However its remote location from Barrow, the closest population center, has kept the fishery from being intensively exploited. In recent years the population of Barrow has grown and better modes of transportation have become available making it possible for increased exploitation of Colville River fisheries. The re-establishment of the village of Nuitsaq on the west channel of the Colville delta during spring of 1973, as a result of a village land allotment by the Alaska Native Claims Act, has brought several new families into the delta. The need for information regarding Colville fisheries resources sufficient to allow realistic harvest limits for sustained yield is urgent and beyond the scope of this project. The initial fishing effort involved an underwater television reconnaissance of the Colville delta in spring 1972 and an aerial survey of the headwaters of the Chandler River in spring prior to ice breakup to determine the extent and quality of potential fish overwintering sites. (See also W77-10893) (Sinha-OEIS)
W77-10902

A SUMMARY OF OBSERVATIONS OF BIRDS AT OLIKTOK POINT AND NOTES ON BIRDS OBSERVED ALONG THE COLVILLE RIVER--SUMMER 1971,
Alaska Univ., College. Inst. of Marine Science.
G. E. Hall.
In: Environmental Studies of an Arctic Estuarine System, Environmental Protection Agency Ecological Research Series No. EPA-660/3-75-026, June 1975. p 505-533, 7 ref. Grant R801124-03.

Descriptors: *Baseline studies, *Birds, *Environmental effects, *Resources development, Arctic, Alaska, Water pollution.
Identifiers: *Outer Continental Shelf.

The birds noted at Oliktok Point are typical of the avifauna found on the arctic slope of Alaska, and the abundance of certain species of waterfowl and shorebirds points out the tremendous value of this region as a breeding area. This report cannot serve as a comprehensive survey of the birds of the entire region as the areas covered were too small and observation periods limited to seven weeks out of the whole season. However, methods learned this year will be employed and expanded to include a broader scope of future surveys in the area next year. This data should supplement and corroborate much that is known about the distribution of birds in the region, as well as give clues to species that may require more intensive work. (See also W77-10893) (Sinha-OEIS)
W77-10903

COASTAL ZONE POLLUTION IN INDONESIA WITH EMPHASIS ON OIL. A RECONNAISSANCE SURVEY.
Lembaga Minyak Dan Gas Bumi, Djakarta (Indonesia).
For primary bibliographic entry see Field 5B.
W77-10907

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE. SPEC. REPT. III: A METHODOLOGY FOR INVESTIGATING FRESH WATER INFLOW REQUIREMENTS OF A TEXAS ESTUARY, VOLUME II--APPENDICES,
Texas Univ. at Austin. Center for Research in Water Resources.
W. P. Lambert, and E. G. Fruh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 183, Price codes: A24 in paper copy, A01 in microfiche. Texas Univ. at Austin Center for Research in Water Resources Special Report III: Volume II-Appendices, to Research Applied to National Needs Program (RANN). (1976). p 438-999, Report No. NSF/RA-760259. Grant No. AEN74-13590-A01.

Descriptors: *Water resources, *Estuaries, *Resources development, *Management, *Texas, Freshwater, Computer programs, Coasts, Methodology.

This volume consists of five appendices to the Special Report III: A Methodology for Investigating Fresh Water Inflow Requirements of a Texas Estuary. The appendices are: Appendix A, Area Study; Appendix B, Calibration, Verification, and Sensitivity Analysis of HYDTID and LOTRAN; Appendix C, Computer programs, Appendix D, Selected Computational Procedures; and Appendix E, Compendium of Experimental Results Generated During Execution of the Illustrative Application of the Investigative Fresh Water Methodology. A comprehensive bibliography is included. (Sinha-OEIS)
W77-10908

CITIZEN PERCEPTION OF COASTAL AREA PLANNING AND DEVELOPMENT: A STUDY OF THE ATTITUDES AND KNOWLEDGE OF LOUISIANAS,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 6B.
W77-10932

EFFECT OF SEDIMENT ORGANIC MATTER ON MIGRATION OF VARIOUS CHEMICAL CONSTITUENTS DURING DISPOSAL OF DREDGED MATERIAL,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 5B.
W77-10937

THE SEDIMENT ENVIRONMENT OF PORT VALDEZ, ALASKA: THE EFFECT OF OIL ON THIS ECOSYSTEM,
Alaska Univ., College.
For primary bibliographic entry see Field 5C.
W77-10944

STUDIES OF PRESSURE AND ENERGY OF STANDING WAVES,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR).
For primary bibliographic entry see Field 8B.
W77-10964

TRANSVERSE MIXING IN PARTIALLY STRATIFIED FLOW,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-10965

A UNIVERSAL FORM FOR SHORELINE RUN-UP SPECTRA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
D. A. Huntley, R. T. Guza, and A. J. Bowen.
Journal of Geophysical Research, Vol. 82, No. 18, p 2577-2581, June 20, 1977. 4 fig, 1 tab, 20 ref. ONR N00014-75-C-0300.

Descriptors: *Beaches, *Shores, *Shoreline cover, Hydraulics, Oceanography, Oceans, Slopes, Frequency curves, Mathematical studies, Photography, Equations.
Identifiers: *Beach run-up, Spectra, Shoreline run-up spectra, Energy density, Beach slope, Run-up acceleration.

Time series of shoreline run-up on two natural beaches were measured by using a time-lapse camera. Spectra of the time series and two other run-up spectra measured by Suhayda suggest that for the frequency band over which incident waves are large enough to break a universal 'saturation' form for the vertical run-up spectrum occurs, with energy density which is in terms of gravitational acceleration, beach slope, frequency (in hertz), and a universal dimensionless constant. The universal nondimensional constant was found to have a value of about 1. The result was discussed in relation to previous laboratory experiments and theories based on monochromatic waves which suggest the existence of a limiting amplitude for standing waves formed by reflection at the shoreline. The limiting amplitude is related to a critical parameter. A possible interpretation of this critical parameter was given, based on percentage exceedances of the critical downslope acceleration. In this interpretation, a Gaussian distribution for run-up acceleration was assumed. The assumption cannot be tested directly, but the observed distribution functions for run-up elevation suggest that it may need to be modified. Departures from the universal spectrum at higher and lower frequencies were discussed briefly. (Lee-ISWS)
W77-10973

INITIAL DILUTION WITH DEEPWATER DIFFUSERS,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5B.
W77-10974

DREDGED MATERIAL AS A NATURAL RESOURCE--CONCEPTS FOR LAND IMPROVEMENT AND RECLAMATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 4A.
W77-10983

SUCCESSION OF RED TIDE ORGANISMS IN OMURA BAY, WITH RELATION TO WATER POLLUTION, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10997

BREAKWATER SYSTEM,
For primary bibliographic entry see Field 8B.
W77-11009

TIME-STRESSED COASTAL ENVIRONMENT ASSESSMENT AND FUTURE ACTION.
Coastal Society, Arlington, Va.
For primary bibliographic entry see Field 5G.
W77-11022

RELATIVE SIGNIFICANCE OF CONTEMPORARY DREDGING IMPACTS IN SAN DIEGO BAY, AN HISTORICALLY STRESSED ENVIRONMENT,
Smith (David D.) and Associates, San Diego, Calif.
For primary bibliographic entry see Field 5G.
W77-11023

MPACT OF DREDGING IN THE TAMPA BAY STUARY, 1976-1976,
illsborough Community Coll., Tampa, Fla.
or primary bibliographic entry see Field 5C.
77-11024

REDGING AND ITS IMPACTS ON UPPER HESAPEAKE BAY: SOME OBSERVATIONS,
tate Univ. of New York, Stony Brook. Marine iences Research Center.
or primary bibliographic entry see Field 5G.
77-11026

MPACTS OF COASTAL DREDGING IN SAN EDRO BAY, CALIFORNIA,
or primary bibliographic entry see Field 5G.
77-11027

OASTAL ZONE MANAGEMENT: A AWYER'S PERSPECTIVE,
nvironmental Defense Fund, East Setauket, Y.
or primary bibliographic entry see Field 6E.
77-11028

ECREATIONAL DEVELOPMENT AND OASTAL ECOLOGY - SEEKING THE RIGHT ALANCE,
allace, McHarg, Roberts and Todd, Philadel-ia, Pa.
r primary bibliographic entry see Field 6G.
77-11030

YDROCARBON STRESS IN COASTAL WET-NDS,
evron Oil Co., New Orleans, La.
r primary bibliographic entry see Field 5G.
7-11031

OSION DEFENSE STRUCTURES ON THE GET SOUND SHORELINE,
stern Washington State Coll., Bellingham. pt. of Geography and Regional Planning.
primary bibliographic entry see Field 4D.
7-11038

IZ HOOK: PAST, PRESENT, AND FUTURE,
stern Washington State Coll., Bellingham. pt. of Geology.
L. Schwartz.
Time-Stressed Coastal Environments: Assess-nt and Future Action, Proceedings of 2nd An-l Conference of The Coastal Society, held New eans, LA, November 17-20, 1976. p 255-259, 1 5 ref.

criptors: *Spits, *Erosion, *Resources elopment, *Baseline studies, Environmental cts, *Washington, Coasts.
ntifiers: *Outer Continental Shelf, *Coastal e, Olympic Peninsula, *Ediz Hook(Wash), pwater.

: Hook is a three-and-a-half mile long spit ted near the city of Port Angeles, on the north t of Washington's Olympic Peninsula. The r harbor, provided protection by the spit, is nly deepwater port on the U.S. side of the t of Juan de Fuca. The port has been men-ed frequently as a possible monobuoy ter-s for petroleum shipments from the North e oil fields. However, the spit is in danger of truncated near its base in the near future, roded away completely in the future. Though sediment still comes to the spit from el-ere along the coast, the supply has effectively reduced from an estimated 350,000 cu. ear, prior to any form of man-made inter-ce, to a present load of 90,000 cu. yds/year. building and then near-destruction of Ediz has been a lengthy and complicated process.

A final solution to the problems brought on by man's interference with natural conditions has been a long time in coming. Hopefully, the approach now being undertaken will stabilize the spit and satisfy the needs of all concerned. (See also W77-11022) (Sinha-OEIS)
W77-11039

HUMAN INDUCED STRESS ON THE CAUCASIAN COAST OF THE BLACK SEA,
Illinois Univ. at Urbana-Champaign. Dept. of Geography; and Akademiya Nauk Gruzinskoi SSR, Tiflis.
For primary bibliographic entry see Field 4D.
W77-11040

INFORMATION, CRITERIA, AND GUIDELINES TO IMPROVE COASTAL WETLAND MANAGEMENT,
Chesapeake Research Consortium, Inc., Baltimore, Md.
For primary bibliographic entry see Field 6G.
W77-11043

PHYTOPLANKTON OF THE UPWELLING AREA OF NORTHWEST AFRICA: I. PIGMENTS AND PRODUCTION (CRUISE 'SAHARA II' OF THE RESEARCH VESSEL 'CORNIDE DE SAAVEDRA'), (IN SPANISH),
Instituto de Investigaciones Pesqueras, Barcelona (Spain).
For primary bibliographic entry see Field 5C.
W77-11045

OSCILLATIONS IN HARBORS CONTAINING ISLANDS,
University of Southern California, Los Angeles. Dept. of Civil Engineering.
J. J. Lee.
Sea Grant Reprint No. USCSG-R-02-75, 15 p. Reprinted from: Proceedings of the Specialty Conf. on 'Civil Engineering in the Oceans/III,' p 632-645, 1975. 7 fig, 10 ref. SG-04-3-158-45, NSF-GK-27774.

Descriptors: *California, *Harbors, *Waves(Water), Coasts.
Identifiers: *Oscillations(Harbors).

A method is presented for analyzing the wave induced oscillations in an arbitrary shape harbor (with constant depth) containing irregular shape islands. The solution is formulated as an integral equation which is then approximated by a matrix equation. The final solution is obtained by matching the solutions at various imaginary boundaries. Circular harbors containing circular islands of different sizes are studied. Application of the method to a simplified model of Newport Beach Harbor (Newport Beach, California) is demonstrated. Results of a limited field measurement are also noted. The existence of islands modified the response of harbors quite noticeably in certain cases. (NOAA)
W77-11046

ANALYSIS OF BRINE DISPOSAL IN THE GULF OF MEXICO. (3) CAPLINE SECTOR,
National Oceanic and Atmospheric Administration, Washington, D.C. Center for Experiment Design and Data Analysis.
For primary bibliographic entry see Field 5E.
W77-11049

MATANZAS INLET GLOSSARY OF INLETS REPORT NO. 5,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
A. J. Mahta, and C. P. Jones.
Sea Grant Program Report No. 21, May 1977. 34 fig, 15 tab, 51 ref.

Descriptors: *Florida, *Inlets(Waterways), *Sediments, Coasts, Morphology, Hydraulics, Climates.
Identifiers: Coastal Zone management, *Matanzas Inlet(FL).

The numerous inlets connecting Florida's inner waters to the Atlantic Ocean and the Gulf of Mexico are important from consideration of recreational and commercial vessel traffic. In addition, inlets act was flushing agents, providing renewal of bay waters by exchange with outer continental shelf waters. The inlets also contribute significantly to the serious beach erosion problem. This report is one in a series. The purpose of this series is to provide a summary for each inlet of the more significant available information and to list known documentation. This report compiles historical, geological, climatological, morphological, hydraulic and sedimentary information about Matanzas Inlet. The information contained is intended to summarize past conditions, not to predict those that might occur in the future. (See also W77-04841 and W77-02673) (NOAA)
W77-11051

INDUSTRIAL USE OF BRACKISH AND SALINE WATER IN THE HAIFA BAY AREA,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Dept. of Coastal Plain.
For primary bibliographic entry see Field 3C.
W77-11077

INTERRELATIONSHIPS OF SEEDLING VIGOR CRITERIA OF WHEAT UNDER DIFFERENT FIELD SITUATIONS AND SOIL WATER POTENTIALS,
Kabul Univ. (Afghanistan). Faculty of Agriculture.
For primary bibliographic entry see Field 3F.
W77-11088

DEVELOPMENT OF AN AREAL MANAGEMENT CONCEPT FOR GULF PENAEID SHRIMP,
Louisiana Wildlife and Fisheries Commission, New Orleans, La.
C. J. White, and C. J. Boudreaux.
Technical Bulletin No. 22, February, 1977. 77 p, 57 fig, 5 tab, 61 ref.

Descriptors: *Management, *Wildlife management, Commercial shellfish, *Shrimp, Estuaries, Coasts, *Louisiana, Seasonal.

Information is presented on the occurrence, growth, and movements of penaeid shrimp in Louisiana estuarine waters from July 1972 through June 1975. Correlation of this information with data gathered from monitoring of estuarine hydrological conditions provided a basis for the development of new management techniques for the exiting shrimp industry. Abnormal hydrological conditions during the study period resulted in reduced population densities and premature movements of penaeid shrimp. Management options which were offered to Louisiana's shrimp managers included a zone system of opening the brown shrimp season, special seasons to harvest overwintering shrimp, extended seasons, and a shrimp nursery sanctuary concept. From these options, the zone system and extended seasons were accepted by the industry. It is hoped that the industry will accept the option which provides for the delineation of primary nursery grounds for juvenile penaeid shrimp. (Chilton-ORNL)
W77-11124

MIXED FUNCTION OXIDASES IN MARINE ORGANISMS IN RELATION TO PETROLEUM HYDROCARBON METABOLISM AND DETECTION,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
For primary bibliographic entry see Field 5C.

W77-11241

EFFECTS OF DREDGING OPERATIONS ON ESTUARINE BENTHIC MACROFAUNA,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5C.
W77-11242

GENERAL TEST CONDITIONS AND PROCEDURES FOR CHLORINE TOXICITY TESTS WITH ESTUARINE AND MARINE MACROINVERTEBRATES AND FISH,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
For primary bibliographic entry see Field 5A.
W77-11243

BEHAVIORAL AVOIDANCE RESPONSES OF ESTUARINE FISHES TO CHLORINE,
Ichthyological Associates, Inc., Middletown, Del.
For primary bibliographic entry see Field 5C.
W77-11244

BIOASSAY PROCEDURES FOR MARINE PHYTOPLANKTON WITH SPECIAL REFERENCE TO CHLORINE,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5A.
W77-11245

THE EFFECT OF PETROLEUM HYDROCARBONS ON REPRODUCTION OF AN ESTUARINE PLANKTONIC COPEPOD IN LABORATORY CULTURES,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W77-11247

THE ECOLOGICAL EFFECTS OF PHYSICAL DAMAGE FROM MOTOR BOATS ON TURTLE GRASS BEDS IN SOUTHERN FLORIDA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W77-11248

HEPATOMAS IN MARINE FISH FROM AN URBAN ESTUARY,
California Univ., Davis. Dept. of Pathology.
For primary bibliographic entry see Field 5C.
W77-11253

TRACE METAL CONTENT OF PLANKTON AND ZOOPLANKTON COLLECTED FROM THE NEW YORK BIGHT AND LONG ISLAND SOUND,
National Marine Fisheries Service, Milford, Conn. Experimental Biological Investigations.
For primary bibliographic entry see Field 5A.
W77-11254

MICROBIOLOGICAL EFFECTS OF METAL IONS IN CHESAPEAKE BAY WATER AND SEDIMENT,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-11255

CADMIUM AND OTHER HEAVY METALS IN SEA-SKATERS (GERRIDAE: HALOBATES, RHEUMATOBATES),
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W77-11256

THE ASSOCIATION OF PHYTOFLAGELLATE BLOOMS IN LOWER NEW YORK BAY WITH HYPERTROPHICATION,
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Lab.
For primary bibliographic entry see Field 5C.
W77-11261

THE OCCURRENCE OF FIN ROT IN MULLET (MUGIL CEPHALUS) ASSOCIATED WITH CRUDE OIL CONTAMINATION OF AN ESTUARINE POND-ECOSYSTEM,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-11264

STUDIES OF THE EFFECT OF THE ENVIRONMENT ON THE HEART RATE OF SHELLFISHES.--1. EFFECT OF TEMPERATURE, SALINITY AND HYPOXIA ON THE HEART RATE OF SCALLOPS, (IN JAPANESE),
Hokkaido Regional Fisheries Research Lab. (Japan).
For primary bibliographic entry see Field 5C.
W77-11265

THE EFFECTS OF VARIOUS COMPONENTS OF WATER POLLUTION ON THE BEHAVIOR OF SOME AQUATIC MACROPHYTES OF THE COASTAL RIVERS OF ISRAEL,
Tel-Aviv (Israel). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-11266

RELATIONSHIP BETWEEN WATER POLLUTION AND THE FLORA OF TWO COASTAL RIVERS OF ISRAEL,
Tel-Aviv Univ. (Israel). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-11267

BENTHIC COMMUNITY STRUCTURE NEAR THE WOODS HOLE SEWAGE OUTFALL,
Southeastern Massachusetts Univ., North Dartmouth. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-11280

BENTHIC INVERTEBRATES AS INDICATORS OF ORGANIC POLLUTION IN THE WESTERN BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5A.
W77-11281

SOME EFFECTS ON THE ECOLOGY OF A LITTORAL ZONE RECEIVING THE WASTES ON AN OIL REFINERY (QUELQUES DONNEES SUR L'ECOLOGIE D'UNE ZONE MARINE LITTORALE RECEVANT LES REJETS D'UNE RAFFINERIE DE PETROLE),
Aix-Marseille-3 Univ. (France). Laboratoire de Microbiologie.
For primary bibliographic entr , see Field 5C.
W77-11282

PHYSIOLOGICAL RESPONSES OF ESTUARINE ORGANISMS TO CHLORINE,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W77-11283

CONTAMINATION OF BIOLOGICAL SAMPLES BY INGESTED SEDIMENT,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5A.
W77-11298

CHLORINE TOXICITY TO EGGS AND LARVAE OF FIVE CHESAPEAKE BAY FISHES,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W77-11299

NATURAL VARIABILITY IN DISTRIBUTION OF AN INTERTIDAL POPULATION OF MACOMA BALTHICA SUBJECT TO POTENTIAL OIL POLLUTION AT PORT VALDEZ, ALASKA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.
For primary bibliographic entry see Field 5B.
W77-11301

ACUTE TOXICITY OF KEPONE TO FOUR ESTUARINE ANIMALS,
Environmental Research Lab., Gulf Breeze, Fla.
For primary bibliographic entry see Field 5C.
W77-11320

THE PAPILLOMATOSIS OF THE EUROPEAN EEL (ANGUILLA ANGUILLA L.): ANALYSIS OF SEASONAL FLUCTUATIONS IN THE TUMOR INCIDENCE,
Hamburg Univ. (West Germany). Institut fur Hydrobiologie und Fischereiwissenschaft.
For primary bibliographic entry see Field 5C.
W77-11324

STATEMENT ON APPROACHES TO THE STUDY OF POLLUTION IN BENTHIC MARINE ENVIRONMENT, (IN ITALIAN),
Naples Zoological Station (Italy).
For primary bibliographic entry see Field 5C.
W77-11325

ACUTE TOXICITY OF OIL DISPERSANTS TO MARINE FISH LARVAE,
Aberdeen Univ. (Scotland). Dept. of Natural History.
For primary bibliographic entry see Field 5C.
W77-11333

THE RED TIDES OF MALTA,
Harriet Costello School, Basingstoke (England).
For primary bibliographic entry see Field 5C.
W77-11334

ZINC-65 SPECIFIC ACTIVITIES IN THE MIGRATORY PACIFIC HAKE MERLUCCIUS PRODUCTS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W77-11336

A VISCOUS ANTITUMOR SUBSTANCE OBTAINED FROM A MARINE BACTERIUM NO. 9-12,
Kagawa Univ., Takamatsu (Japan). Aji Marine Biological Station.
For primary bibliographic entry see Field 5A.
W77-11344

RESPONSES OF ARCTIC MARINE BENTHIC CRUSTACEANS TO SEDIMENTS CONTAMINATED WITH CRUDE OIL,
Fisheries and Marine Service, Ste Anne de Bellevue (Quebec). Arctic Biological Station.
For primary bibliographic entry see Field 5C.
W77-11346

MORPHOLOGICAL ADAPTATIONS TO THERMAL STRESS IN A MARINE FISH, FUNDULUS HETEROCLITUS,
State Univ. of New York at Stony Brook. Dept. of Ecology and Evolution.
For primary bibliographic entry see Field 5C.
W77-11351

EFFECTS OF ENVIRONMENTAL FACTORS ON RADIOCADMIUM UPTAKE BY FOUR SPECIES OF MARINE BIVALVES,
Environmental Research Lab., Narragansett, R.I.
For primary bibliographic entry see Field 5C.
W77-11352

ON THE INFLUENCE OF SEWAGE POLLUTION ON INSHORE BENTHIC COMMUNITIES IN THE SOUTH OF KIEL BAY. PART 2. QUANTITATIVE STUDIES ON COMMUNITY STRUCTURE,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5C.
W77-11362

FRESH GROUND WATER STORED IN AQUIFERS UNDER THE CONTINENTAL SHELF: IMPLICATIONS FROM A DEEP TEST, NANTUCKET ISLAND, MASSACHUSETTS,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, Reston, Va. Geologic Div.
For primary bibliographic entry see Field 2F.
W77-11378

ARCTIC CONTINENTAL SHELF PROCESSES AND MORPHOLOGY RELATED TO SEA ICE DEFORMATION, BEAUFORT SEA, ALASKA,
Geological Survey, Menlo Park, Calif. Geologic Div.
For primary bibliographic entry see Field 2C.
W77-11383

GROWTH INHIBITION CAUSED BY TURBULENCE IN THE TOXIC MARINE DINOFLAGELLATE GONYAULAX EXCAVATA,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5C.
W77-11418

MARINE CLADOCERA (CRUSTACEA) IN THE EUTROPHICATED AND POLLUTED SARONIC GULF (GREECE),
Athens Univ. (Greece). Zoological Lab. and Museum.
For primary bibliographic entry see Field 5C.
W77-11420

EFFECTS OF IRRIGATION HISTORY ON RESPONSES OF COTTON TO SUBSEQUENT WATER STRESS,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 3F.
W77-11430

LEAF TEMPERATURE REVEALS STRESS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Jackson, S. B. Idso, R. J. Reginato, and W. Kimball.
Agronomy and Soils, Vol 29, No 8, p 10-13, June-July 1976. 5 fig.

Descriptors: *Crop response, *Temperature, *Water stress, *Instrumentation, Crop production, Air temperature, Irrigation practices, Transpiration, Evaporation, Canopy, Satellites (Artificial), Data collections, Farm management, Soil-water-plant relationships.
Identifiers: Infrared thermometers.

A plant with adequate soil moisture is able to transpire water and keep its leaves cooler than the surrounding air temperature; leaves transpire less and grow warmer as moisture becomes scarce. A thermal scanning device to measure crop stress has been developed; present and future technology of this type is described. Infrared thermometers can indirectly measure surface temperatures by measuring the radiant thermal energy emitted from a leaf surface. To calculate the stress degree day figure, a farmer measures the temperature of the crop canopy and the air just above the crop an hour or so after solar noon. Readings from aircraft or satellites require two measuring times, one just before dawn for the minimum air temperature and one after noon for the maximum. Results of measurements from several crops indicate that as the midday canopy temperature increases in comparison to the midday air temperature above the canopy, moisture stress increases and crop yield declines. Application of the results is outlined. (Jahns-Arizona)
W77-11434

DEVELOPMENT OF COUNTY AND LOCAL ORDINANCES DESIGNED TO PROTECT THE PUBLIC INTEREST IN FLORIDA'S COASTAL BEACHES,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W77-11455

TITLE TO FORESHORE--GEORGIA TIDELANDS ACT OF 1902 GRANTS RIGHT TO CULTIVATE AND HARVEST SHELLFISH IN FORESHORE AREA, FEE SIMPLE RESERVED IN THE STATE (COMMENT ON STATE V ASHMORE).
For primary bibliographic entry see Field 6E.
W77-11463

WHO OWNS THE BEACH. MASSACHUSETTS REFUSES TO JOIN THE TREND OF INCREASING PUBLIC ACCESS,
For primary bibliographic entry see Field 6E.
W77-11464

SOME ASPECTS OF THE DAILY DEVELOPMENT OF THE PLANKTON IN THE ENVIRONMENT OF THE PORT OF MARSEILLE, (IN FRENCH),
Aix-Marseille-2 Univ. (France). Laboratoire d'Hydrobiologie.
G. Patriti.
Cah Biol Mar 17, p 139-155, 1976.

Descriptors: *Plankton, Phytoplankton, Harbors, Environment, *Variations, Zooplankton, Temperature.
Identifiers: *Marseille harbor(France).

A study of plankton populations in Marseille's harbor (France) for a 5 day period showed daily variations of different biological and hydrobiological factors. High variations may appear day after day, particularly when biological parameters (zooplankton and phytoplankton) are concerned; a variation coefficient (Cv) of about 200 is not rare. Among hydrological parameters, seston weight shows the highest relative variation (Cv = 87). To some extent the variation coefficient suggests a differentation between the harbor environment and the reference area. In this way the harbor area looks more stable than Gulf of Marseille waters where temperature and extinction coefficients are concerned. Variations in salinity and seston weight are higher in the harbor area.--Copyright 1977, Biological Abstracts, Inc.
W77-11486

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

HYDROGEN ION EXCHANGE ON AMORPHOUS SILICA IN SEAWATER,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2K.
W77-10979

PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER FROM AQUEOUS WASTES,
Hanover Research Corp., East Hanover, N.J. (Assignee).
For primary bibliographic entry see Field 5D.
W77-11011

INTERNATIONAL SYMPOSIUM ON BRACKISH WATER AS A FACTOR IN DEVELOPMENT.
Ben Gurion Univ. of the Negev (Israel). Inst. of Desert Research.
For primary bibliographic entry see Field 3C.
W77-11055

SENSITIVITY OF DESALTED WATER COSTS FROM VARIOUS PROCESSES TO CHANGING ENERGY PRICES,
Mekorot Water Co., Tel-Aviv (Israel). Engineering Div.
N. Arad, and P. Glueckstern.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 185-192. 2 fig, 5 tab.

Descriptors: *Desalination, *Desalination processes, *Energy, *Cost analysis, *Cost comparisons, Reverse osmosis, Membrane processes, Vapor compression distillation, Flash distillation, Investment, Economic efficiency, Technology.
Identifiers: Multieffect distillation.

This paper analyzes the sensitivity of desalted water costs to changing energy prices and investment costs for desalting plants, using both known and projected ranges. Analysis is made for evaporative and membrane processes in the 1 million gallons per day (MGD) range, and expected product water costs from multistage flash and multieffect distillation plants in the same range. A wide range of values was employed for both energy and investment costs, with product water costs computed as a function of those other costs. Regardless of the process used, sea water can be desalted for $1.0-1.5 per cubic meter in the 1 MGD plant size range with 10 percent interest rate on capital investment, 30-year plant life and 80 percent load factor. Projected reverse osmosis technology for desalting sea water may save 13-30 percent. With an additional 5-7 percent saving if pumping energy could be recovered. The same process used under identical economic and operating conditions could desalt brackish water for $.38-.43 per cubic meter. In the 100 MGD plant size range, a power producing and water desalting operation could desalt water for $.31-.45 per cubic meter if the multistage flash process is used; 16-20 percent savings could be realized if the multieffect distillation process is used. (See also W77-11055) (Jahns-Arizona)
W77-11072

APPLICABILITY OF COMMERCIAL REVERSE OSMOSIS UNITS FOR THE QUALITY IM-

PROVEMENT OF BRACKISH WATER SOURCES IN THE SOUTHERN ARAVA,
Mekorot Water Co., Tel-Aviv (Israel). Desalting Dept.
P. Glueckstern, and M. Greenberger.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 193-208. 5 fig, 1 tab, 4 ref, 2 append.

Descriptors: *Reverse osmosis, *Membranes, *Desalination, *Brackish water, Water quality, Technology, Maintenance, On-site tests, Performance, Data collections, Turbidity, Water supply development, Municipal water.
Identifiers: *Israel(Arava).

Several reverse osmosis (RO) units were tested for periods of up to 18 months at Eilat in the southern Arava region of Israel, to determine the feasibility of desalination of available brackish water supplies. Membrane modules were evaluated, along with the effect of field variables such as temperature and turbidity on the performance and life of different membranes. Chemical cleaning procedures for module performance restoration are presented. The general reliability of the RO units tested was demonstrated; it was recommended that the process be considered for municipal water supply uses. All units operated about 80 percent of the time, with unavailable time due to lack of power, acid or control air supply, or to manpower problems. Maintenance and equipment performance of the specific units is described. (See also W77-11055) (Jahns-Arizona)
W77-11073

ELECTRODIALYSIS IN WATER DESALINATION AND THE INFLUENCE OF ION EXCHANGE RESIN INTRODUCTION INTO THE APPARATUS,
Ben Gurion Univ. of the Negev, Beersheva (Israel). Div. of Membranes and Ion Exchangers.
E. Korngold.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 209-216. 3 fig, 3 tab, 9 ref.

Descriptors: *Electrodialysis, *Desalination, *Ion exchange, *Resins, Permselective membranes, Hydrodynamics, Hydraulic conductivity, Electrical resistance, Energy, Mass transfer.
Identifiers: Brine cell, Diluate cell, Polarization.

A new electrodialysis system was developed which contains ion exchange resins between permselective membranes to minimize the energy consumption usually associated with thicker cells. Greater electrodialysis cell thickness eliminates hydrodynamic problems. Ion exchange resins of high conductivity allow for use of cells approximately 10 mm thick; operation is simple, and leakage between diluate and brine cells can be eliminated in this system. An even flow distribution between the cells is maintained so that the danger of salt precipitation is reduced. The electrical resistance of the stack is decreased by ion exchange resins placed between the membranes, with the energy requirement being about twice that of an unfilled 1.3 mm cell. Desalination of low T.D.S. water requires no increase in energy consumption. Another advantage is that the limiting current density can be increased 3 to 4 times. The pH variation of brine and diluate in polarization conditions with this system is also discussed. (See also W77-11055) (Jahns-Arizona)
W77-11074

ION-PERMSELECTIVE MEMBRANES,
Ben Gurion Univ. of the Negev, Beersheva (Israel). Div. of Membranes and Ion Exchangers.
F. D. de Korosy.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 217-220.

Descriptors: *Permselective membranes, *Membrane processes, *Desalination, *Electrodialysis, Ion exchange, Hydraulic conductivity, Mechanical properties, Scaling, Fouling.
Identifiers: Cellulosic membranes, Polyethylene membranes, Ionics membranes, Polarization, Monomers.

The range and quality of ion-permselective membranes used for electrodialytic desalination are discussed, along with the process by which these membranes are effective. The membranes contain charged groups that are covalently bound to the matrix; attracted counter-ions which increase in concentration in the membrane far exceed the co-ions, so that most current is conducted by counter-ions. These membranes may be organic or inorganic; their active groups can be introduced into the pre-existing matrix, or the matrix can be polymerized from monomers that contain those groups. The important membrane properties discussed include conductivity, permselectivity, swelling and mechanical stability; the manufacture of membranes is also outlined. Cellulosic and polyethylene membranes were developed, the latter proving best against fouling. Ionics membranes are strong, hard and brittle; cellulosic ones are strong but not very brittle, and are cheap to produce. Various kinds of membrane can be tailored for specific resistance values; chemical resistance is best in fluoroalkane membranes. Disturbances due to impurities in the feed water are described. (See also W77-11055) (Jahns-Arizona)
W77-11075

THE ROLE OF MEMBRANE METHODS IN THE DESALINATION OF BRACKISH WATER,
California Univ., Berkeley. Sea Water Conversion Lab.
K. S. Spiegler.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 221-230. 7 fig, 8 ref.

Descriptors: *Membrane processes, *Desalination, *Brackish water, *Reverse osmosis, *Electrodialysis, Mass transfer, Ion exchange, Economic efficiency, Electrochemistry.
Identifiers: Polarization.

An optimal production rate of desalination membrane units requires minizing the mass transfer bottlenecks (polarization) at membrane-solution interfaces. Reverse osmosis and electrodialysis are discussed in terms of such polarization, and some economic calculations are presented for the two methods. In studies on reverse osmosis, systematic analysis of the variation of the electrical potential difference across a tubular Loeb-Sourirajan type membrane (cured at 94 degrees C) indicated that salt concentration at the membrane-solution interface follows the pattern predicted from mass-transfer theory. However, salt concentrations near the wall are greater than predicted. Streaming potentials across the membrane suggest it carries a negative fixed charge. Other reverse osmosis units and their effects are discussed. Studies on electrodialysis revealed that at relatively low voltages and current densities the desalting of a solution flowing on a labyrinthian course past 50 x 45 cm ion-exchange membranes covered with mesh-step spaces could be quantitatively predicted by classical electrochemical transport theory. At higher voltages, when the theory predicts limiting electric current plateaus, acid-base generation sets in. These and other technical problems which develop with the two methods are discussed. (See also W77-11055) (Jahns-Arizona)
W77-11076

DESALTING'S ROLE IN FUTURE WATER RESOURCE MANAGEMENT,
Orange County Water District, Fountain Valley, Calif.
P. K. Allen.
Desalination, Vol. 19, p 483-490, December 1976. 3 fig.

Descriptors: *Desalination, *Water supply development, *Water demand, *Water management(Applied), *California, Colorado River Aqueduct, Groundwater recharge, Saline water intrusion, Water reuse, Distillation.
Identifiers: *Orange County(Calif).

Water demand problems in Orange County, California, are presented, as well as possible benefits from increased desalination practices and applicability of this area's situation to the global water picture. Orange County's growth rate has closely paralleled the world population increase with consequent impacts on county resources as land use has shifted from predominately agricultural to urban. The history of increased water demand and use is presented, including details on the Colorado River Aqueduct, State Water Project and groundwater recharge programs. A tertiary wastewater treatment plant and seawater desalter were constructed in Fountain Valley in 1975 to supply water to seawater barrier injection wells. The county's long-range goal is to reclaim and utilize secondary treated waste water now being discharged into the Pacific Ocean. Since available fresh water represents such a small percentage of the world's total water supply, distillation technologies must be used to meet the growing water demand. (Jahns-Arizona)
W77-11078

DESALTING SALINE GROUND WATER FO AGRICULTURE,
Alfateh Univ., Tripoli.
Y. M. El-Sayed, S. K. Shakshooki, J. A. Jawad, and Y. Matar.
Desalination, Vol 19, p 175-188, December 1976. fig, 1 tab, 11 ref.

Descriptors: *Desalination processes, *Wat utilization, *Irrigation engineering, *Irrigation e ficiency, *Solar stills, Electrodialysis, Tomatoe Beans, On-site tests, Arid lands, Irrigati processes, Cost-benefit analysis.
Identifiers: *Libya, *Drip irrigation.

Results presented of a study conducted in t Wadi El-Hai area of Libya to evaluate certa desalination methods and the effects of desalt water on tomatoes and beans grown in the ar The response of tomatoes and beans to drip irri tion with and without water retention agents in soil was tested. A solar still was constructed drip irrigation; evaluation of its cost and p formance is presented, as compared with an el trodialysis process. Given locally prevailing dices for prices and land productions, benefits likely to exceed costs for an average produ value of $0.47/Kg with the electrodialysis meth and $1.15/Kg with the solar method. The so technique is competitive if stills can be c structed at $10/m2 pool area with a yearly aver performance of 3.5 L/m2d. Results indicated significant difference between conventional drip irrigation unless a water retention agent is volved, in which case the growth rate increa (Jahns-Arizona)
W77-11085

SOLAR DISTILLATION IN INDIA,
Central Salt and Marine Chemicals Research In Bhavnagar (India).
S. D. Gomkale, and R. L. Datta.
Annals of Arid Zone, Vol 15, No 3, p 206-218, S tember, 1976. 8 fig, 2 tab, 4 ref.

Descriptors: *Solar distillation, *Potable wa *Water supply, *Desalination, Distillation, Sa water, Water resources development, Water t ment, Arid lands, Semiarid climates, Groundw resources, Salinity.
Identifiers: *Solar radiation, *India.

Research and experiments on solar distillation in ndia are discussed. Available underground water n the desert regions of India is unfit for drinking lue to high salt content. It is hoped that the pota- le water supply can be increased through solar istillation. Several research institutes in India ave conducted research on solar distillation, and he findings are presented here. Locations of solar adiation stations in India are given. The conomics of constructing solar distillation facili- es are discussed. It is concluded that solar distil- ation is a suitable solution to drinking water roblems faced by isolated communities having aline water sources and abundant solar energy. esalted water obtained by solar distillation is ostly when compared to urban water supply osts, but in the worst hit areas need for a supply f drinking water should be considered first and ost of desalted water should be compared with e cost of water as delivered at site by alternative ources. (Jamail-Arizona)
77-11087

OLAR ENERGY UTILIZATION FOR ARID ONE DEVELOPMENT,
entral Arid Zone Research Inst., Jodhpur (India).
. S. Mann.
nnals of Arid Zone, Vol 15, No 3, p 129-136, Sep- mber, 1976. 3 tab, 3 ref.

escriptors: *Solar distillation, *Solar radiation, Water resources development, *Water supply, rid lands, Semiarid climates, Desalination, mps, Potable water, Water resources develop- ent, Irrigation, Energy, Energy conversion, roundwater, Pumping.
entifiers: *India.

rious uses of solar energy, in India in particular t with application in arid lands in general, are aluated. The advantages of utilizing solar energy e discussed and the various uses to which solar ergy might be put are examined. The seasonal an values of total solar radiation on a horizontal face for various arid and semiarid regions of dia are presented. They indicate the enormous tential for solar energy utilization in these re- ns. The following possible uses of solar energy discussed: (1) pumping of groundwater for ir- ation, (2) drying of agricultural products, (3) alination of water, (4) cooking, and (5) provid- lighting in rural areas. The article presents a itive evaluation of the use of solar energy in olving the problem areas discussed. (Jamail- zona)
7-11090

E POLITICS OF SALT: BACKGROUND AND PLICATIONS OF THE MEXICAN-AMER- N TREATY OF 1944,
zona Univ., Tucson, Inst. of Government earch.
primary bibliographic entry see Field 6E.
7-11097

TUS OF DESALINATION RESEARCH AND CHNOLOGY IN THE MIDDLE EAST,
hram Scientific Dept. Cairo (Egypt).
alal, and A. A. Husseiny.
alination, Vol. 20, p 217-225, March 1977. 2 fig, ef.

criptors: *Desalination, *Research and elopment, *Foreign research, *Technology, alination plants, Desalination processes, ning, Arid lands, Flash distillation, Electrodi- s, Reverse osmosis, Solar stills, Solar distilla- Nuclear engineering, Agricultural engineer-

tifiers: *Middle East.

lle Eastern countries have recently begun ting more attention to research and develop- in the area of desalination. These countries utilizing available manpower and other resources for research projects, experiments and the construction of prototype plants to determine the feasibility of new desalting processes, especially those appropriate for agricultural water production. Several desalting projects and long-term planning schemes for irrigation of arid lands have resulted from general conditions involving an abundance of high salinity and brackish water resources, extensive population growth and increased food-supply problems. Technical advancements have been achieved, including optimization of basic multi-stage flash distillation, electrodialysis and reverse osmosis techniques. Desalination units using solar energy have progressed to the point where deep basin prototype solar stills have been constructed; research and development on this process is discussed. Other experimental studies are underway to evaluate the potentials of windmill-driven and nuclear desalination plants. Plans for future development are discussed, including the transfer of technology and establishment of research and development centers. (Jahns-Arizona)
W77-11109

SOLAR ENERGY RESEARCH AT CAZRI, JODHPUR--ACHIEVEMENTS AND FUTURE PLANS,
Central Arid Zone Research Inst. Jodhpur (India).
H. P. Garg.
Annals of Arid Zone, Vol. 15, No. 3, p 228-246, September, 1976, 10 fig, 6 tab, 16 ref.

Descriptors: *Water resources development, *Solar distillation, *Water supply, *Solar radiation, Energy, Energy transfer, Potable water, Pumps, Pumping, Irrigation systems, Water resources, Water supply development, Heating.
Identifiers: *Solar energy, *India.

Research conducted in India on some of the important applications of solar energy for domestic, agricultural, and industrial purposes such as heating water, drying and dehydrating fruits and vegetables, cooking and boiling food, distilling saline water, and solar pumping of water for lift irrigation purposes are discussed. The need for solar distillation of water and experiments with yields of fresh water from saline underground water using solar distillation are discussed and the results presented. The advantages and prospects for future use of solar energy are presented. (Jamail-Arizona)
W77-11110

RECLAMATION OF IRRIGATION FIELD DRAINAGE WATER,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5D.
W77-11113

PROSPECTS OF THE EXPLOITATION OF ADVANCED ENERGY RESOURCES IN WATER PRODUCTION IN THE MIDDLE EAST,
Iowa State Univ., Ames. Dept. of Chemical Engineering; and Iowa State Univ., Ames. Dept. of Nuclear Engineering.
Z. A. Sabri, A. A. Husseiny, A. Valfells, A. F. Abdul-Fattah, and S. Galal.
Desalination, Vol. 20, p 279-287, March 1977. 4 fig, 20 ref.

Descriptors: *Desalination processes, *Energy, *Geothermal studies, Thermal water, Desalination plants, Saline water systems, Flash distillation, Industrial use(Water), Distillation, Nuclear energy, Depression storage.
Identifiers: *Middle East, Red Sea.

Some economically feasible energy sources for use in desalination plants in the Middle East are presented. One potential source is the hot brine and steam fields in the Red Sea Deeps and other locations. Direct utilization of geothermal energy in multi-purpose plants is the most efficient method; industrial applications include salt recovery, mining, animal husbandry and fisheries. Geothermal technology can be used in supplying fresh water to the Red Sea coasts for the western cities of Saudi Arabia and new settlements on Egypt's eastern coast. Desalination systems for water-producing geothermal plants are discussed, including multistage flash and multiple-effect distillation. Other potential energy sources include exploitation of heavy water and heavy hydrogen isotopes obtained from the Red Sea and the use of natural depressions in the production of power and water. The latter technique involves admitting sea water from the Mediterranean into the depression through hydraulic turbines, thus producing electrical energy and creating an artificial lake which serves as a sink for evaporation. (Jahns-Arizona)
W77-11116

DESALTING IN AUSTRALIA: THE DEVELOPMENT OF A NEW PROCESS FOR BRACKISH WATER,
ICI Australia Ltd, Melbourne. Research Dept.
P. M. Sharples, and B. A. Bolto.
Desalination, Vol. 20, p 391-401, March 1977. 4 fig, 4 tab, 23 ref.

Descriptors: *Desalination processes, *Australia, *Ion exchange, *Resins, Operating costs, Desalination plants, Pre-treatment(Water), Effluents, Potable water, Brackish water, Arid lands, Distillation, Membrane processes, Reverse osmosis, Electrodialysis.
Identifiers: *Sirotherm resin.

Desalting processes used in Australia include distillaton, electrodialysis and reverse osmosis; in remote communities where mining and tourism are major industries, some 30 plants have been installed. A new ion exchange process was developed by CSIRO and ICI Australia to upgrade mildly brackish water to potable or industrial standards. The process involves using Sirotherm resins regenerated by hot water instead of chemicals as in conventional regeneration. Advantages include reduced operating costs, low energy requirements (using low grade or waste heat) and minimum pollution load since the effluent contains only the salt stripped from the resins. Cost advantages have extended the range of application of salinity levels up to 3000 mg/l. Plants using this process are discussed, along with system limitations and pretreatment requirements. (Jahns-Arizona)
W77-11117

SOLAR PONDS AS HEAT SOURCE FOR LOW-TEMPERATURE MULTI-EFFECT DISTILLATION PLANTS,
Hebrew Univ., Scientific Research Foundation, Jerusalem (Israel).
H. Tabor.
Annals of Arid Zone, Vol. 15, No. 3, p 155-171, September, 1976, 3 fig, 1 tab, 5 ref.

Descriptors: *Solar distillation, *Water supply, *Water resources development, *Desalination processes, *Water treatment, Solar radiation, Energy, Evaporation, Salinity, Water sources, Water purification, Costs, Heating, Mathematical studies.
Identifiers: *Solar ponds.

Non-convecting solar ponds have the potential of providing low-temperature heat well below current fuel prices. The optimum size of ponds, to be used as heat sources is discussed. Between 1958 and 1966, solar ponds were intensively studied in Israel and it was determined both by mathematical analysis and experimental ponds in the field that temperatures in excess of 90 degrees could be obtained from a non-convecting solar pond. These ponds are used in the desalinization of water. The cost and thermal output of a solar pond are dealt with and three possible systems are discussed: (1) use of a solar pond as the exclusive source of heat for the pond, (2) use of fuel only, and (3) use of

solar pond plus fuel. The results are presented. For a pond without auxilliary fuel it pays to overdesign the pond and reject some of the surplus heat in summer because this calls for a distillation plant of lower rating. This system compares favorably in terms of costs with an all fuel system. A system using a solar pond in the summer and aided by fuel in the winter is also described. (Jamail-Arizona)
W77-11119

HEAVY METAL ACCUMULATION IN THE VICINITY OF A DESALINATION PLANT,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 5B.
W77-11278

ISRAEL STRIVES FOR EFFICIENT USE OF WATER RESOURCES,
For primary bibliographic entry see Field 3C.
W77-11439

THE MSF/FBE: AN IMPROVED MULTI-STAGE FLASH DISTILLATION PROCESS,
Technische Hogeschool, Delft (Netherlands).
A. W. Veenman.
Desalination, Vol. 19, p 1-14, December 1976. 6 fig, 5 tab, 5 ref.

Descriptors: *Flash distillation, *Desalination plants, Comparative benefits, Comparative costs, Heat transfer, Entrainment, Operation and maintenance, Fouling, Descaling.
Identifiers: *Vertical multi-stage flash/fluidized bed evaporator (MSF/FBE), Fluidized bed, Delft University of Technology(Netherlands).

A vertical flash evaporator combined with a fluidized bed heat exchanger (referred to as a multi-stage flash/fluidized bed evaporator or MSF/FBE) has various advantages over a conventional horizontal evaporator. The process involves a smaller plant size, better flash-off, no demister losses, and high vapor space loading factor. There is also a much lower specific heat consumption, as well as possibilities to vary the load from 0 to 100% and to increase the maximum brine temperature above limits usually imposed by scale formation. The plant's main feature is its vertical concept with short flash chambers accommodating a large number of parallel tubes in which heat transfer takes place by means of a fluidized bed. The heat transfer coefficient is enhanced especially during operation at low superficial fluid velocity. Details are presented on the Delft University of Technology's 50 cu m/day plant for the production of feedwater for a central boiler house. Also discussed is a comparative cost study between a 10,800 cu m/day horizontal flash evaporator in Rotterdam and a MSF/FBE for the same production. (Jahns-Arizona)
W77-11441

3B. Water Yield Improvement

EFFECTS OF PHREATOPHYTE REMOVAL ON WATER QUALITY IN THE GILA RIVER PHREATOPHYTE PROJECT AREA, GRAHAM COUNTY, ARIZONA, WITH A SECTION STATISTICAL ANALYSIS,
Geological Survey, Phoenix, Ariz. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-10868

UNITED STATES AND MEXICO: WEATHER TECHNOLOGY WATER RESOURCES AND INTERNATIONAL LAW,
Arizona Univ., Tucson, Coll. of Law,
For primary bibliographic entry see Field 6E.
W77-11173

AN ASPHALT INCORPORATOR AND PACKER FOR LINING IRRIGATION DITCHES,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
For primary bibliographic entry see Field 4A.
W77-11411

OPTIMIZATION OF RUNOFF AGRICULTURE ON RECLAIMED MINE LANDS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
J. L. Kelly.
Master of Science thesis, 1976. 86 p, 3 fig, 6 tab, 10 ref, 4 append.

Descriptors: *Land reclamation, *Water spreading, *Model studies, *Water harvesting, *Crop production, Water yield improvement, Runoff, Mine wastes, Computer models, Water requirements, Watersheds(Basins), Arizona, Arid lands, Semiarid climates, Consumptive use, Linear programming, Simulation analysis, Corn(Field), Agricultural watersheds, Rainfall-runoff relationships, *Agricultural runoff.
Identifiers: Black Mesa(Ariz).

The reclamation of mine lands in arid and semi-arid regions is generally considered to be equivalent to the reestablishment of vegetation and the return of the land to its former use, usually grazing. This study is concerned with using these reclaimed lands for agricultural purposes. Although agriculture is not usually considered feasible in arid regions, the application of runoff harvesting to the venture of agriculture adds a new dimension to the reclamation of strip mined lands in arid climates. A model is presented which utilizes linear programming and watershed cropland simulation to select the best suited crop and runoff treatment for the system being considered. It is then modified to determine the optimum catchment area ration to be used. The model was applied to the reclaimed coal mine lands on the Black Mesa of Northern Arizona. Results are presented and show that maximum economic returns can be obtained for conventional irrigated agriculture by using a ration of 55 acres of catchment area with no runoff treatment to one acre of cropland producing corn. (Jamail-Arizona)
W77-11436

3C. Use Of Water Of Impaired Quality

LINKED MODELS FOR MANAGING RIVER BASIN SALT BALANCE,
California Univ., Davis, Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-10849

NITRATES IN EFFLUENTS FROM IRRIGATED LANDS - ANNUAL REPORT,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-10941

STUDY OF MINERALIZATION IN AN AGRICULTURAL SOIL OF RESIDUAL MUDS OF VARIOUS ORIGINS, (IN FRENCH),
Ecole Nationale Superieure d'Agronomique et des Industries Alimentaires de Nancy (France). Laboratoire Matiere Org. Environ.
For primary bibliographic entry see Field 5G.
W77-10998

INTERNATIONAL SYMPOSIUM ON BRACKISH WATER AS A FACTOR IN DEVELOPMENT.
Ben Gurion Univ. of the Negev (Israel). Inst. of Desert Research.
International symposium held January 5-10, 1975, 305 p. Edited by Arie Issar.

Descriptors: *Brackish water, *Water resources development, *Planning, *Desalination, *Agriculture, Crop production, Desalination processes, Irrigation practices, Saline water, Arid lands, Land management, Public health, Leaching, Plant growth, Reverse osmosis, Electrodialaysis.
Identifiers: *Israel.

Papers collected were part of an international symposium organized by the Institute for Desert Research at Ben-Gurion University of the Negev, Israel. Topics covered relate to ways of utilizing brackish water by direct application or after desalination, and the need for long-range planning which incorporates this resource. Some papers deal specifically with salination mechanisms, brackish water for agricultural use, irrigation techniques using saline water, and desalination methods. Panel discussions cover future trends in direct use of brackish water for agriculture and in desalination methods. One objective was to help in the fight against the mounting world food shortage. The international movement to advance and intensify agriculture will require extensive cultivation of much arid and semi-arid land. Since most of the water in these regions is brackish, development of that resource is of critical importance. (See W77-11056 thru W77-11077) (Jahns-Arizona)
W77-11055

ELUCIDATING SALINATION MECHANISMS BY STABLE ISOTOPE TRACING OF WATER SOURCES,
Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5B.
W77-11056

BRACKISH GROUNDWATER BODIES AS A RESULT OF GEOLOGICAL HISTORY AND HYDROLOGICAL CONDITIONS,
Rijksinstituut voor Drinkwater voorziening, Delft (Netherlands).
For primary bibliographic entry see Field 2F.
W77-11057

BRACKISH WATER AS A FACTOR IN DEVELOPMENT OF THE SAFFORD VALLEY ARIZONA, U.S.A.,
Arizona Water Resources Research Center, Tucson.
S. D. Resnick, and K. J. Decook.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 41-50. 2 tab, 2 fig, 13 ref.

Descriptors: *Leaching, *Salinity, *Salt tolerance, *Brackish water, *Arizona, *Groundwater, *Irrigation practices, *Water supply, *Crop production, Saline soils, Saline water, Salts, Alternative water use, Drainage systems, Land management, Water supply development, Water utilization, Water management, Cultivation, Water quality, Cotton.
Identifiers: *Safford Valley(Ariz), Gila River(Ariz).

The paper summarizes results of studies conducted at the University of Arizona Safford Experimental Farm since 1947 concerning the effects of brackish water on agricultural practices and industrial develoment. The Safford Valley is typical of many arid regions in that it must augment its only perennial supply of surface water, the Gila river, with poor quality groundwater. One study examined the effects on crop production of combinations of well and river water used for leaching and irrigation in conjunction with deep plowing for water penetration. Results showed

creased crop production with increased river water usage. Other tests determined the effects of leaching applications at different depths and an interdisciplinary study in 1972 projected future water quality conditions on the agriculture and economy of the valley. (See also W77-11055) (Bennett-Arizona)
W77-11058

WESTERN NEGEV EXPLOITATION OF BRACKISH WATER FOR AGRICULTURAL USE,
Tahal Consulting Engineers Ltd, Tel-Aviv (Israel).
. Bar-Joseph, and N. Columbus.
n: Brackish Water as a Factor in Development, nternational Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p. 67-75.

Descriptors: *Aquifers, *Brackish water, *Saline water, *Irrigation water, *Groundwater resources, Water quality, *Aquifer management, Salts, Salt tolerance, Saline water intrusion, Subsurface waters, Groundwater mining, Percolation, Transmissivity, Water sources, Pumping, Encroachment, Geologic formations, Groundwater recharge, Groundwater movement.
Identifiers: Israel.

During the last decade a noticeable increase in demand for brackish water for agricultural use has occurred in Israel, such as in the western Negev settlements of Nahal Oz and Kfar Aza, where groundwater of salinity ranging between 700 and 2200 ppm is used for cotton irrigation. As a result, a detailed study of brackish water resources was undertaken, particularly in the Western Negev area where large deposits of calcareous sandstones and sands of Pleistocene age exist along the coastal aquifer of Israel. The authors make a hydrological evaluation of the coastal aquifer area, evaluate the groundwater salinity concentrations, and suggest a scheme for further exploiting the brackish water resources of this region. The plan would call for drilling production wells in stages, starting with two exploratory wells and carefully reviewing the effect on the flow regime before extension of well production. (See also W77-11055) (Bennett-Arizona)
W77-11060

SOURCE, CONSUMPTION AND USE OF BRACKISH WATER IN ISRAEL,
Tel-Aviv Univ. (Israel). Dept. of Geography.
Bonne, and Z. Grinwald.
Brackish Water As A Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 77-87. 4 tab, 3 fig, 6 ref.

Descriptors: *Water supply development, *Desalination, *Groundwater availability, *Water management(Applied), Reclaimed water, Interbasin transfers, Groundwater resources, Water wells, Water resources development, Water storage, Water utilization, Brackish water, Saline water, Aquifers.
Identifiers: *Israel.

Israel is depending more each year on supplementing its water supply with brackish water because of its current virtually total exploitation of fresh water resources. Brackish water is defined as that which is restricted for direct use by its high salinity content. Two-third's of Israel's brackish water is in surface flows, mainly in the Bet Shean springs. The remaining underground aquifer supplies are along the coastal plain and in the Arava valley. Saline water is likely to further replace fresh water use in he future as population, industrial and agricultural expansion place an increasing demand on the country's water resources. Agriculture currently consumes 80 percent of the brackish water now being utilized and the remainder is used by industry. Only 60 percent of the brackish water resources are being exploited and the remaining 120 MCM should be utilized only if marginal benefits can exceed marginal costs. The author recommends 3 proposals for brackish water development: pumping water out of aquifers before the process of salinization has taken over, increasing brackish water usage by industry and agriculture by offering compensation, and use of desalination for saline water that cannot be used directly. (See also W77-11055) (Bennett-Arizona)
W77-11061

DRIP IRRIGATION WITH SALINE WATER AND THE LEACHING OF SOIL BY MEANS OF DRIP IRRIGATION,
Yotvata Experimental Station (Israel).
M. Uzrad, I. Ravina, B. Zur, S. D. Goldberg, and B. Gornat.
In: Brackish Water As A Factor In Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 89-96.

Descriptors: *Impaired water use, *Irrigation practices, *Irrigation efficiency, *Leaching, Irrigation systems, Sprinkler irrigation, Irrigation programs, Crop response, Infiltration, Water yield improvement, Salt tolerance, Salinity, Saline water.
Identifiers: *Drip irrigation, Israel.

Drip irrigation has been found to be a very successful form of irrigation in the aird Arava region of Israel, an area of high temperatures, low relative humidity and resultant high evapotranspiration rates, and poor soils with low water-holding capacities. However, drip irrigation usually leaves high salinity concentrations around the dripper because of the high evaporation rates. The usual leaching process requires sprinkling of furrow irrigation which is inconvenient and costly. An experiment was conducted to determine whether the drip irrigation method could be used for leaching. Results indicated that drip irrigation could be used sucessfully for leaching if applied near the end of a growing season where the crop's foliage would shield the wetted area, reducing evaporation. It was also discovered that the use of a plastic mulch to cover the wetted strip would further increase the leaching efficiency of the drip irrigation method. (See also W77-11055) (Bennett-Arizona)
W77-11062

PHYSIOLOGICAL BASIS FOR THE REDUCTION OF PLANT GROWTH UNDER CONDITIONS OF IRRIGATION WITH BRACKISH WATER AND POSSIBLE METHODS OF AMELIORATION,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
J. Gale.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 97-102. 36 ref.

Descriptors: *Brackish water, *Irrigation effects, *Plant growth, *Salt tolerance, *Plant physiology, Salinity, Crop response, Root development, Soil-water-plant relationships, Water balance, Turgidity, Photosynthesis, Plant breeding, Carbon dioxide, Fertilization, Toxicity, Ions, Osmosis.
Identifiers: Root resistance, Leaf resistance, Osmotic adaptation.

Direct plant responses to salinity and ways of reducing the effect of salinity on plant growth are discussed. Although root resistances to hydraulic flow increase under brackish conditions, this is mostly offset by greater leaf resistance to water vapor loss. Thus, plant water balance, as evidenced by turgor, is rarely affected by saline irrigation water. However, many plant species grow better with brackish water when the atmospheric evaporation demand is decreased. Greater leaf resistance to water loss is usually accompanied by increased resistance to the diffusion of carbon dioxide gas into the leaf, reducing photosynthesis and overall plant growth. This may be offset by increasing the atmospheric CO_2 concentration around plants grown in suitable enclosures, such as plastic tunnels. One main reason for reduced growth is that salt-resistant plants expend so much energy in exclusion of salts from metabolically active sites by compartmentation and salt pumps. The damage may be reduced by providing for high rates of energy input in photosynthesis such as by use of CO_2 fertilization. Toxicity caused by certain ions in brackish water accumulating in plants during osmotic adaptation can sometimes be reduced by addition of complementary ions, especially calcium and potassium. Breeding of resistant crop plants involves selection of salt tolerant species and varieties and direct genetic breeding of physiological characteristics associated with tolerance. (See also W77-11055) (Jahns-Arizona)
W77-11063

AGROTECHNICAL PRINCIPLES FOR WATER AND SALINITY CONTROL IN THE ROOT ZONE,
Technion-Israel Inst. of Tech., Haifa. Dept. of Soil Science.
B. Zur, I. Ravina, and M. Uzrad.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 113-117. 8 ref.

Descriptors: *Agronomy, *Water control, *Salinity, *Root zone, *Irrigation practices, Irrigation effects, Crop response, Crop production, Soil-water-plant relationships, Soil water, Transpiration, Root systems, Leaching, Evaporation control, Agriculture.
Identifiers: Plant water deficit, Leaf water potential.

The main water variable influencing crop growth and yield is water deficit, which develops in plants as a result of root water absorption lagging behind transpirational water loss through leaves. Total leaf water potential is used as a measure of the plant water deficit level. Changes with time in the plant water potential level are influenced by time changes in soil water potential and water flux through the plant. The value of leaf water potential or one of its components is the main variable linking growth processes to the plant's transpiration process. Within this model the objective of irrigation is to control the water deficit level in the growing crop to obtain maximal or most economical yield, usually by controlling the soil water content's time and space fluctuations. Agrotechnical principles recommended for conditions of high salinity, high heat load and light soils include application of water at the soil surface or below, and inducing flow conditions throughout the root zone at all times. Irrigation should be essentially continuous, with the application rate allowing for a continuous net downward flux throughout the root zone. The leached zone should be controlled by daily application of water. It is also important to reduce evaporation water loss from the soil surface and the growing crop. A field irrigation experiment is described and applications of the principles presented. (See also W77-11055) (Jahns-Arizona)
W77-11064

BENEFITS OF BRACKISH WATER STRESSES TO CROP PRODUCTION,
Minnesota Univ., St. Paul, Dept. of Horticultural Sciences.
J. Levitt, and M. Twersky.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 119-123. 1 fig, 29 ref.

Descriptors: *Brackish water, *Stress, *Crop production, *Irrigation effects, *Crop response,

Beneficial use, Soil-water-plant relationships, Irrigation efficiency, Water injury, Plant growth, Resistance, Salt tolerance, Plant morphology, Energy, Salinity, Plant physiology.
Identifiers: *Salt stress.

Possible benefits from the salt stress component of brackish water inlude yield ehancement due to increased growth or development, increases in a desired plant component and energy savings. Pathological benefits would emerge if salt stress increased the plant's resistance to viral, bacterial, fungal or insect diseases. Irrigation with brackish water inhibits the growth of glycophytic weeds, thus favoring growth of any crop more halophytic than the weed. Physiological benefits to the plant include nutritional effects such as that from NaCl, acceleration of development to survive stress, and antagonism of other stresses. Salt stress may reduce or prevent injuries by decreasing water loss from the plant, resulting in lower vapor pressure, a stomatal closure and a decrease in the specific surface of the morphological strucutre. Other stress that may be avoided or minimized are chemical and low-temperature stresses. Increases in various plant components induced by salt stress from irrigation are discussed, along with examples of more efficient use of energy. (See also W77-11055) (Jahns-Arizona)
W77-11065

USE OF GEOTHERMAL BRACKISH WATER FOR SOIL WARMING AND VEGETABLE IRRIGATION,
Ben-Gurion Univ. of the Negev, Beersheba (Israel). Inst. of Desert Ecology.
D. Pasternak, M. Twersky, I. Borovic, Y. de Malach, and E. Rappaport.
In: Brackish water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 125-134. 3 fig, 1 pl, 2 tab, 17 ref.

Descriptors: *Thermal water, *Brackish water, *Soil temperature, *Irrigation effects, *Crop response, Soil-water-plant relationships, Soil treatment, Crop production, Irrigation practices, Melons, Tomatoes, Mulching, Germination, Plant growth, On-site investigations, Saline water systems, Geothermal studies.
Identifiers: Cucumber, Israel.

Warm water (40 degrees C)from a geothermal brackish water aquifer in the Negev, Israel, was used for irrigation and soil warming of four summer vegetable crops (cucumbers, melons, watermelons and tomatoes). Circulating this water through the soil by a trickling irrigation system increased the temperature of plastic mulched plots 9 degrees C above that of unmulched soil and 6-7 degrees C above unheated plastic mulched plots. Germination in plants from warm plots was quicker and more uniform than in control plants. Cucumbers had the most marked response, with earlier maturation and higher yields. Melons ripened earlier but without increased yields. Tomatoes and watermelons did not benefit from the treatment, apparently because of a lower optimal root temperature required for growth. Plastic mulching accelerated maturation and increased yield in both heated and control cucumber plots; this also prevented salt accumulation in the upper 10 cm of soil. Clear polyethylene was a more effective mulch than black polyethylene. All four crops had yields equal to or greater than those obtained commercially with fresh water irrigation. (See also W77-11055) (Jahns-Arizona)
W77-11066

EFFECTS OF BRACKISH WATER IRRIGATION ON YIELD AND DEVELOPMENT OF COTTON,
Ben-Gurion Univ. of the Negev, Beersheba (Israel). Inst. of Desert Ecology.
M. Twersky, D. Pasternak, and I. Borovic.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 135-142. 4 tab, 12 ref.

Descriptors: *Brackish water, *Crop production, *Plant growth, *Irrigation effects, *Cotton, Sprinkler irrigation, Irrigation practices, Crop response, Irrigation water, Height, Plant morphology.
Identifiers: Israel, Photosynthates, Dry matter.

Irrigation effects with fresh and brackish waters were studied using upland cotton (Gossypium hirsutum L., c.v. Acala SJ-1) grown in the northern Negev, Israel. Sprinkler irrigation was used to apply water of low salinity and fresh water to test the effects on dry matter production and elongation. Irrigation with brackish water resulted in greater boll production and consequently a better incorporation of photosynthates for fruit production. Total dry matter production was the same (370 gr/plant) with both types of irrigation water. Plants irrigated with brackish water were 25 cm shorter, with height being affected directly by salinity and indirectly by the amount of bolls per plant. Changes in cotton's indeterminate morphological development through phase shifts in the vegetative/fruiting balance may account for higher seed cotton yields. A discussion of the study's implications is included. (See also W77-11055) (Jahns-Arizona)
W77-11067

THE IRRIGATION OF WINTER TOMATOES IN THE ARAVA,
Yotvata Experimental Station (Israel).
For primary bibliographic entry see Field 3F.
W77-11068

SELECTION OF MANGO ROOTSTOCKS FOR IRRIGATION WITH SALINE WATER,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Horticulture.
A. Kadman, S. Gazit, and G. Ziv.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 159-163. 3 tab, 2 ref.

Descriptors: *Salt tolerance, *Irrigation effects, *Rhizomes, *Saline water, *Crop response, Crop production, Orchards, Soil-water-plant relationships, Calcareous soils, Chlorine, Embryonic growth stage, Irrigation water, On-site tests.
Identifiers: *Mango, *Rootstocks, Poly-embryonic, Mono-embryonic, Leaf scorching, Grafting.

An experiment was conducted at the Kibutz Yotvata in the southern part of the Arava, Israel, during the 1971-73 to select mango rootstocks tolerant of saline irrigation water. The arid conditions in this region seem favorable for commercial mango growing, but an important obstacle, in addition to calcareous soil, is the high salt content of the irrigation water used. Mango trees grafted onto common rootstocks in that region are severely damaged. The experiment involved 3200 seedlings of 80 different varieties, including poly- and mono-embryonic types, drip irrigated with water containing over 600 ppm of chlorine. Salinity soon caused severe scorching of leaf tips and margins, which later resulted in complete plant degeneration. A wide variation was observed in the sensitivity of various seedlings to the adverse water and soil conditions, with several varieties having little or no damage. The best tolerance was found in plants of the 13/1 poly-embryonic variety or its related types. After the close of the experiment in 1973, superior plants were transferred and grafted with common mango varieties to establish an experimental orchard. (See also W77-11055) (Jahns-Arizona)
W77-11069

ON THE ROLE OF LEAF WATER IN REGU-LATING METABOLISM,
Ben Gurion Univ. of the Negev, Beersheba (Israel). Research and Development Authority.
For primary bibliographic entry see Field 2I.
W77-11070

IRRIGATION WITH BRACKISH WATER: CHEMICAL AND HYDRAULIC CHANGES IN SOILS IRRIGATED WITH BRACKISH WATER UNDER COTTON ROTATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soils and Water.
H. Frenkel, and I. Shainberg.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 175-183. 6 fig, 3 tab, 8 ref.

Descriptors: *Irrigation effects, *Brackish water, *Soil chemistry, *Permeability, *Cotton, Laboratory tests, On-site investigations, Loess, Hydraulic conductivity, Leaching, Soil-water-plant relationships, Absorption, Soil investigations, Irrigation efficiency, Sodium, Chlorides, Gypsum.
Identifiers: Sodic water, Israel.

Laboratory and field studies were undertaken at Kibutz Nahal Oz, Israel, to determine the feasibility of using brackish water for irrigating loessial soils under cotton rotation. Laboratory studies evaluated the sensitivity of the hydraulic conductivity of Nahal Oz soil to leaching with solutions of different sodium absorption ratio (SAR) and salt concentrations. Using laboratory results, the study was continued on microplots in the field to determine the response of commercial cotton grown on regosolic loess irrigated with sodic water (high salt content and high SAR). This sodic water introduces sodium into the exchange complex reducing soil hydraulic conductivity, but the water's high salt content suppresses this detrimental effect on permeability. Leaching by rain makes this soil nearly impermeable. Gypsum, CaC12 and AlC13 amendments effectively prevented sodium accumulation and reduction of the infiltration rate in this soil. Gypsum was the most economic treatment, while aluminum chloride was the most effective. The experimental soil was less sensitive than loamy soil to exchangeable sodium. It is recommended that gypsum be applied in alternate years at a rate of 20 tons/ha. (See also W77-110 (Jahns-Arizona)
W77-11071

SENSITIVITY OF DESALTED WATER COS FROM VARIOUS PROCESSES TO CHANGI ENERGY PRICES,
Mekorot Water Co., Tel-Aviv (Israel). Engineer Div.
For primary bibliographic entry see Field 3A.
W77-11072

APPLICABILITY OF COMMERCIAL REVER OSMOSIS UNITS FOR THE QUALITY I PROVEMENT OF BRACKISH WAT SOURCES IN THE SOUTHERN ARAVA,
Mekorot Water Co., Tel-Aviv (Israel). Desalt Dept.
For primary bibliographic entry see Field 3A.
W77-11073

ELECTRODIALYSIS IN WATER DESALI TION AND THE INFLUENCE OF I EXCHANGE RESIN INTRODUCTION IN THE APPARATUS,
Ben Gurion Univ. of the Negev, Beersh (Israel). Div. of Membranes and Ion Exchange
For primary bibliographic entry see Field 3A.
W77-11074

ION-PERMSELECTIVE MEMBRANES,
Ben Gurion Univ. of the Negev, Beersh (Israel). Div. of Membranes and Ion Exchange

or primary bibliographic entry see Field 3A.
77-11075

HE ROLE OF MEMBRANE METHODS IN
HE DESALINATION OF BRACKISH WATER,
lifornia Univ., Berkeley. Sea Water Conversion
ab.
r primary bibliographic entry see Field 3A.
77-11076

DUSTRIAL USE OF BRACKISH AND SALINE
ATER IN THE HAIFA BAY AREA,
hal Consulting Engineers Ltd., Tel-Aviv
rael). Dept. of Coastal Plain.
Columbus, and J. Bar-Joseph.
Brackish Water as a Factor in Development,
ernational Symposium, January 5-10, 1975,
er-Sheva, Israel, Ben-Gurion University of the
gev, p 239-246.

scriptors: *Industrial water, *Cooling water,
rackish water, Water utilization, Water
nagement(Applied), Sea water, Industrial
nts, Chlorides, Groundwater, Brines, Saline
ter, Aquifers.
ntifiers: *Israel(Haifa-Akko Bay area).

the Haifa-Akko Bay area of Israel, several in-
trial enterprises have been using pumped saline
undwater for cooling purposes. The Haifa-
ko Bay Pleistocene aquifer containing sand and
careous sandstone currently produces 12 MCM
ually from four production wells. The ground-
er quality of these aquifers varies from 30 per-
t seawater and 70 percent freshwater, or 9000
n chlorides, in the shallower sections of the
ifer, to 90 percent seawater and 10 percent
hwater, or 17000 ppm chlorides, in the deeper
tion of the aquifer. It is more economical to
p saline water by means of wells than to pump
rectly from the sea for industries located near
coastline such as Haifa Bay area. In the com-
years, industries are expected to demand up to
MCM per year for cooling purposes. Further
ies must be conducted to determine more ac-
tely the quantities of saline water that are ex-
table. (See also W77-11055) (Bennett-Arizona)
7-11077

ALTING SALINE GROUND WATER FOR
RICULTURE,
teh Univ., Tripoli.
primary bibliographic entry see Field 3A.
-11085

WATER QUALITY PROBLEM ON THE
ORADO RIVER,
Mexico Interstate Streams Commission,
a Fe.
primary bibliographic entry see Field 5G.
-11168

ICAN-AMERICAN INTERNATIONAL
ER QUALITY PROBLEMS: PROSPECTS
PERSPECTIVES,
ersidad Nacional Autonoma de Mexico, Mex-
ity. School of International Law.
rimary bibliographic entry see Field 6E.
-11169

ED STATES APPROACHES TO THE
NITY PROBLEM ON THE COLORADO
ER,
rtment of State, Washington, D.C. Office of
egal Advisor.
rimary bibliographic entry see Field 6E.
11170

SALINITY IN THE COLORADO: AN INTERPRETATION OF THE MEXICAN-AMERICAN TREATY OF 1944,
Universidad Nacional Autonoma de Mexico, Mexico City. School of International Law.
For primary bibliographic entry see Field 6E.
W77-11171

A HISTORY AND INTERPRETATION OF THE WATER TREATY OF 1944,
For primary bibliographic entry see Field 6E.
W77-11174

SURFACE MODIFICATIONS FOR WATER MANAGEMENT AND SALINITY CONTROL IN A NONIRRIGATED AREA,
Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div.
R. J. Rektorik, R. R. Allen, and L. Lyles.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 699-703, Special Edition 1976. 6 fig, 2 tab, 15 ref.

Descriptors: *Saline soils, *Salinity, Leaching, Runoff, Surface runoff, Grain sorghum, Cotton, Crop production, Salt.

Leveling the saline soil areas in a field to a plane 9 cm lower than that of the nonsaline soil areas allows water from high intensity rains to run off from the higher nonsaline soils and pond on the saline soils, thus providing leaching water. Original soil salinity for the 0-90 cm soil profile was reduced 53 and 16 percent in the saline and nonsaline areas, respectively. Grain sorghum (1969) and cotton (1970) yields were 47 and 38 percent greater than yields from an adjacent untreated field. (Skogerboe-Colorado State)
W77-11394

SAMPLING THE UNSATURATED ZONE IN IRRIGATED FIELD PLOTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W77-11400

TEST LEACHING OF SOLONCHAKS IN THE RIVER LENA VALLEY (USSR), (IN RUSSIAN),
Akademiya Nauk SSSR, Yakutsk. Institut Biologii.
L. G. Elovskaya, and A. K. Konorovskii.
Pochvovedenie 5, p 48-54, 1976.

Descriptors: *Desalination, Washing, *Saline soils, Drainage, *Leaching, Soils.
Identifiers: *River Lena Valley(USSR), Solonchaks.

A possibility of desalinization of cryogenic salinized soils by washing with artificial drainage is indicated.--Copyright 1977, Biological Abstracts, Inc.
W77-11413

ISRAEL STRIVES FOR EFFICIENT USE OF WATER RESOURCES,
R. Lahav.
Water and Sewage Works, p 64-65, June 1977, 6 fig.

Descriptors: *Water resources development, *Planning, *Water reuse, *Water supply development, *Desalination, Arid lands, Water storage, Crop production, Desalination plants, Flash distillation, Underground storage, Waste water treatment, Recycling, Irrigation practices, Irrigation effects, Water utilization.
Identifiers: *Israel, Drip irrigation, Negev, Sinai.

Methods for increasing and fully utilizing water resources in Israel are outlined. Farming and water storage techniques used over 2000 years ago are being revived for use in the Negev Desert, while cucumbers are being grown using brackish water discovered in vast quantities in reservoirs under the desert. The overall plan is to increase available water 50% by 1988 by such methods as desalinization, recycling waste, and new irrigation practices. Two flash-evaporation plants are currently in operation, with two more planned; a 100 MGD facility will be built together with a nuclear power plant. Recycled sewage and industrial waste will provide much of the additional 500 million cubic meters of water projected for 1988. A new recycling method begins with a sophisticated chemical-physical stage and works in reverse to popular systems, producing cheaper, better quality water. Most of the water will go to agricultural uses. An improved drip irrigation system will be used for seasonal field row-crops; controlled amounts of water and soluble fertilizers can be fed through an advanced system of hoses. Underground reservoirs in the Negev and Sinai deserts represent another resource to be tapped. (Jahns-Arizona)
W77-11439

A STUDY OF SALT LEACHING BY PONDING AND SPRINKLING IN UNSATURATED SOIL COLUMNS,
Alexandria Univ. (Egypt). Dept. of Soil and Water Science.
Y. Z. El-Shafei.
Egyptian Journal of Soil Science, Vol. 15, No. 2, p 151-165, 1975. 10 fig, 4 tab, 13 ref.

Descriptors: *Leaching, *Irrigation effects, *Ponding, *Sprinkler irrigation, *Saline soils, Soil analysis, Soil investigations, Soil profiles, Ion transport, Soil management, Drainage effects, Chlorine.

A laboratory study of salt leaching was conducted on a highly saline loamy sand soil irrigated by ponding (flooding) or sprinkling at four different intensities. Results of soil solution analysis are presented. The order and shape of curves for Cl(-) and SO(2-) did not follow the pattern of total salt distribution; depth of leaching must be considered when comparisons are made. A sprinkler application rate of 5.2 cm/hr was most efficient in leaching salt from the upper zone (0-12 cm), suggesting a sprinkler regime is often preferable because of the resulting unsaturated condition. This is an important factor in areas where water is in short supply or expensive or where drainage is a limitation. Ponding may be preferable in situations where the penetration depth is restricted or when distribution of a specific ion through the profile is desired. (Jahns-Arizona)
W77-11444

ASSESSMENT OF THE SALINIZATION OF IRRIGATED SOILS OF COTTON FIELDS BY AERIAL PHOTOS, (IN RUSSIAN),
Belorusskii Nauchno-Issledovatelskii Institut Pochvovedeniya i Agrokhimii, Minsk (USSR).
E. I. Pankova, and V. M. Mazikov.
Pochvovedenie 5, p 55-65, 1976.

Descriptors: *Saline soils, *Salinity, Irrigated land, *Cotton, Aerial photography, Remote sensing.

Aerial photography makes it possible to delineate regions with salinized and nonsalinized soils under cotton and to determine their surface areas and the degrees of salinization in the top 1 m of the soil profiles. Work on the interpretation of the photographs depends on the size of components of the soil complex.--Copyright 1977, Biological Abstracts, Inc.
W77-11475

3E. Conservation In Industry

REDUCING COKE PLANT EFFLUENT,
Carnegie-Mellon Univ., Pittsburgh, Pa. Environmental Studies Inst.
For primary bibliographic entry see Field 5D.
W77-10922

IMPACT ON TEXAS WATER QUALITY AND RESOURCES OF ALTERNATE STRATEGIES FOR PRODUCTION, DISTRIBUTION, AND UTILIZATION OF ENERGY IN TEXAS IN THE PERIOD 1974-2000,
Texas Univ. at Austin.
For primary bibliographic entry see Field 5C.
W77-10930

METHODS OF RECOVERING WOOL GREASE FROM SPENT WOOL SCOURING LIQUOR,
New Zealand Inventions Development Authority, Wellington. (Assignee).
For primary bibliographic entry see Field 5D.
W77-11013

3F. Conservation In Agriculture

SYSTEMS ENGINEERING APPROACH TO AGRICULTURAL AND RURAL DEVELOPMENT SYSTEMS,
Nairobi Univ. (Kenya). Dept. of Electrical Engineering.
M. M. Shah.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 565-578, 1975. 2 fig, 25 ref.

Descriptors: *Regional development, *Comprehensive planning, *Simulation analysis, *Rural area, *Agriculture, Projects, Water resources development, Mathematical models, Systems analysis.
Identifiers: *Developing countries, Kenya, Socio-economic aspects.

During the last two decades, rapid progress in systems engineering and computer use has been a major influence in increasing the living standards of many nations. Paradoxically, the developed nations have benefited most from these advancements, and in many cases the gap between them and the developing countries has grown. To catch up with the advanced nations, the developing countries must take urgent measures to learn how their Agricultural and Rural Development Systems are functioning, managed, and planned in the context of their overall socio-economic development. Agricultural and Rural development Systems are very complex, large, and stochastic in nature; predictably reliable causal explanations of the socio-economic aspects are not available. The Systems Engineering Approach offers an ideal tool for structuring and analyzing these systems in the face of uncertainties from the point of view of planning and evaluation of alternative strategies for development. Considered are the four procedures for a Systems Engineering Approach: (1) problem formulation; (2) mathematical and heuristic modeling; (3) simulation studies on the model; and (4) model implementation and application to the problem solution. Use of the approach in Kenya, Nigeria, Venezuela, Mexico, Argentina, and Thailand has shown the need for considerable care in adapting it to the particular conditions of each country. Described are the systems application studies in Kenya. A conceptual hierarchical model of the Agricultural and Rural Development Systems as well as the present work on construction of a normative model of peasant agriculture and an overall macro-economic model of Kenya are briefly considered. (See also W77-10806) (Bell-Cornell)
W77-10819

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1977,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10864

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN A PART OF CURRY COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1976,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10873

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN CENTRAL (MAP LC-19) AND NORTHERN (LN-19) LEA COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1976,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10874

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN PORTALES VALLEY, ROOSEVELT COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1976,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10875

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 9D.
W77-10917

SOIL IRRIGATION SYSTEM AND METHOD,
E. S. Green.
U.S. Patent No. 4,001,968, 9 p, 6 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 954, No 2, p 582, January 11, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation effects, *Soil-plant-water relationships, *Capillary action, Irrigation efficiency, Greenhouses, Osmosis.

A plastic sheet is placed between a water-receptive material to which water is supplied and an overlying body of soil. The plastic sheet is impervious to moisture and opaque. It has a multiplicity of openings which are adapated for capillary flow from the water receptive material to the overlying body of soil. Drain openings are conventionally provided to supply drainage. When there is a growing plant that is rooted in the soil in the container, the network of roots by osmosis absorbs moisture from the soil which travels to the exposed portion of the plant where much of it is discharged into the atmosphere. A growing plant is living thing which performs this function so as to exercise a very considerable absorptive force inducing the flow of so-called capillary water through the soil and into the root system of the plant. The capillary sheet serves to prevent substantial loss of moisture from the portions of the sheet which are not covered by a plant container. When the sheet is black or otherwise is opaque the underlying water-receptive material is protected so as to minimize growth of algae. (Sinha-OEIS)
W77-10996

AUTOMATIC CLOSURE VALVE FOR WATER SPRINKLER,
Fujiki Denki Kabushiki Kaisha, Tokyo (Japan). (Assignee).
F. Sato.
U.S. Patent No. 4,005,725, 5 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 955, No 1, p 90, February 1, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Control systems, Valves, Application equipment.

An automatic closure valve for a water sprinkle enables water from a water tap to be used without the necessity for stopping the tap and removing the sprinkler and water hose and enables water remaining in the hose and the closure valve to be automatically drained off after the water sprinkling. The closure valve is constructed with valve casing which is provided with two valve chambers defined in mutual contiguity and connected with each other by means of a passage. The closure valve mechanism for closing the passage responds to increased water pressure in the valve chambers to close the opening. It opens when the pressure in the valve chambers becomes negative. (Sinha-OEIS)
W77-10999

BRAKE MEANS FOR AN AIR-POWERED SPRINKLER SYSTEM,
L. R. Townsend.
U.S. Patent No. 4,005,729, 6 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 955, No 1, p 92, February 1, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, *Irrigation efficiency, Conveyance structures, Water delivery, Application equipment.

A brake for a fluid-powered sprinkler system provided for preventing the drive towers from rolling down inclines and for preventing the wind from rolling the drive towers. The fluid power may either be compressed air or water under pressure. An overhead water supply pipe extends outward from the center pivot point and is supported by spaced-apart wheeled drive towers. An air-powered drive is provided on each of the towers to propel the towers and water supply pipe around the center pivot point. A control is provided for each of the towers for selectively operating the drive to maintain the pipe and towers in an aligned condition as the water supply pipe is pivoted around the central pivot point. The control comprises a rotary cam plate having an alignment arm which extends to the gimbal ring on a flexible joint positioned on the water supply pipe adjacent each tower. A brake is mounted on at least one of the towers adjacent one of the drive wheels and is in operative engagement with the drive lugs. A cylinder rod extending from a fluid-powered cylinder mounted on the tower is connected to the brake so that rotation of the brake causes the cylinder rod to extend and retract into the cylinder. The cylinder normally prevents rotation of the brake thereby preventing rotation of the wheel. (Sinha-OEIS)
W77-11000

REVERSIBLE SELF-PROPELLED CENTER PIVOT SPRINKLER SYSTEM,
L. R. Townsend.
U.S. Patent No. 4,005, 731, 10 p, 14 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 955, No 1, p 93, February 1, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, *Irrigation efficiency, Conveyance structures, Water delivery, Application equipment, Mechanical equipment.

A reversible self-propelled center pivot sprinkler system for sprinkling or irrigating a relatively large area surrounds a central pivot comprising an overhead water supply pipe extending outward from the center pivot point and is supported by spaced-part, wheeled towers. A drive apparatus is provided on each of the towers to propel the towers and water supply pipe. A control apparatus is provided on each of the towers for selectively operating the drive apparatus to maintain the pipe and towers in an aligned condition. The drive apparatus is connected to a trojan bar which is reciprocatably mounted on the tower and which is provided with a selectively movable double dog on at least one end for engagement with drive lugs on at least one of the drive wheels of the tower. The double dog is normally in position so that movement of the trojan bar in one direction will cause the dog to engage the wheel drive lugs to move the tower in a forward direction. The double dog may be selectively moved to a second position so that the dog will engage the wheel drive lugs as the trojan bar is moving in a second direction to cause the tower to be moved rearward. The double dog may be either manually moved or automatically controlled through the use of power cylinders. (Sinha-OEIS)
W77-11001

IRRIGATION SIGNAL,
T. Civalier.
U.S. Patent No. 4,006,473, 5 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 955, no 1, p 324, February 1, 1977.

Descriptors: *Patents, *Irrigation, *Remote control, *Irrigation practices, *Irrigation efficiency, Control systems, Electrical equipment.
Identifiers: Signalling device.

In accordance with conventional practice, irrigation water is introduced into a primary trench from a suitable source and flows through furrows into a secondary trench. The secondary trench may be remote from the operator's station for controlling the irrigation. To assist the operator to know when the field has been flooded to the required depth a signal device is proposed. A housing having an electrically conductive probe attached is supported by an electrically conductive shaft which is inserted into the ground. A perceptible signal, such as a lightbulb is carried by the housing and is activated as water rises to close a circuit between the probe and the shaft. The depth of insertion of the shaft predetermines the height of water necessary to activate the signal. Extensible means are provided to elevate the signal above crop height. (Sinha-OEIS)
W77-11008

METHOD AND APPARATUS FOR TRANSPORTING AN IRRIGATION LINE,
Wade (R. M.) and Co., Portland, Oreg. (Assignee).
Cornelius, and L. C. Olson.
U.S. Patent No. 4,006,860, 17 p, 12 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 955, no 2, p 499, February 8, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Irrigation operation and maintenance, Transportation.
Identifiers: Irrigation lines, Rotational torque.

The object of this invention is to provide an apparatus for transporting an irrigation line including a transport assembly which can be conveniently moved from one irrigation line to another without necessity of moving such transport assembly is moved adjacent an irrigation line. It inccludes means for selectively applying rotational torque to the irrigation line and in turn rotate and transport the irrigation line. The mobile transport assembly may then be moved to another irrigation line to in turn move that irrigation line by applying rotation torque. (Sinha-OEIS)
W77-11010

BENEFITS OF BRACKISH WATER STRESSES TO CROP PRODUCTION,
Minnesota Univ., St. Paul, Dept. of Horticultural Sciences.
For primary bibliographic entry see Field 3C.
W77-11065

EFFECTS OF BRACKISH WATER IRRIGATION ON YIELD AND DEVELOPMENT OF COTTON,
Ben-Gurion Univ. of the Negev, Beersheba (Israel). Inst. of Desert Ecology.
For primary bibliographic entry see Field 3C.
W77-11067

THE IRRIGATION OF WINTER TOMATOES IN THE ARAVA,
Yotvata Experimental Station (Israel).
M. Uzrad, S. D. Goldberg, and B. Gornat.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 143-158. 9 fig, 6 tab, 16 ref.

Descriptors: *Irrigation efficiency, *Tomatoes, *Crop response, *Irrigation practices, Crop production, Arid lands, Irrigation effects, Saline water, Root development, On-site investigations, Planting management, Soil-water-plant relationships, Evaporation control, Leaching, Available water, Irrigation systems.
Identifiers: Arava(Israel), Drip irrigation.

A study was conducted in the arid Arava region of Israel to determine the effects of irrigation on winter tomatoes. Water containing 2,250 ppm salts was applied daily by drip irrigation for the first 2 weeks after seeding in a quantity of 110 percent of daily evaporation. After the summer's difficult climatic conditions had passed, a series of irrigation regimes were tested to determine ways of reducing water use and increasing irrigation intervals. Some variables tested were irrigation intervals of 1, 2 and 3 days and water quantities calculated on the basis of 30 percent, 60 percent and 90 percent of the evaporation from a Class A pan. Half of each experimental plot was covered with clear plastic sheeting to prevent evaporation from the soil surface, increasing the water available to each plant. Irrigation intervals had no significant impact on yield, the explanation for which is presented. Plots receiving the greatest quantity of water had the highest yields, apparently due to the extended duration of water supply and low level of soil water tension. All daily water applications involved insufficient leaching; leaching efficiency increased with greater irrigation intervals, since a larger quantity of water was used at each irrigation date. Although there was no significant difference between covered and uncovered plots, yields were generally higher in covered plots irrigated at longer intervals. (See also W77-11055) (Jahns-Arizona)
W77-11068

EFFECTS OF IRRIGATION MANAGEMENT ON THE QUALITY OF IRRIGATION RETURN FLOW IN ASHLEY VALLEY, UTAH,
Superior Farming Co., Bakersfield, Calif.
For primary bibliographic entry see Field 5B.
W77-11079

EFFICIENCY OF SPRINKLER IRRIGATION SYSTEMS,
Department of Agriculture, Kelmscott (Australia).
T. Calder.
Journal of Agriculture, Vol 17, No 3, p 82-84, 1976. 2 fig, 4 tab.

Descriptors: *Sprinkler irrigation, *Irrigation efficiency, *Irrigation practices, *Irrigation design, *Australia, Winds, Air temperature, Humidity, Evaporation, Testing procedures.
Identifiers: Perth(Australia).

Designing an efficient sprinkler system requires taking into account the effects of wind, temperature and humidity on precipitation rates, as well as determining sprinkler spacings and pressures. The discharges of individual sprinklers should be uniform on any one lateral and not vary more than 20%. This is especially true when growing shallow-rooted vegetable crops on sandy soils in hot, often windy summer weather, conditions found in Western Australia. Maintaining satisfactory growth requires replacement of water used by plants and lost through evaporation. In the Perth area, the replacement rate for best growth is considered 80 to 90% of measured evaporation rates. Wind reduces effectiveness by its influence on evaporation and the watering pattern. On a normal day, even under relatively calm conditions, only about 60% of the water from a sprinkler reaches the ground, although increased humidity may improve this percentage somewhat. To counteract wind effects on distribution patterns, wind velocities should be considered when designing sprinkler layouts and spacings. A test for measuring system effectiveness is outlined. (Jahns-Arizona)
W77-11084

DESIGN AND PERFORMANCE OF A SIMPLE SOLAR PUMP FOR LIFT IRRIGATION PURPOSES,
Societe Francaise d'Etudes Thermiques et d'Energie Solaire, Sofretes (France).
M. P. Girardier, and M. G. Clemot.
Annals of Arid Zone, Vol 15, No 3, p 146-154, September, 1976. 4 fig.

Descriptors: *Pumps, *Pumping, *Solar radiation, *Water supply, *Irrigation systems water supply development, Mexico, Africa, Irrigation, Energy, Arid lands, Semiarid climates.

The use of solar energy for the operation of irrigation pumps is discussed and evaluated. Performance studies were carried out on a number of low temperature solar engines. These engines will automatically pump water from any depth without consumption of any kind of energy except from the sun. The design and performance studies of these engines is described. Several solar engine pumps are operating in Africa and Latin America and these operational units are described. The Mexican government is using them for irrigation, as well as to provide water for rural villages. The future of solar engines and the advantages of using solar energy for pumping water are presented. These include: (1) availability of the energy source, (2) reliability and long life expectancy of the equipment with minimum maintenance and, (3) knowing the ceiling cost of the operation as opposed to the random nature of conventional installations as the result of unpredictable variations in the price of fuels. The economic costs related to the use of solar powered pumps are discussed. (Jamail-Arizona)
W77-11086

INTERRELATIONSHIPS OF SEEDLING VIGOR CRITERIA OF WHEAT UNDER DIFFERENT FIELD SITUATIONS AND SOIL WATER POTENTIALS,
Kabul Univ. (Afghanistan). Faculty of Agriculture.
A. Gul, and R. E. Allan.
Crop Science, Vol 16, p 615-618, September-October 1976. 4 tab, 13 ref.

Descriptors: *Seeds, *Germination, *Wheat, *Soil water, *Soil-water-plant relationships, On-site tests, Laboratory tests, *Washington, Plant growth, Plant physiology, Root development, Planting management, Growth stages, Correlation analysis.
Identifiers: *Soil water potential, Emergence rate index(ERI), Culm, Coleoptile, Kernel.

Studies of 93 wheat (Triticum aestivum L. em Thell.) lines and four check cultivars were con-

ducted using four water potentials (-2.2, -6.0, -10.2 and i14.4) in the laboratory and in three eastern Washington field situations. The purpose was to investigate the relationships among emergence rate index (ERI), total stand (TS), culm length, coleoptile length, seedling height, root weight and kernel weight. Only 9 of 21 simple correlation coefficients among ERI values of field and laboratory tests were significant. ERI values of the field tests correlated with one another but gave small or nonsignificant r values with ERI values from the four laboratory water potential levels. Marked differences in planting depth and water potential level between the field and laboratory could account for this lack of relationship. Coleoptile length, seedling height and culm length correlated positively with field ERI, while in the laboratory only ERI at -2.2 bars correlated significantly with coleoptile length and seedling height. Laboratory results indicated a general trend toward increased association between ERI and TS, ERI and root weight, and TS and root weight as soil water potential decreased. Lines with rapid emergence and higher TS at low water potentials may also have proportionally more root growth. Significant correlations were also noted between TS and both coleoptile length and seedling height in field studies. Selection gain is best achieved by evaluating wheat lines for seedling vigor (ERI, TS) under diverse field situations and at low soil water potentials. (Jahns-Arizona)
W77-11088

SOLAR ENERGY UTILIZATION FOR ARID ZONE DEVELOPMENT,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3A.
W77-11090

CROP PRODUCTION POTENTIALS IN INDIA--A WATER AVAILABILITY BASED ANALYSIS,
Punjab Agricultural Univ., Ludhiana (India).
H. S. Mavi, and J. E. Newman.
Agricultural Meteorology, Vol 17, No 5, p 387-395, November 1976. 1 fig, 2 tab, 10 ref.

Descriptors: *Crop production, *Projections, *Available water, *Water demand, Human population, Land use, Water supply, Droughts, Food abundance.
Identifiers: *India, Food requirements.

Population growth projections and inadequate water supply indicate crop production in India cannot keep pace with food requirements. For purposes of study, India was divided into three crop production regions, based on drought frequency and irrigation intensity. The region of assured water supply encompasses 29% of the country's crop land and accounts for 42% of crop production, average yield being 44% higher than the national average. The region of uncertain water supply represents 61% of the crop land and 51% of the production, with yield being 17% below the national average. The region of undependable water supply represents 10% of the crop land and 7% of the production, with yield 25% below the average. Inadequate water supply is an important factor limiting crop production in many cultivated areas, and the addition of new crop lands will further strain water resources. First approximation projections, based on an estimated population growth of 400 million in the next 25 years, indicate food grain production will not meet the country's needs. (Jahns-Arizona)
W77-11091

CHEMICAL COMPOSITION AND NUTRIENT UPTAKE OF WHEAT VARIETIES AS INFLUENCED BY MOISTURE REGIMES,
Soil and Water Management Research Station, Kota (India).
D. L. Sharma, P. N. Sharma, S. P. Tomar, and U. B. Singh.
Andhara Agricultural Journal, Vol 22, No 3-4, p 66-71, May-June/July-August 1975. 3 tab, 10 ref.

Descriptors: *Soil-water-plant relationships, *Crop response, *Wheat, *Nutrient requirements, *Irrigation effects, Moisture availability, Soil moisture, Nitrogen, Phosphorus, Potash, Crop production, Sodium, Calcium, Magnesium, *Absorption, Soil chemistry.
Identifiers: *India.

The effects of five moisture regimes on four wheat varieties grown on clay loam soil in 1971-72 are reported. Regimes included irrigation at 30%, 45%, 60% and 75% of available soil moisture. Higher moisture regimes increased the uptake of N, P and potash. The greatest N uptake occurred when irrigation was applied at 60% of available soil moisture; P uptake was significantly higher in Sonalika, Kalyan sona and Lalbahadur varieties. Nutrient uptake increased with greater yield. Concentrations of N, P and K did not differ significantly with different moisture regimes and varieties, possibly due to the fact that the N fraction in grain generally decreases as the amount of water applied increases, a result of increased yield from water application. Higher moisture regimes increased Ca, Mg and Na content with irrigation up to 60% of available soil moisture. (Jahns-Arizona)
W77-11092

RESPONSE OF DRYLAND WHEAT TO PHOSPHORUS FERTILIZER AS INFLUENCED BY PROFILE WATER STORAGE AND RAINFALL,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
R. Singh, R. K. Chadha, H. N. Verma, and Y. Singh.
Journal of Agricultural Science, Vol 88, No 3, p 591-595, June 1977. 2 fig, 6 tab, 11 ref.

Descriptors: *Crop response, *Wheat, *Phosphorus, *Soil water, Fertilization, Dry farming, Soil-water-plant relationships, Plant growth, Crop production, Available water, Fertilizers, Rainfall.
Identifiers: Profile water storage, Plant water content.

Field experiments were conducted with dryland wheat grown on loamy-sand and sandy-loam soils from 1973 to 1975 to determine the effects of phosphorous fertilizer, initial profile water storage, and seasonal rainfall on yield and water use. Rates of P tested were 0, 15, 30 and 45 kg P205/ha. Plant available water at seeding varied from 62 to 205 mm, seasonal rainfall from 62 to 154 mm and available P status from 9.5 to 18.5 kg P/ha; these factors determined yield response to P fertilizer. Response to P was noed up to 15 kg and 30 kg P205/ha in loamy-sand and sandy-loam soils, respectively. Wheat growth and yield were strongly correlated with available water at planting plus seasonal rainfall. Straw yield increased significantly during 1973-74 on sandy-loam soil; initial profile water storage, which results in higher vegetative growth at the initial stages, had the most influence on this yield. Total water use after P application increased by 16 mm in sandy-loam soil while remaining unaffected in loamy-sand soil. Harvest-time water content profiles indicate the fertilized crop extracted more water from layers below 135 cm in loamy-sand and 22.5 cm in sandy-loam soil. (Jahns-Arizona)
W77-11093

EFFECT OF ABSCISIC ACID ON THE TRANSPIRATION OF ZEA MAYS UNDER DIFFERENT LEVELS OF SOIL WATER POTENTIAL,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
For primary bibliographic entry see Field 2D.
W77-11094

NEW SOIL IMPLEMENT MAKES A GOOD IMPRESSION,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
R. M. Dixon.
Crops and Soils, Vol 29, No 8, p 14-16, June-July 1977. 4 fig.

Descriptors: *Dry farming, *Cultivation, *Soil treatment, *Farm equipment, *Planting management, Crop production, Soil management, Mulching, Germination, Moisture availability, Erosion control, Soil compaction.

A new no-till method for planting barren lands is presented. It involves grooving the soil with an impression cylinder to concentrate moisture and provide a good environment for seed germination and growth. This 'land imprinter' pulled by a tractor consists of a drum about 3 feet in diameter and feet long. Half of the drum has a corrugated face that imprints slots in the soil which direct rainfall into the other half of the imprint, which is made from shapes forming a geometric pattern with a V-shaped bottom to receive and hold seed and soil moisture. The corrugated section seals over during a rainfall and transfers water to the seed area, thus burying the seed, retaining moisture and insuring a good stand. The construction and operation of this imprinter is described, along with crop seeding methods. The imprinter leaves most above-ground plant material on the surface to retard runoff, sealing and evaporation, while enhancing the roughness and porosity of the soil which increases water infiltration. This implement can also be used for mulching, preparing a seedbed, wind and water erosion control, and surface compacting. Greater crop yields in drylands can be expected with its use. (Jahns-Arizona)
W77-11096

EFFECTS OF PLANT WATER STATUS ON STOMATAL ACTIVITY, PHOTOSYNTHESIS AND NITRATE REDUCTASE ACTIVITY OF FIELD GROWN COTTON,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2I.
W77-11098

WATER RELATIONS OF FIELD GROWN COTTON AND SORGHUM: TEMPORAL AND DIURNAL CHANGES IN LEAF WATER, OSMOTIC AND TURGOR POTENTIALS,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2I.
W77-11099

RESPONSE OF OATS TO WATER DEFICIT. PHYSIOLOGICAL CHARACTERISTICS,
South Dakota State Univ., Brookings. Dept. Plant Science.
For primary bibliographic entry see Field 2I.
W77-11100

RESPONSE OF OATS TO WATER DEFICIT. GROWTH AND YIELD CHARACTERISTICS,
South Dakota State Univ., Brookings. Dept. Plant Science.
For primary bibliographic entry see Field 2I.
W77-11101

THE ARIZONA GROUNDWATER CONTROVERSY AT MID-CENTURY,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 6E.
W77-11102

TRICKLE IRRIGATION AND FERTILIZATION OF TOMATOES IN SAND DUNES: WATER, AND P DISTRIBUTIONS IN THE SOIL AND TAKE BY PLANTS,
Agricultural Research Organization, Bet Dagan (Israel). Div. of Soil Chemistry and Plant Nutrition.
B. Bar-Yosef.

Agronomy Journal, Vol. 69, No. 3, p 486-491, May-June 1977. 1 fig, 11 tab, 8 ref.

Descriptors: *Irrigation effects, *Fertilization, Tomatoes, *Dune sands, *Nutrient requirements, Moisture uptake, Soil-water-plant relationships, Crop production, Crop response, Nitrogen, Irrigation practices, Soil water, Water utilization, Root zone, Leaching, Phosphorus.
Identifiers: *Trickle irrigation, Israel.

Various daily rates of water, N, and P were applied through a trickle irrigation system to tomato plants (Lycopersicum esculentum Mill.) grown on coastal dunes of fine sand in southern Israel. Fruit yields were greatest (about 110 tons/ha) when the daily average water content in the soil root volume was around 5% (w/w), N concentration in the soil solution 140 + or - 40 ppm N, and N uptake rate about 100 mg N/plant/day. Daily water consumption varied from 0.4 to 1.0 liter/plant/day, depending on leaf area and climatic conditions. In general, water use efficiency decreased with time. The amount of water used to produce 1 g dry matter was similar in all treatments (about 250 + or - 40 g water/g d.m.). Plants absorbed 30 to 50% of the added N, this low recovery probably due to leaching losses. (Jahns-Arizona)
W77-11104

DESICCATION-INDUCED DAMAGE TO THE CELL ENVELOPE OF ROOT-NODULE BACTERIA,
Tasmania Univ., Hobart (Australia). Dept. of Agricultural Science.
For primary bibliographic entry see Field 2I.
W77-11105

SOIL SURFACE SEALING CAUSED BY RAIN DROP IMPACT,
Alexandria Univ. (Egypt). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 2G.
W77-11107

SEASONAL VARIATIONS IN STOMATAL RESISTANCE IN COTTON,
Queensland Univ., Brisbane (Australia). Dept. of Agriculture.
P. Evenson, and C. W. Rose.
Agricultural Meteorology, Vol. 17, No. 5, p 381-389, November 1976. 1 fig, 2 tab, 4 ref.

Descriptors: *Seasonal, *Cotton, *Stomata, Flow resistance, Viscous flow, On-site investigations, Transpiration, Photosynthesis, Plant physiology, Evapotranspiration, Diffusivity, Moisture stress, Saturation, Leaves.
Identifiers: *Stomatal resistance, Diffusive resistance, Saturation deficit.

Marked seasonal variations in stomatal resistance were noted in freshly irrigated cotton leaves tested using a viscous flow porometer. Field measurements of viscous resistance were combined with data on stomatal anatomy to infer seasonal changes in diffusive resistance and to determine how and stomatal anatomy factors responsible for the variations. Resistances under unstressed, fully illuminated conditions increased during the cooler months of the year; gas exchange in transpiration and photosynthesis is more directly related to diffusion than to viscous resistance. Increased diffusive resistance was associated with smaller stomatal cavities and narrower slit width of stomata. Since seasonal trends were coherent between years, the results can be used in interpreting water stress effects. Changes in leaf and stomatal anatomy were reasonably related to seasonal changes in temperature, saturation deficit and factors influencing photosynthesis. (Jahns-Arizona)
W77-11108

SOLAR ENERGY RESEARCH AT CAZRI, JODHPUR--ACHIEVEMENTS AND FUTURE PLANS,
Central Arid Zone Research Inst. Jodhpur (India).
For primary bibliographic entry see Field 3A.
W77-11110

RESPONSE OF DRYLAND COTTON PLANT GROWTH, SOIL-WATER UPTAKE, AND LINT YIELD TO TWO EXTREME TYPES OF TILLAGE,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil and Water.
E. Stibbe, and A. Hadas.
Agronomy Journal, Vol. 69, No. 3, p 447-451, May-June 1977. 4 fig, 5 tab, 7 ref.

Descriptors: *Crop response, *Plant growth, *Cotton, *Moisture stress, *Cultivation, Root development, Soil-water-plant relationships, Root distribution, Dry farming, Deep tillage, Crop production, Planting management, Root zone, Soil water, Moisture uptake.
Identifiers: Lint, Bolls.

The soil-water interaction patterns of dryland cotton (Gossypium hirsutum L.) roots under two extreme tillage practices were evaluated. Treatments involved plowing to a depth of 40 cm and a no-tillage disking prior to the growing season, each replicated six times. The 2-year crop rotation consisted of summer grown cotton followed by winter wheat under dryland conditions. Plants on plowed soil had a denser and deeper root system and more extensive and prolonged above-round vegetative growth than those on minimum-tilled soil. Final lint yields did not differ in two seasons of study. Plants on plowed soil had an increasing extraction rate with consequent peak moisture stress in the reproductive stage. Those on minimum-tilled soil had a relative-constant rate in the period from emergence to early plowing and a moisture-stress-induced termination of vegetative growth. The number and dry-weight of lint-produced bolls of plants on plowed soils increased until the end, due to higher soil moisture content, but finally reached a lower weight per boll compared with those growing on minimum-tilled soil. (Jahns-Arizona)
W77-11118

IRRIGATION AND NITROGEN STUDIES IN S.23 RYEGRASS GROWN FOR SEED 2. CROP TRANSPIRATION AND SOIL-WATER STATUS,
Nottingham Univ. (England). School of Agriculture.
P. D. Hebblethwaite, and M. McGowan.
Journal of Agricultural Science, Vol. 88, No. 3, p 615-624, June 1977. 9 fig, 2 tab, 19 ref.

Descriptors: *Irrigation effects, *Crop response, *Nitrogen, *Transpiration, *Soil water, Soil-water-plant relationships, Moisture deficit, Root zone, Absorption, Nuclear moisture meters, Soil moisture, Soil investigations, Surface runoff, Irrigation efficiency, Water loss, On-site investigations.
Identifiers: *Ryegrass, Soil water deficit.

Neutron scattering was used to determine the effects of irrigation and nitrogen on the soil-water regimes developed by S.23 perennial ryegrass grown for seed in 1972 and 1974. Roots extracted water from a depth of about 105 cm by early May in 1972 and early April in 1974, with extraction from greater depths insignificant in both years. Nonirrigated plots had a maximum deficit of about 110 mm. Deficits developed rapdily in 1974 but were delayed to the end of the 1972 growing season. Maximum deficits were under 25 mm in the top 35 mm of soil with irrigation and as high as 40 mm without irrigation. Water uptake by grass roots may be impaired by deficits as small as 30 mm when undergoing inflorescence initiation. Agreement between measured crop transpiration and that calculated from meteorological data was poor, primarily because of surface runoff; losses from runoff may be as high as 50%. The neutron probe is a fast and efficient method of measuring soil moisture, to assess irrigation needs, and to determine the relationships between soil dryness at any growth stage and crop development. Conflicting results for different N regimes were probably due to a significant variation in water loss rates between replicate profiles. (See also W77-11432) (Jahns-Arizona)
W77-11121

AUTOMATIC FEEDBACK CONTROL TO MAINTAIN CONSTANT SOIL MOISTURE TENSION IN THE STUDY OF DROUGHT TOLERANCE IN RICE,
International Rice Research Inst., Los Banos, Laguna (Philippines). Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-11229

EVALUATION OF SLOW-RELEASE NITROGEN FERTILIZERS ON PENNPAR CREEPING BENTGRASS,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
D. V. Waddington, and J. M. Duich.
Agronomy Journal, Vol 68, No 5, p 812-815, September-October 1976. 3 fig, 2 tab, 11 ref.

Descriptors: *Fertilization, Nutrients, Turf grasses, Nitrogen, Urea, Crop production, Turf, Kentucky blue grass, *Fertilizers, Crop response.
Identifiers: *Bentgrass.

As new fertilizer materials become available for turfgrass fertilization, their relative merits should be evaluated under various field conditions so that sound recommendations can be made concerning their use. In this study on 'Pennpar' creeping bentgrass single applications of four slow-release N fertilizers and multiple applications of urea applied to fine, mixed, mesic Typic Hapludalf soil were compared for four consecutive growing seasons. Split applications of slow-release materials were also included in the fourth season. Clipping yields and turf color were used to evaluate response to fertilization. Growth patterns varied from year to year, but certain relationships between treatments generally remained the same: (1) greatest initial response occurred with isobutylidene diurea; (2) yields from slow-release treatments equalled or exceeded those from the urea treatment for 13 to 14 weeks, thereafter urea gave higher yields; (3) response from sulfur-coated urea and resin-coated fertilizer was intermediate between and ureaform. Split applications of slow-release sources reduced the flush of spring growth and increased turf color in the fall when single spring applications were used. The delay in response noted after isobutylidene diurea applications on Kentucky bluegrass in other experiments was not as apparent under the conditions of this study, possibly due to the incorporation of fertilizer by aerating and topdressing at the time of application and more liberal watering on the bentgrass area. (Skogerboe-Colorado State)
W77-11389

MULCH, NITROGEN, AND IRRIGATION EFFECTS ON GROWTH, YIELD, AND NUTRIENT UPTAKE OF FORAGE CORN,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
K. L. Khera, R. Khera, S. S. Prihar, B. S. Sandhu, and K. S. Sandhu.
Agronomy Journal, Vol 68, No 6, p 937-941, November-December 1976. 5 fig, 6 tab, 17 ref.

Descriptors: *Mulching, *Nitrogen, *Irrigation effects, Crop response, Nutrients, Temperature, Soil temperature, Crop production, *Corn(Field), Growth rates.

Nitrogen, irrigation, and soil-temperature regime are major factors influencing crop growth. Hot

season crops in tropical areas are reported to benefit from soil temperature reductions caused by straw mulching. But how the mulch would affect the nitrogen and irrigation requirements of the crop is not known. The independent and combined effects of two rates of straw mulch, viz., 0 and 6 metric tons/ha; three rates of nitrogen, viz., 50, 100, and 150 kg N/ha; and three levels of irrigation, viz., 7.5 cm irrigations based on irrigation water (IW)/pan-evaporation (PAN-E) ratios of 0.6, 0.9, and 1.2 on forage corn in a 2-year field experiment were studied. Green and dry forage yields and uptake of N and P significantly increased with mulching and with each successive increment of nitrogen. As the IW/PE ratio increased from 0.6 to 0.9, the green and dry forage yields and nutrient uptake increased significantly, but declined with further increase in irrigation. As a 2-year average, mulching increased the dry forage yield by 11.8 quitals/ha or 26% and showed a significant interaction with nitrogen rates. Fifty kg and 100 kg N/ha with mulch yielded as much as 100 kg and 150 kg N/ha without mulch, respectively. It is indicated that straw mulching in forage corn during hot and dry season increases yield and nutrient uptake and helps economize nitrogen. (Skogerboe-Colorado State)
W77-11390

WATER TRANSPORT FROM ROOTS TO SOIL,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W77-11391

GROWTH RATE AND NUTRIENT UPTAKE OF TWO COTTON CULTIVARS GROWN UNDER IRRIGATION,
Agricultural Research Organization, Bet Daga (Israel).
J. Halevy.
Agronomy Journal, Vol 68, No 5, p 701-705, September-October 1976. 2 fig, 3 tab, 22 ref.

Descriptors: *Cotton, Irrigation, Irrigation practices, Crop response, *Nutrients, Nitrogen, Phosphorus, Potassium, Semi-arid climates, *Growth rates, *Absorption.
Identifiers: Lint yields, Dry matter yields.

The production of high cotton yield is highly dependent on adequate growth rate and nutrient uptake about which relatively little information is available under semiarid conditions. Growth rate and N, P, K uptake of two cotton cultivars, 'Acala 1517-C' and 'Acala 4-42,' which differ in their response to K fertilizer, were investigated in an irrigated field under favorable conditions conducive to high yields. The rate of dry matter production was slow until flowering and after the first bolls opened. Up to 72 days from emergence, 15% of the total dry matter was produced; from 112 days until picking, 10%; and during the 40-day period from 72 to 112 days, 75%. Throughout this period the growth rate was nearly linear, 250 kg/ha/day. Total dry matter was 12,200 to 13,480 kg/ha. Its distribution in mature plants was 26% in the leaves, 24% in stems, 16% in burs, 21% in seeds, and 13% in lint. The lint yield was 1,700 kg/ha. Total uptake of N, P, and K was 230, 45, and 174 kg/ha. The total uptake of N and P followed that of dry matter production, whereas K was absorbed more rapidly, reaching a maximum at 112 days from emergence and then decreasing. The removal of nutrients from the field by seed and lint was 98 to 109 kg N/ha, 19 to 21 kg P/ha, and 43 to 47 kg K/ha. (Skogerboe-Coloado State)
W77-11393

AGRICULTURAL LEGISLATION'S POTENTIAL IN REDUCING DISCHARGE OF POLLUTANTS,
Agricultural Stabilization and Conservation Service, Washington, D.C. Environmental Quality and Land Use Staff.
For primary bibliographic entry see Field 5G.
W77-11395

EVALUATION OF RESISTANCE AND MASS TRANSPORT EVAPOTRANSPIRATION MODELS REQUIRING CANOPY TEMPERATURE DATA,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering; and Nebraska Univ., Lincoln. Inst. of Agricultural and Natural Resources.
For primary bibliographic entry see Field 2D.
W77-11396

ANATOMICAL RESPONSE OF POTATO STEMS AND ROOTS TO SOIL MOISTURE AND RATES OF FERTILIZER,
Maine Univ. at Orono. Dept. of Soils.
G. Singh, and R. A. Struchtemeyer.
Agronomy Journal, Vol 68, No 5, p 732-735, September-October 1976. 4 tab, 14 ref.

Descriptors: *Soil moisture, *Soil water, Fertilizer, Fertilization, Nutrients, *Potatoes, Nitrogen, Moisture stress, *Root development, Xylem.

This study was conducted to determine the effect of three moisture regimes and three rates of fertilizer on the anatomy of stems and roots of the 'Katahdin' cultivar of potato. A Caribou loam (coarse loamy, mixed frigid Dystric Eutrochrept) was used in a greenhouse experiment. The soil was placed in pots. Fertilizer at rates of 0, 168, and 336 kg N/ha, in a 10-15-15 mixture, was used. Soil moisture stresses equivalent to 30, 50, and 70% depletions of available moisture were allowed to develop. The data showed that the area of the xylem in the stems decreased as soil moisture stress increased. The highest rate of fertilizer reduced the area of the xylem, but increased the diameter of the individual vessels. In the roots the area of xylem and ploem decreased while the area of cortex increased with an increase to soil moisture stress in the 75-day experiment. The area of xylem tended to increase while the cortical tissue tended to decrease with increases in the rate of fertilization. (Skogerboe-Coloado State)
W77-11398

EFFECT OF P, CA, AND MG CONCENTRATIONS IN SOLUTION CULTURE ON GROWTH AND UPTAKE OF THESE IONS BY RICE,
National Research Center for Rice and Beans, Goiania-Goias (Brazil).
N. K. Fageria.
Agronomy Journal, Vol 68, No 5, p 726-732, September-October 1976. 5 fig, 3 tab, 28 ref.

Descriptors: Fertilization, Fertilizer, Nutrients, *Phosphorus, *Calcium, *Magnesium, *Rice, Crop response, Crop production, *Growth rates, *Absorption, Ions.

Nutrient requirements during various phases of plant growth are affected by many factors. Greater knowledge of this subject is warranted by the intensification of agriculture. The present study was undertaken to determine the effect of varying concentrations of P, Ca, and Mg on the growth and uptake patterns of these ions by rice. Rice plants were grown in culture solution of these ions. Minimum concentrations required for maximum growth were 25 microM P, 250 microM Ca, and 33 microM Mg, respectively. At higher P concentrations a linear absorption isotherm was obtained with respect to P content in the plant tissue. The critical concentration of P in the tops of 100-day old plants was 0.4%. To support maximum growth, Ca content varied from 242 to 2,373 micro g-atoms/five plants for 25 to 125 days of growth. Maximum growth was characterized by a relative absorption (I(M)) rate ranging from 14 to 320 micro g-atoms of Ca/g dry weight of roots/day during the period of cultivation. To support maximum growth, plants must absorb 13.7, 7.7, 4.3, 4.0, and 2.4 micro g of magnesium per g fresh weight of roots/hour at 25, 50, 75, and 100, and 125 days of growth, respectively. With the advancement of age, P and Ca content in plants and their utilization quotients were increased but relative growth rate and rate of Ca and Mg absorption decreased. (Skogerboe-Colorado State)
W77-11399

THE USE OF CROSSOVER DISCOUNT RATES IN IRRIGATION SCHEME DESIGN,
Bradford Univ. (England). Dept. of Economics.
D. Nudds, and A. Bottomley.
Water Resources Bulletin, Vol 12, No 2, p 277-280, April 1976. 1 fig, 1 tab.

Descriptors: *Irrigation, *Discount rates, Economics, Irrigation systems, Capital costs, Interest rate.
Identifiers: Benefit cost ratio, Rate of return.

Present values of costs on different scheme designs vary with the rate of discount chosen. One design may yield a higher present cost at a particular rate of discount and a lower present cost at another rate. Choice of scheme design will therefore depend upon the rate of discount thought to equal the oppportunity cost of capital in the nation contemplating the project. The design with the highest internal rate of return is not necessarily the one which should in all cases be selected. (Skogerboe-Colorado State)
W77-11401

TRAVELING GUN APPLICATION UNIFORMITY IN HIGH WINDS,
Agricultural Research Service, Morris, Minn. North Central Region.
H. Shull, and A. S. Dylla.
In: Transactions of the American Society of Agricultural Engineers, Soil and Water, p 254-259, Special Edition, 1976. 5 tab, 7 ref.

Descriptors: *Uniformity coefficient, *Sprinkle irrigation, Irrigation systems, Irrigation practices, Winds, Wind velocity.

Field tests of a traveling gun sprinkler irrigation system showed that increases in wind velocity must be accompanied by decreases in travel lane spacing if an acceptable water application uniformity is to be maintained. Travel lane spacing must be decreased further as the wind direction and travel direction become more nearly parallel. An empirical equation is presented to estimate lane spacing as a function of wind velocity and direction, and sprinkler water pressure, for the sprinkler tested. If travel lane spacings recommended for no-wind conditions are used, the water distribution pattern during winds will become uneven. If recommended lane spacing reductions for windy conditions are followed, the application pattern during winds may be acceptable under some wind directions; however, if winds are nearly parallel to the travel direction the application pattern will be poor. Also, if the narrow spacings recommended for winds are used, the application pattern may be poor if the wind velocity decreases. Spacings from 30 to 75 percent of the wetted diameter gave acceptable uniformity with no wind. (Skogerboe-Colorado State)
W77-11403

IRRIGATION CONTROL USING TENSIOMETERS AND SALINITY SENSORS,
Agricultural Research Service, Riverside, Calif. Dept. of Soil Science.
J. D. Oster, L. S. Willardson, J. van Schilfgaarde, and J. O. Goertzen.
In: Transactions of the American Society of Agricultural Engineers, Soil and Water, p 294-2[illegible], Special Edition 1976. 5 fig, 1 tab, 24 ref.

Descriptors: *Irrigation practices, *Irrigation systems, *Leaching, *Tensiometers, Lysimeters, Evapotranspiration, Root systems, *Salinity.
Identifiers: High-frequency irrigation, Irrigation scheduling.

Pressurized, high-frequency irrigation systems can e controlled to provide a nearly constant rescribed leaching fraction by use of salt sensors nd tensiometers in combination as a dual feed- ack system. A lysimeter experimnt evaluated the ptimum depth of sensor placement and provided xperience for the appropriate selection of control ettings, both of which are strongly dependent on oot water uptake distribution. (Skogerboe-olorado State)
/77-11404

EMPERATURE EFFECTS ON EMITTER ISCHARGE RATES,
epartment of Agriculture, Summerland (British olumbia). Research Station.
. Parchomchuk.
: Transactions of the American Society of gricultural Engineers, Soil and Water, p 690-692, pecial Edition 1976. 5 fig, 1 tab, 4 ref.

escriptors: *Temperature, *Water temperature, Viscosity, Flow rates, Uniformity coefficient, ydraulics, Irrigation, Irrigation systems, Appli- ation rates.
dentifiers: *Trickle irrigation, Drip irrigation, Emitter flow.

ne of the major requirements of trickle irrigation precise control of water application rate. To at- in optimum control, all emitters must deliver ater at equal rates and rates should not change ith time or environmental factors. There is neral agreement that discharge rates should not ry more than + or - 10 percent for uniform water plication. Variations in emitter manufacture or erating pressure are cited as the major sources emitter discharge variation (Keller and Karmeli 74). However, an additional factor which could sult in large emitter discharge variations is water nperature variation. Viscosity changes, due to anging water temperatures, cause emitter scharge variations greater than the maximum + - 10 percent limit if flow through the emitter is minar. Turbulent flow emitters, on the other nd, are not affected by viscosity changes. Water nperature variations can occur in a number of ys. Temperature variation occurs over a period time with day-night, day to day and seasaonal ather changes and from end to end of lateral es due to solar heating of black plastic pipe. ater temperatures in lateral lines as high as 77C 0F) have been reported. This study investigates effect of water temperature variation upon charge rates of several emitter types. Water nperature variation in lateral lines was mea- ed to determine expected discharge variations. ogerboe-Colorado State)
7-11406

RICULTURAL DRAINAGE WATER AS A SIS FOR WILDLIFE DEVELOPMENT IN E SAN JOAQUIN VALLEY OF CALIFOR- A,
l Conservation Service, Davis, Calif.
. Dickey, R. A. Rivera, B. J. Hewes, and M. Sussman.
Transactions of the American Society of icultural Engineers, Soil and Water, p 862-865, cial Edition 1976. 3 fig, 3 tab, 15 ref.

criptors: *Drainage, *Drainage water, arshes, Drainage effects, *California, Return /, Wildlife habitats, *Wildlife management, icultural runoff.
tifiers: *San Joaquin Valley(Calif).

ortant marshland habitat in California is esti- ed at 1.94 million ha (4.8 million acreas) with e and Federal ownership totaling about 93,555 231,000 acres). Some of the habitat area has a ial water supply, some a full supply, but much has very little water. Agricultural drainage d provide a full water supply for up to 127,170 314,000 acres) of wildlife habitat by the year . The impact of such usage would be greatly beneficial both to wildlife habitat development and to irrigated cropland. Agricultural drainage can provide a firm water supply for wildlife and the wildlife use will allow the development of on-farm drainage systems to maintain land productivity. Further, such a short-term plan would be easily adaptable and in fact complementary to a long term plan for a master drainage system to be implemented at a later date. (Skogerboe-Colorado State)
W77-11407

GRAIN SORGHUM RESPONSE TO INUNDATION AT THREE GROWTH STAGES,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
T. A. Howell, E. A. Hiler, O. Zolezzi, and C. Ravelo.
In: Transactions of the American Society of Agricultural Engineers, Soil and Water, p 876-880, Special Edition, 1976. 4 fig, 3 tab, 14 ref.

Descriptors: *Grain sorghum, *Crop response, *Crop production, Drainage, Drainage practices, *Growth stages.
Identifiers: Inundation.

Drainage design is often limited by characterizing the crop response to specific water inputs. This research evaluated grain sorghum response to inundation periods of twelve days at the early vegetative, early boot, and heading growth stages for grain sorghum. Twelve days of inundation at early vegetative growth reduced the plant stand by 5 percent and yield by 30 percent. Inundation for 12 days at the early boot stage reduced the plant stand by 2 percent and yield by 26 percent. Inundations after grain sorghum heading did not reduce yield. Inundation may cause further yield reduction by physical damage to the crop such as lodging and by increased time to maturity. (Skogerboe-Colorado State)
W77-11408

AN ASPHALT INCORPORATOR AND PACKER FOR LINING IRRIGATION DITCHES,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
For primary bibliographic entry see Field 4A.
W77-11411

REDUCING TAILWATER RUNOFF FOR EFFICIENT IRRIGATION WATER USE,
Southwestern Great Plains Research Center, Bushland, Tex.
A. D. Schneider, L. L. New, and J. T. Musick.
In: Transactions of the American Society of Agricultural Engineers, Soil and Water, p 1093-1097, Special Edition 1976. 4 fig, 3 tab, 8 ref.

Descriptors: *Tailwater, *Return flow, Irrigation, *Irrigation practices, Furrow irrigation, Surface irrigation, *Grain sorghum, Crop production, Crop response.

Tailwater runoff from 570-m graded furrows was varied from 0 to 8 hr to determine the variability of grain sorghum yield with length of run. During the first 3 to 4 hrs, cumulative infiltration into the Pullman clay loam is 5 to 7 cm. Infiltration into the slowly permeable soil then approaches the steady-state rate of less than 0.25 cm/hr. Continuing to irrigate after the entire furrow reached the steady-state infiltration rate did not significantly increase the field average yield. The root zone at the tail end of the field was not fully wetted, but the soil water was sufficient for normal plant growth, and tailwater runoff was less than 10 percent of the applied water. As a result, the irrigation water-use efficiency varied inversely as the duration of tailwater runoff. By reducing the duration of tailwater runoff, additional land could be irrigated with the limited groundwater supply. (Skogerboe-Colorado State)
W77-11412

WATER STRESS AND PHENOLOGY IN WHEAT,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
J. F. Angus, and M. W. Moncur.
Australian Journal of Agricultural Research, Vol 28, No 2, p 177-181, March 1977. 3 fig, 2 tab, 7 ref.

Descriptors: *Moisture stress, *Phenology, *Crop response, *Wheat, *Soil-water-plant relationships, Drying, Soil moisture, Plant growth, Growth stages, Growth rates, Planting management, Water requirements, On-site tests, Flowering.
Identifiers: Leaf water potential, Anthesis.

Experiments were conducted with single wheat plants (Triticum aestivum cv. Gabo) sown in tall pots in a sandy loam soil and top-watered until floral initiation when the plants experienced increasing stress as soil water was depleted. Results of early and late stress treatments show classical drying curves, with later stress causing a more abrupt fall in dawn leaf water potential, presumably because plants were larger when stress began and therefore able to exhaust the available soil water more rapidly. At intervals after the dawn leaf water potential had reached values of -5, -10, -15 bars, etc., stress was relieved with enough water for unstressed development until anthesis. Plants subjected to mild stress (down to about -15 bars) had earlier anthesis dates than well-watered controls, while those experiencing severe stress (from -25 to -40 bars) flowered after the controls. Results indicate that water stress can be an important factor affecting the phasic development of field crops and should be included in developmental models if they are to predict the timing of crops within an accuracy of a few days. (Jahns-Arizona)
W77-11427

DEVELOPMENT OF A SOLAR PUMP FOR LIFT IRRIGATION PURPOSES,
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Dept. of Solar Energy.
V. A. Baum, and A. G. Babaev.
Annals of Arid Zone, Vol 15, No 3, p 137-145, September, 1976. 2 fig, 13 ref.

Descriptors: *Solar radiation, *Water supply development, *Irrigation systems, *Pumping, Irrigation, Pumps, Arid lands, Semiarid climates, Water supply, Water resources development, Energy.
Identifiers: *Thermoelectric generators.

There is a need for low powered pumps to lift water from the ground in arid and semiarid lands. Since arid zones are characterized by an abundance of solar radiation, many attempts have been made in the last century to create small solar engines for water lifting. The need for the development of a medium size solar pump for lift irrigation purposes in arid lands and the advantages and disadvantages of four types of engines are discussed: (1) steam engines, (2) hot-air engines, (3) photocell converters of solar energy into electricity; and (4) thermoelectric generators. Steam engines and hot-air engines were found to be impracticable. Small engines using Photovoltaic cells with proper concentrators may find wider use in the near future. Thermoelectric generators seem to be more practical than the other three types of engines discussed. Design details of low power solar thermoelectric generators are presented. (Jamail-Arizona)
W77-11428

AN ASSESSMENT OF THE IMPACT OF WATER IMPOUNDMENT AND DIVERSION STRUCTURES ON VEGETATION IN SOUTHERN ARIZONA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 4A.
W77-11429

EFFECTS OF IRRIGATION HISTORY ON RESPONSES OF COTTON TO SUBSEQUENT WATER STRESS,
California Univ., Davis. Dept. of Agronomy and Range Science.
J. M. Cutler, and D. W. Rains.
Crop Science, Vol 17, No 2, p 329-335, March-April 1977. 5 fig, 2 tab, 37 ref.

Descriptors: *Irrigation effects, *Cotton, *Drought tolerance, *Moisture stress, *Crop response, Plant growth, Plant tissues, Plant physiology, Root development, Diffusion, Soil moisture, Stomata, Osmosis, Leaves, Irrigation practices, History.

A study was conducted to evaluate the response of cotton plants (Gossypium hirsutum L.) to moisture stress following a pretreatment period involving various irrigation frequencies. Water stress under conditions of low and moderate irrigation frequency limited growth, with height, dry weight of tops and leaves, and leaf area all being less with lower irrigation frequencies. The ability to recover was a function of stress intensity and/or duration. During the final drought period tissue water desorption characteristics, stomatal closure thresholds, and turgor sensitivity were different in stress-conditioned plants than in non-stressed ones. Net distribution of dry matter was modified with irrigation frequency, with a greater partitioning into root growth for lower frequency pretreatments. Several responses to subsequent water deficit were influenced by irrigation history in directions which suggest that plants subjected to stress during development have a lessened sensitivity to later stresses. Osmotic adjustment might play a role in the reduced sensitivity of hardened plants. (Jahns-Arizona)
W77-11430

ARIZONA PUMP WATER BUDGETS, 1977. (MARICOPA, PIMA, PINAL, COCHISE AND GREENLEE COUNTIES),
Arizona Univ., Tucson. Coll. of Agriculture.
For primary bibliographic entry see Field 8C.
W77-11431

IRRIGATION AND NITROGEN STUDIES IN S.23 RYEGRASS GROWN FOR SEED, 1. GROWTH, DEVELOPMENT, SEED YIELD COMPONENTS AND SEED YIELD,
Nottingham Univ. (England). School of Agriculture.
P. D. Hebblethwaite.
Journal of Agricultural Science, Vol 88, No 3, p 605-614, June 1977. 6 fig, 8 tab, 26 ref.

Descriptors: *Irrigation effects, *Nitrogen, *Crop response, *Seeds, *Perennial ryegrass, Plant growth, Soil-water-plant relationships, Soil fertilization, Moisture stress, Grasses.
Identifiers: *Ryegrass, *Seed yield, Tillers, Florets.

Field experiments with S.23 perennial ryegrass indicated irrigation caused seed yield increases of 16% in 1972 and 52% in 1974 but had no effect in the wet year of 1973. The maximum deficit in 1972 reached 110 mm at the end of July and coincided with anthesis, indicating a yield response due to increased seeds per unit area. The peak deficit in 1974 reached about 100 mm but built up earlier in the season so it was 80 mm by the time the first ears formed; yield response was due to increased fertile tillers, seeds per unit area, and 1000-seed weight. Irrigation had a slight effect on threshed straw yields, total dry matter, harvest index and total number of tillers, but effects were greatest on the crop's reproductive development. Increasing N used from 0 to 80 kg/ha increased seed yields, all seed yield components except 1000-seed weight, threshed straw yields, and total dry matter and number of tillers at most sampling dates. Quantities from 80 to 160 kg/ha had little further effect on those components except in 1972 when seed yields declined. Greater N caused an increase in florets and decrease in percentage of florets producing seed in 1972. The optimum level of applied N on this site was around 80 kg/ha, regardless of stand age or soil moisture. Moisture stress could be an important factor contibuting to yield variability in some seasons. (See also W77-11121) (Jahns-Arizona)
W77-11432

LOSS OF MOISTURE IN WHEAT AND RICE GROWN UNDER FIELD CONDITIONS, AND ITS EFFECT ON MACHINE OPERATION,
Punjab Agricultural Univ., Ludhiana (India). Coll. of Agricultural Engineering.
R. N. Kaul, and R. Kumar.
Indian Journal of Agricultural Sciences, Vol 44, No 11, p 760-767, November 1974. 2 fig, 5 tab, 5 ref.

Descriptors: *Moisture content, *Water loss, *Harvesting, *Wheat, *Rice, *Farm equipment, Dry farming, On-site investigations, Plant growth, Crop response, Crop production, Plant physiology, Soil-water-plant relationships, Moisture stress.
Identifiers: Shattering.

A study conducted with 6 wheat and 2 rice varieties revealed considerable variation in the moisture content among different varieties in the growth cycle before maturity. The rate of moisture loss varied among the different varieties, but moisture in all wheat varieties declined from 30% to below 10% in 4 to 5 days. The moisture loss pattern of the standing crop could influence a machine-harvesting system. Shattering would be less when the grain's moisture content is high, but the crop cannot be harvested with any power-driven machine if the field has not dried to give sufficient traction. Although rice's moisture loss was low, shattering increased with a delay in harvesting. Unseen stress cracks that develop in standing rice kernels could be a cause of high grain cracking in rice-milling plants. (Jahns-Arizona)
W77-11435

OPTIMIZATION OF RUNOFF AGRICULTURE ON RECLAIMED MINE LANDS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W77-11436

PREDICTION MODELS FOR MONTHLY RUNOFF,
Regional Engineering Coll., Rourkela (India).
For primary bibliographic entry see Field 4A.
W77-11437

ISRAEL STRIVES FOR EFFICIENT USE OF WATER RESOURCES,
For primary bibliographic entry see Field 3C.
W77-11439

FEASIBILITY OF INTRODUCING SOLAR-POWERED IRRIGATION ON A REPRESENTATIVE ARIZONA FARM,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
C. L. Towle, Jr.
Master of Science thesis, 1976. 102 p, 3 fig, 20 tab, 24 ref, 1 append.

Descriptors: *Cost analysis, *Cost allocations, *Pumping, *Solar radiation, *Feasibility studies, *Irrigation, *Arizona, Energy, Groundwater, Pumps, Computer models, Farm management, Crop production.
Identifiers: *Solar energy.

The possibility of improving the long-term Arizona crop industry outlook in the face of increasing energy scarcity by using solar energy as the power source for irrigation wells was examined through a representative farm feasibility approach. The study was conducted in Pinal County, Arizona. Arizona was chosen because of its need to pump irrigation water and its abundance of sun light. Four conventional energy sources are used to power irrigation wells in Arizona: natural gas, diesel fuel, LP gas, and electricity. Electricity was picked as the conventional energy source against which solar energy would be compared. A description of a representative, farm and its expenditures for energy is given. Conclusions are presented. It is estimated that solar powered irrigation systems cost four times those using electricity and that it will be about 40 years before the price of conventional energy rises enough relative to the general economy to justify the farm paying this price. (Jamail-Arizona)
W77-11440

A STUDY OF SALT LEACHING BY PONDING AND SPRINKLING IN UNSATURATED SOIL COLUMNS,
Alexandria Univ. (Egypt). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 3C.
W77-11444

EVALUATION OF RECESSION PHENOMENON IN VEGETATED BORDER IRRIGATION SYSTEM,
Udaipur Univ. (India). Coll. of Technology and Agricultural Engineering.
R. K. Singh, A. P. Mishra, and B. Anjaneyulu.
Irrigation and Power, Vol. 33, No. 4, p 521-52[illegible] October 1976. 4 fig, 2 tab, 5 ref.

Descriptors: *Recession curves, *Runoff, *Border irrigation, *Irrigation efficiency, Surface runoff, Inflow, Flow, Mathematical models, Equations, Slopes.
Identifiers: *Horizontal recession, *Vertical recession.

Recession flow of surface irrigation is important for evaluating the border method's irrigation efficiency because a relatively large volume of surface storage is available when the inflow is shut off. The phenomenon involves both horizontal and vertical recession. Vertical recession is the movement of a trailing tail of water in a vertical direction at the upstream end; horizontal recession involves the disappearance of free surface water longitudinally after the completion of vertical recession. Both types of recession are analyzed with equations given to describe the process. Results of an experiment conducted to measure recession are presented. Vertical recession time increases as slope decreases and inflow rate (depth of flow upstream) increases. Horizontal recession time increases with distance and approaches a constant value near the end of the border. (Jahns-Arizona)
W77-11445

THE CLASS ONE EQUIVALENCY FOR CERTAIN RECLAMATION PROJECTS (HEARING ON H.R. 13101, WHICH PROVIDES FOR CONSIDERATION OF THE COMPARATIVE PRODUCTION POTENTIAL OF IRRIGABLE LANDS IN DETERMINING NONEXCESS ACREAGE UNDER FEDERAL RECLAMATION LAWS).
For primary bibliographic entry see Field 4B.
W77-11446

. WATER QUANTITY MANAGEMENT AND CONTROL

A. Control Of Water On The Surface

ETERMINATION OF SEDIMENT YIELD BY RANSFERRING RAINFALL DATA,
rizona Univ., Tucson. Dept. of Systems and In-ıstrial Engineering.
or primary bibliographic entry see Field 2J.
77-10804

UTOCORRELATION CHARACTERISTICS OF YDROMETEOROLOGICAL DATA OF THE NITED STATES,
entral and Southern Florida Flood Control Dis-ct, West Palm Beach. Resource Planning Dept.
or primary bibliographic entry see Field 2B.
77-10805

HE ARNO RIVER MODEL PROBLEMS, ETHODOLOGIES AND TECHNIQUES,
entro di Ricerca IBM di Pisa (Italy).
or primary bibliographic entry see Field 2A.
77-10809

DYNAMIC-STOCHASTIC MODEL FOR ATER QUALITY IN PART OF THE DFORD-OUSE RIVER SYSTEM,
mbridge Univ. (England). Control and Systems v.
r primary bibliographic entry see Field 5B.
7-10811

TEGRATED SURVEYS OF LAND AND ATER RESOURCES FOR DEVELOPMENT RPOSES,
ernational Inst. for Aerial Survey and Earth ences, Enschede (Netherlands).
r primary bibliographic entry see Field 6A.
7-10824

E DEVELOPMENT OF MODELLING AND MULATION TECHNIQUES APPLIED TO A MPUTER-BASED TELECONTROL WATER PPLY SYSTEM,
nbridge Univ. (England).
Fallside, P. F. Perry, R. H. Burch, and K. C. rlow.
Proceedings of the IFIP Working Conference Computer Simulation of Water Resources tems. G.C. Vansteenkiste (Ed.), Ghent, Belgi-July 30-Aug. 2, 1974. American Elsevier blishing Company, Inc., New York, N.Y., p -640, 1975. 9 fig, 7 ref.

scriptors: *Water supply, *Networks, mulation analysis, Computers, Control, Reser-rs, Pipes, Pumping, Flow, Constraints, Opera-s, Programs, Water demand, Equations, thematical models, Systems analysis, Costs.
ntifiers: *Telecontrol systems, Performance in-s.

velopments in modern control theory and its ap-ations are increasingly concerned with the rall control of complex plants, containing y control variables and inputs. It is often ap-priate to use an optimal control in which the rol inputs are calculated to minimize a per-mance index subject to certain constraints im-d by the plant. This is true particularly for dis-ution systems such as water supply networks, e the operating cost is well defined and can be ded in the performance index, and thus suc-ful implementation of an optimal control leads peration of the network at minimum cost. A ssary preliminary to the establishment of a control scheme for a complex system is the setting up of an accurate mathematical model of the system. This allows the thorough testing of various control schemes for the best choice of performance index and for the must suitable choice of control algorithm with a balance between optimality in the control sense and ease of implementation in an on-line form. Herein, the significant features of water network analysis have been gathered to establish a unified model for large water supply networks from a control viewpoint. A simulation program has been established to allow the off-line investigation of control schemes for the East Worcestershire water supply network. A sample print out of source station conditions at one increment is given; the program generates a full cost summary together with the total cost of the particular operating policy. (See also W77-10806) (Bell-Cornell)
W77-10826

WATERLO, A DATA BANK AND COMPUTER SYSTEM FOR RIVER CHANNEL NETWORKS AND RIVER BASINS IN BELGIUM,
Vrije Universiteit Brussels (Belgium). Hydrology Section.
T. D'Hondt, and A. Van der Beken.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 651-660, 1975. 4 fig, 2 tab, 2 ref.

Descriptors: *River basins, *Channels, Computers, *Data collections, Networks, Computer programs, Water management(Applied), Measurement, Water quality, Water levels, Systems analysis.
Identifiers: *River Zwalm(Belgium).

Presented is a logical extension, relative to time-dependent data, of the data bank and computer system for river channels and basins denoted WATERLO. Developed is a comprehensive system whih maximizes availability of data collected by diverse administrations, institutions and agenices. The data are identified by the point location method. The index used in the WATERLO system identifies precisely and without ambiguity any location on the River Zwalm in Belgium. The masterfile possesses a sequential structure which is strictly determined by the natural hierarchy of the river basins. The extension proposed herein is on the level of the data-records with the lowest possible significance in the hierarchical structure of the main-file. One more level containing data of a dynamical nature, such as water levels and water quality measurements, enables one to introduce an 'indexed sequential' structure. (See also W77-10806) (Bell-Cornell)
W77-10827

WATER RESOURCES DATA BANK IN NEW JERSEY AND COMPUTATIONS OF EXTREME FLOWS,
Columbia Univ., New York. Seminars on Pollution and Water Resources.
For primary bibliographic entry see Field 7C.
W77-10830

LOW COST DRAINAGE NETWORKS,
South Australian Inst. of Tech., Adelaide.
D. H. Lee.
Networks, Vol. 6, No. 4, p 351-371, October 1976. 12 fig, 1 tab, 12 ref.

Descriptors: *Drainage, *Networks, *Economic efficiency, Design, Construction, Plumbing, Optimization, Computer programs, Projects, Mathematical models, Equations, Systems analysis, Structural engineering.

Described is an approach to reducing the cost of drainage networks, such as plumbing networks in buildings. The drain design problem is modelled as a specialized mathematical network called a drainage network; it is shown to be related to the Steiner problem in a directed graph. A procedure which yields a good approximation to the minimum cost drainage network is described. This network is then realized as a practical plumbing network via a software package called SCAND (System for Computer Aided Network Design) which allows for the network to be fitted to the real building. SCAND allows a designer to assemble a drainage network of arbitrary complexity from a catalogue of components and to interactively modify it to fit particular situations by moving links or relocating junctions to avoid structural beams or columns. Examples of application of the approach to real problems are given. The partitioning of the practical problem into two phases is an important feature of the method. Although it does not yield optimal solutions, the approach is probably adequate for most situations. (Bell-Cornell)
W77-10833

RESERVOIRS WITH SEASONALLY VARYING MARKOVIAN INFLOWS, AND THEIR FIRST PASSAGE TIMES,
For primary bibliographic entry see Field 2E.
W77-10836

PREDICTING INSTANTANEOUS PEAK DEMAND IN RURAL DOMESTIC WATER SUPPLY SYSTEMS,
Utah Water Research Lab., Logan.
T. C. Hughes, and R. V. Canfield.
Water Resources Bulletin, Vol. 13, No. 3, p 479-488, June 1977. 4 fig, 3 tab, 8 ref.

Descriptors: *Water supply, *Rural areas, *Domestic water, *Design criteria, *Water demand, Flow rates, Utah, Mississippi, Sampling hyrdographs, Probability, Projects, *Forecasting.
Identifiers: Peak flows, Frequency distribution.

Many rural areas of the United States still have no public domestic water systems. Typical land use patterns in these areas may require 1/2 mile or more of pipe per farm connection. Public systems serving these areas are economically feasible only if realistic short-term peak demand standards are available for their design. The lack of reliable data upon which to establish such criteria has resulted in a large variation in criteria among state and federal agencies involved in financing and in approving construction of these systems. During the summer of 1975 three distribution laterals of a rural system in Utah were master metered and instantaneous peak flows were recorded for 4 months. The metered lines served 4, 12, and 22 farm houses each. The frequency distribution of peak flows has been analyzed and compared with that developed during similar research in Mississippi and with the existing design standards of the Farmers Home Administration of the State of Utah. Despite the totally different approaches used by the two projects, close agreement is shown between this research and that accomplished in Mississippi. (Bell-Cornell)
W77-10838

WATER RESOURCE MODELING.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 6A.
W77-10840

ECOLOGICAL MODELING.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 6A.
W77-10841

REGIONAL ENVIRONMENTAL MANAGEMENT MODELING.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 6A.
W77-10842

SEASONAL AND NONSEASONAL ARMA MODELS IN HYDROLOGY,
Hackensack Water Co., Weehawken, N. J.; and Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 2A.
W77-10843

OPTIMAL STORAGE CONTROL IN A COMBINED SEWER SYSTEM,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-10846

PRESCRIPTIVE MODELS FOR NONSTRUCTURAL FLOODPLAIN PLANNING,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 6F.
W77-10847

EXTENDED PERIOD SIMULATION OF WATER SYSTEMS--PART A,
Systems Control, Inc., Palo Alto, Calif.
H. S. Rao, and D. W. Bree, Jr.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 103, No HY2, p 97-108, Proceedings paper No 12738, February 1977. 30 ref. OWRT C-6198(5221)(3).

Descriptors: *Water distribution(Applied), *Simulation analysis, *Mathematical models, Networks, Computers, Dynamics, Equations, Behavior, Long-term planning, Operations research, Reservoir storage, Pumping, Demand.
Identifiers: *Matrices(Mathematics).

A procedure is presented for simulating the behavior of a water distribution system over time. The extended period simulation capability is an important consideration in both planning and operation of water distribution systems. The important aspects of the paper are: (1) the application of efficient sparsity-oriented programming techniques for the static solution of network nodal equations using a modified Newton-Raphson procedure; and (2) the development of an integration scheme to link several static solutions, each representing an interval of time, to changes in water levels in elevated storage reservoirs, in pumping schedules and in demand patterns. The procedure is general enough to be applied to most water distribution systems. This paper has described the analytical considerations in performing an extended period simulation of water distribution systems; results of model validation using experimental data collected for San Jose Water Works will be examined in a forthcoming paper by the writers. (Bell-Cornell)
W77-10848

LINKED MODELS FOR MANAGING RIVER BASIN SALT BALANCE,
California Univ., Davis, Dept. of Civil Engineering.
O. J. Helweg, and J. W. Labadie.
Water Resources Research, Vol 13, No 2, p 329-336, April 1977. 6 fig, 8 ref. OWRT C-6301(5229)(2).

Descriptors: *River basins, *Salt balance, *Optimization, *Simulation analysis, *Economic efficiency, Management, Groundwater, Surface waters, Streams, Aquifers, Downstream, Wells, Pumping, Irrigation, Demands, Algorithms, Conjunctive use, Decision making, Equations, Mathematical models, Systems analysis, *Water quality control.
Identifiers: *Cost effectiveness, *Astran method, *Linked models, Salt transport, Cost minimization, Screening model.

A pressing problem facing the irrigation intensive areas of the world is the increasing salinity of groundwater. A cost-effective salinity management technique, called the accelerated salt transport (Astran) method, has been developed which may be feasible for many stream aquifer systems. The basic idea is to encourage application of pumped water downstream of the well from which it is pumped rather than within its vicinity. In this way a mechanism is established for accelerating the downstream transport of salts in the groundwater at a more rapid rate than would occur naturally through convection and dispersion while still satisfying irrigation demands. A management algorithm is developed for implementing the Astran method which combines an optimizing model with a detailed quantity-quality simulation model. The optimizing model generates least-cost alternatives for distributing water over the basin. These alternatives are subsequently examined by the simulation model as to their effectiveness in controlling the salt balance. A parameter in the optimizing model can be adjusted so as to produce a desired degree of salinity control. The management algorithm has been applied to the Bonsall Subbasin in the San Luis Rey River Basin in order to test its effectiveness. Results of the case study indicate that the Astran method: (1) is cost-effective, requiring roughly 10% of the cost of tiling for this area; (2) encourages balanced conjunctive use of surface water and groundwater; and (3) is flexible enough to respond to future management needs. (Bell-Cornell)
W77-10849

INDEX OF LAKE BASIN LAND USE FOR LAND USE PLANNING PURPOSES,
Vermont Agricultural Experiment Station.
For primary bibliographic entry see Field 5G.
W77-10852

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1975.
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10854

WATER RESOURCES DATA FOR MISSOURI, WATER YEAR 1975.
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10855

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1975.
Geological Survey, Richmond, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10856

THE BIG THOMPSON RIVER FLOOD OF JULY 31-AUGUST 1, 1976, LARIMER COUNTY, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.; and Colorado Water Conservation Board, Denver.
For primary bibliographic entry see Field 2E.
W77-10859

THEORETICAL ANALYSIS OF FLUID FLOW AND ENERGY TRANSPORT IN HYDROTHERMAL SYSTEMS,
Geological Survey, Louisville, Ky. Water Resources Div.; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-10861

FINITE-DIFFERENCE MODEL OF TWO-DIMENSIONAL, SINGLE-, AND TWO-PHASE HEAT TRANSPORT IN A POROUS MEDIUM--VERSION I,
Geological Survey, Louisville, Ky. Water Resources Div.; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-10862

SUMMARY STATEMENTS OF WATER RESOURCES INVESTIGATIONS 1976-77,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 9C.
W77-10863

SIMULATION STUDIES OF FLOW AND SEDIMENT TRANSPORT USING A MATHEMATICAL MODEL, ATCHAFALAYA RIVER BASIN LOUISIANA,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.; and Geological Survey, Miami Fla. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-10867

AN ANALYSIS AND COMPARISON OF LANDSAT-1, SKYLAB (S-192) AND AIRCRAFT DATA FOR DELINEATION OF LAND-WATER COVER TYPES OF THE GREEN SWAMP, FLORIDA,
Geological Survey, Miami, Fla. Water Resources Div.
A. L. Higer, A. E. Coker, N. F. Schmidt, and L. E. Reed.
NASA Skylab EREP Report, November 1975. 3 p, 12 fig, 2 tab, 15 ref, 2 append.

Descriptors: *Remote sensing, *Surface water, *Vegetation, *Aircraft, *Analytical techniques, Data collections, Satellites(Artificial), Computer programs, Model studies, Evaluation, Data processing, Mapping.
Identifiers: *Land-water cover types, *Categorization, *Green Swamp(Fla), Landsat-1, Skylab (S-192).

Landsat-1 and Skylab (S-192) data from the Green Swamp area of central Florida were categorized into five classes: water, cypress, other wetlands, pine, and pasture. These categories were compared with similar categories on a detailed vegetative map made from low altitude aerial photography. Agreement of Landsat and Skylab categorized data with the vegetation map were 61 percent and 83 percent respectively. The Green Swamp vegetative categories may be widespread but often consist of numerous small isolated areas because Landsat has a greater resolution than Skylab it is more favorable for mapping the small vegetative categories. However, with the additional spectral resolution available in the S-192 data it is possible to categorize complex areas such as the Green Swamp, provided the investigator has adequate ground truth to establish the signatures categories and to merge them into logical composites. (Woodard-USGS)
W77-10871

THE DELAWARE RIVER BASIN LANDSAT DATA COLLECTION SYSTEM EXPERIMENT,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-10877

FLOOD PLAIN INFORMATION REPORT PRAIRIE CREEK, LINN COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.

Prepared for the Iowa State Natural Resources Council, February 1966. 27 p, 2 tab, 9 plates, 7 photos.

Descriptors: *Floods, *Flood profiles, *Flood control, *Flood data, *Non-structural alternatives, *Flood plain zoning, *Iowa, Building codes, Flood peak, Flood plains, Flood flow, Flood damage, Standard Project Flood.
Identifiers: Prairie Creek(IA), Cedar Rapids(IA), Fairfax(IA), Norway(IA), Watkins(IA), Blairstown(IA), Keystone(IA), Linn County(IA), Mud Creek(IA), Weasel Creek(IA), Intermediate Regional Flood, Encroachment lines.

The study area involves 216 square miles of the Prairie Creek watershed, including the tributaries of Mud Creek, and Weasel Creek, and the towns of Cedar Rapids, Fairfax, Norway, Watkins, Blairstown, and Keystone in Linn County, IA. Development in the flood plain is not extensive, consisting primarily of agricultural land with scattered industrial and residential sites in the lower watershed. Damage from past floods has been light. Extensive future developments in the flood plain are anticipated due to population growth trends. Data were obtained from county records, newspaper files, and historical documents. Flooding occurs in the late winter and early spring, and is caused by snowmelt, heavy rains, or both. Recent major floods occurred in 1959, 1961, and 1965. As in many previous years, damage was concentrated in the lower flood plain, in and around Cedar Rapids. At the lower study limit, the Intermediate Regional Flood is expected to crest at 768.7 feet and the Standard Project Flood will crest at 769.8 feet. Additional flood plain development will increase the flood crest levels. Although intended for informational purposes, this report also describes and recommends non-structural flood control measures, including encroachment lines, zoning, subdivision regulations, building codes, and flood control regulations. (Nessa-NC)
W77-10909

WAPSINONOC CREEK FLOOD PLAIN INFORMATION, MUSCATINE COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
Prepared for the Iowa State Natural Resources Council, June 1971. 48 p, 8 tab, 12 plates, 34 fig.

Descriptors: *Floods, *Flood damage, Flood flow, Flood control, Flood data, *Non-structural alternatives, *Flood plain zoning, *Iowa, Building codes, Flood peak, Historic floods, Flood plains, Flood frequency, Flood profiles, Standard Project Flood.
Identifiers: *Wapsinonoc Creek(IA), West Liberty(IA), Muscatine County(IA), Intermediate Regional Flood, Encrochment lines.

The study area covers the West Branch, Middle Branch, and East Branch of Wapsinonoc Creek including West Liberty, in Muscatine County, IA. The drainage area is 108 square miles in size at the upper limit of the study reach. Some residential and commercial developments are on or adjacent the flood plain. There are no continuous stream gaging records for the basin. Following a large flood on June 7, 1967 rainfall and runoff data were collected by the U.S. Geological Survey. Indirect discharge measurements were made at several locations in the basin. Major floods are caused by heavy general rains or intense local thunderstorms when they occur in the spring and early summer. The greatest known flood flow occurred on June 7, 1967. Rainfall at various places in the watershed ranged from 4 to 13 inches. The peak discharge was 27,400 cubic feet/sec (cfs). It is estimated that the Intermediate Regional Flood (IRF) would discharge 20,800 cfs and would be 0.8 feet lower than the June 1967 flood. The Standard Project Flood (SPF) would be 1 to 5 feet higher than the 1967 flood. Although intended for informational purposes, this report recommends and describes non-structural flood control measures, including encroachment lines, zoning, subdivision regulations, building codes, and flood plain regulations. (Nessa-NC)
W77-10910

WINNEBAGO RIVER AND TRIBUTARIES, FLOOD PLAIN INFORMATION, FOREST CITY, IOWA.
Army Engineer District, Rock Island, Ill.
Prepared for the Iowa State Natural Resources Council, June 1973. 39 p, 6 tab, 32 fig, 17 plates.

Descriptors: *Floods, Flood profiles, *Flood frequency, *Flood control, Flood data, *Non-structural alternatives, *Flood plain zoning, *Iowa, Standard Project Flood, Building codes, Flood peak, Flood flow, Flood damage, Historic flood, Flood plains.
Identifiers: *Winnebago River(IA), Silver Creek(IA), Bear Creek(IA), Twister Creek(IA), Forest City(IA), Winnebago County(IA), Hancock County(IA), Intermediate Regional Flood, Encroachment lines.

The study area includes the portions of Forest City, Iowa, and its suburbs subject to flooding from the Winnebago River, Silver Creek, Bear Creek, and Twister Creek in Winnebago and Hancock Counties, IA. The total drainage area of these streams is 273 square miles. Residential, commercial and agricultural properties along these streams have been severely damaged by past floods. There is a stream gaging station 30 miles downstream from Forest City, but there are no gages installed in the study area itself. The U.S. Geological Survey obtained stage and discharge measurements on the Winnebago following the floods of March 1962 and April 1965. Newspaper files and historical documents provided additional information. Flooding occurs at any time of the year and is caused by intense rainfall with or without snowmelt. Thirteen bridges in the area pose serious obstructions to flood flow since all would be overtopped by an Intermediate Regional Flood (IRF). At the lower study limit the IRF is expected to discharge 13,000 cubic feet/sec (cfs), and the Standard Project Flood (SPF) will discharge 22,000 cfs. Although intended for informational purposes, this report also describes and recommends non-structural flood control measures, including encroachment lines, zoning, subdivision regulations, building codes, and flood control regulations. (Nessa-NC)
W77-10911

FLOOD PLAIN INFORMATION: BAYOU PLAQUEMINE BRULE, CHURCH POINT, LOUISIANA.
Army Engineer District, New Orleans, La.
Prepared for the Town of Church Point, LA., October, 1972, 23 p, 12 fig, 14 plates, 7 tab.

Descriptors: *Louisiana, *Floods, *Flooding, *Peak discharge, *Flood plains, Flood flow, Streamflow forecasting, Flood forecasting, Flood profiles, Hurricanes, Historic floods, Flood data, Flood frequency, Flow duration, Flow characteristics, Flood protection, Channel improvement, Standard Project Flood.
Identifiers: Acadia Parish(LA), Church Point(LA), *Bayou Plaquemine Brule, Bayou des Cannes, Intermediate Regional Flood.

Bayou Plaquemine Brule, draining 363 square miles, is a tributary of Bayou des Cannes. The study covers 7.42 miles of Bayou Plaquemine Brule in the northeast section of Acadia Parish, in which the town of Church Point is located. The stream has an average slope of 1.9 feet per mile. The flood plain ranges from 0.25 to 2 miles in width, and is largely undeveloped with some residential areas and small commercial establishments. The main flood season is winter and spring, though the greatest known flood resulted from a hurricane in August 1940. Channel improvements along 24 miles of the stream, completed in 1965, are the chief flood damage reduction measure. At the lower limit of the study area, peak discharge for an Intermediate Regional Flood and Standard Project Flood are 8,400 cubic feet per second (cfs) and 18,000 cfs, respectively. Water surface elevations for the IRF and SPF would exceed the underclearance elevation for all three bridges in the study area. The IRF would reach a height of 5.5 feet in 16.5 hours, remaining above bankfull for 47 hours. The SPF would rise 7.9 feet in 26 hours, remaining above bankfull for 70 hours. A flood occurring in December 1971 was the worst since the 1940 flood; surveys indicate the high water mark for this flood was about one foot below the IRF. (Gentry-NC)
W77-10912

DES MOINES RIVER FLOOD PLAIN INFORMATION, DES MOINES, IOWA.
Army Engineer District, Rock Island, Ill.
Prepared for the Iowa State Natural Resources Council, April 1970. 65 p, 9 tab, 36 fig, 23 plates.

Descriptors: *Floods, *Flood control, *Flood plain zoning, Flood profiles, *Non-structural alternatives, *Iowa, Building codes, Flood peak, Flood flow, Flood damage, Flood frequency, Historic flood, Flood data, Flood plains, Standard Project Flood.
Identifiers: *Des Moines River(IA), Des Moines(IA), Polk County(IA), Intermediate Regional Flood, Encroachment lines.

The study area includes 11 miles of the Des Moines River flood plain starting from the Center Street dam in the city of Des Moines to the downstream side of the Saylorville dam in Polk County, IA. There are some residential and commercial establishments on or adjacent to the flood plain. Stream and daily wire-weight gaging records have been kept since 1941. Newspaper files and historical documents provided additional data. Major flooding occurs in early spring and early summer due to snowmelt, or heavy rains, or both. Seven bridges and one dam obstruct the river. These may cause ice jam problems during a snowmelt flood. A recent large flood occurred on April 10, 1965, cresting at 28.7 feet. If the Saylorville Reservoir is used for flood control, the Intermediate Regional Flood would crest at 20.9 feet, and the Standard Project Flood would crest at 30.6 feet. Regulation of development in the flood plain is suggested as a solution to the flooding problem. Zoning ordinances, encroachment lines, subdivision regulations and building codes are described. This report does not recommend the specific techniques to be used. (Nessa-NC)
W77-10914

SOUTH BRANCH KISHWAUKEE RIVER FLOOD PLAIN INFORMATION, DE KALB COUNTY, ILLINOIS.
Army Engineer District, Rock Island, Ill.
Prepared for Illinois Department of Public Works and Buildings, Division of Waterways, June 1971. 63 p, 11 tab, 18 fig, 22 plates.

Descriptors: *Floods, *Flood damage, *Flood control, Flood data, *Non-structural alternatives, *Flood plain zoning, *Illinois, Building codes, Flood peak, Historic flood, Flood plains, Flood flow, Peak discharge, Standard Project Flood.
Identifiers: *South Branch Kishwaukee River(IL), *East Branch Kishwaukee River(IL), DeKalb County(IL), Sycamore(IL), Genoa(IL), Kirkland(IL), Kingston(IL), Intermediate Regional Flood, Encroachment lines.

The study area involves 45 miles of the South Branch and 5 miles of the East Branch of the Kishwaukee River, including the cities of DeKalb, Sycamore, Kirkland, Kingston and Genoa, in DeKalb County, IL. Some residential and commercial buildings are in the flood plains in the urban areas. Flood data were obtained from the U.S. Geological Survey gages, one maintained since 1929, and the other from 1926 to 1933. Supplemen-

tary data were obtained from newspaper files and historical records. The main flood season occurs in late winter and early spring, resulting from snowmelt and heavy general rains. Intense local thunderstorms can cause floods in other seasons. The greatest recorded flood flow occurred on January 5, 1946, discharging 6,840 cubic feet/sec (cfs) at the Fairdale gaging station and cresting at 9.35 feet. The maximum recorded stage of 10.0 feet occurred on February 24, 1949, discharging 6,00 cfs. The Intermediate Regional Flood (IRF) would be 2.7 feet higher than the January 1946 flood at the Fairdale gaging station, while the Standard Project Flood (SPF) would be 6.3 feet higher. Future developments in the flood plain could cause higher surface water elevations. Although intended for informational purposes, this report describes and recommends non-structural flood control measures, including encroachment lines, zoning, subdivision regulations, building codes, and flood control regulations. (Nessa-NC)
W77-10915

FLOOD PLAIN INFORMATION: BULL CREEK, AUSTIN, TEXAS.
Army Engineer District, Fort Worth, Tex.
Prepared for the City of Austin, Texas, June, 1976, 39 p, 7 fig, 15 plates, 6 tab.

Descriptors: *Texas, *Floods, Flood flow, *Flood forecasting, *Peak discharge, *Flood plains, Flood profiles, Historic floods, Flood data, Flood frequency, Flow duration, Flow characteristics, Flood protection, Non-structural alternatives, Building codes, Land use, Dams.
Identifiers: *Bull Creek, Austin(TX), 10-year flood, 50-year flood, 100-year flood, 500-year flood.

Bull Creek drains 31.63 square miles in Travis County, Texas, in the vicinity of Austin. Its principal tributarties are West Bull Creek and Cow Fork Bull Creek. Bull Creek drains into the Colorado River. Little development presently exists in the flood plain, but there is great potential for future growth. Most floods occur as the result of frontal type storms, remnants of tropical hurricanes, and thunderstorms, usually in the spring or fall. Obstructions to flood flow include vegetation, dams, bridges and culverts. In the study area the only flood control measures are minor channel improvement and realignment near highways crossings, although a comprehensive plan for regulating development exists for the city of Austin, which includes creek ordinance, subdivision ordinance and building codes. Little specific data are available on past floods. Peak discharges at the mouth of Bull Creek for a 10-year, 50-year, 100-year and 500-year flood are 15,500, 24,000, 28,000 and 38,100 cubic feet per second, respectively. At the confluence with West Bull Creek, a 100-year flood will rise 22.6 feet above bankfull at a rate of 5.8 feet per hour and be above bankfull for 10.9 hours. A 500-year flood will crest at 24.5 feet and remain above bankfull for 21.1 hours, rising at a rate of 6.2 feet per hour. (Gentry-NC)
W77-10918

FLOOD PLAIN INFORMATION: COLORADO RIVER-ONION CREEK TO MONTOPOLIS BRIDGE, AUSTIN, TEXAS.
Army Engineer District, Fort Worth, Tex.
Prepared for City of Austin, TX., September, 1976, 39 p, 6 fig, 17 plates, 6 tab.

Descriptors: *Texas, *Floods, Flood flow, *Flood forecasting, Flood profiles, *Peak discharge, Flow characteristics, *Flood plains, *Flood protection, Storms, Historic floods, Flood data, Flood frequency, Flow duration, Flood damage, Non-structural alternatives, Dams, Reservoirs, Erosion control.
Identifiers: 10-year flood, 50-year flood, 100-year flood, 500-year flood, *Colorado River(Tex), Austin(TX), Onion Creek(TX), Lake Travis(TX).

The study reach includes 14.7 miles of the Colorado River in Travis County, Texas, extending from the confluence with Onion Creek to Montopolis bridge (US Highway 183). The average streambed slope in the study reach is 1.79 feet per mile. The flood plains are lightly populated with the main development being agriculture and the mining of sand and gravel. Most floods are the result of intense rains during springs and fall, usually frontal type storms. The U.S. Geological Survey (USGS) and the U.S. Weather Bureau have maintained gauges in several different locations since 1898; historical information was also obtained from the USGS records, newspaper records, and the Texas Department of Highways and Public Transportation. Four bridges located in the study area may impede floodflows during storms. Flood control measures consist mostly of a series of upstream reservoirs and runoff detention structures. However, only Lake Travis (Mansfield dam) has allocated storage for flood control. Large floods have occurred many times on the Colorado River; the largest flood before storage began in Lake Travis in 1940 was in June, 1935. Since the construction of the lake, no outstanding floods have occurred. Peak discharge for a 10-year, 50-year, 100-year and 500-year flood would be 50,000, 102,000, 170,000 and 335,000 cubic feet per second (cfs) respectively. Velocities for a 100-year flood would range from 4.8 to 10.7 feet per second in the main channel, and 0.8 to 2.9 ft/sec in the overbank areas. A 100-year flood would rise at a rate of 2.1 feet per hour and remain 63 hours above bankfull. Guidelines for flood plain management are presented. consisting mostly of non-structural alternatives. (Gentry-NC)
W77-10919

FLOOD PLAIN INFORMATION: BARTONS AND SINKING CREEKS, LEBANON, TENNESSEE.
Army Engineer District, Nashville, Tenn.
Prepared for City of Lebanon, TN., June, 1971, 39 p, 9 fig, 11 plates, 8 tab.

Descriptors: *Tennessee, *Floods, Flood flow, Flood forecasting, *Peak discharge, *Flood plains, Historic floods, Flood data, Flood frequency, Flow duration, Flow characteristics, Flood protection, Standard Project Flood.
Identifiers: *Bartons Creek(TN), *Sinking Creek(TN), Lebanon(TN), Intermediate Regional Flood.

The report covers 7.1 miles of Bartons Creek and 4.5 miles of Sinking Creek in and near the city of Lebanon, Tennessee. Stream gage records are fragmentary and unreliable. The greatest known flood occurred in August, 1939 when Sinking Creek registered a peak discharge of approximately 5,000 cubic feet per second (cfs). The main flood season is winter and early spring. The flood plain of Sinking Creek is heavily developed with commercial and residential areas, while the flood plain of Bartons Creek is devoted mostly to agriculture and related purposes. Several major roads and railroads have been repeatedly inundated by past floods. An Intermediate Regional Flood and Standard Project Flood on Bartons Creek at U.S. Highway 70N Bridge would have peak discharge of 13,000 and 27,000 cfs respectively; and 6,300 and 13,500 cfs respectively on Sinking Creek at Public Square. Channel velocities for Bartons and Sinking Creeks are 7 and 6 feet per second respectively, and less than 2 feet per second overbank velocity for both floods. Floods rise rapidly, between 2.5 and 3 feet per hour and last 14 and 17 hours for an SPF. (Gentry-NC)
W77-10920

FLOOD PLAIN INFORMATION: BAYOU FOUNTAIN, BATON ROUGE, LOUISIANA.
Army Engineer District, New Orleans, La.
Prepared for the City of Baton Rouge, LA., June, 1971, 62 p, 13 fig, 46 plates, 18 tab.

Descriptors: *Louisiana, *Floods, *Flood flow, *Flood profiles, *Peak discharge, *Flood peak, *Flow duration, Flow characteristics, *Flood plains, Streamflow forecasting, Historic floods, Flood data, Flood frequency, Flood damage, Flood protection, Channel improvement, Standard Project Flood.
Identifiers: *Bayou Fountain(LA), Baton Rouge(LA), Intermediate Regional Flood, Elbow Bayou(LA), Bayou Fountain North Branch(LA), Bayou Fountain South Branch(LA), Amite River(LA).

The report covers Bayou Fountain and its tributaries from its confluence with Bayou Manchac to Louisiana State Highway 42 in the vicinity of Baton Rouge. The major tributaries are Elbow Bayou, Bayou Fountain North Branch, and Bayou Fountain South Branch, draining 12.4, 0.8 and 1.3 square miles, respectively. The main flood season for downstream portions of the study reach is winter and spring. Flooding on the tributaries is caused by intense rainfall which can occur at any time of the year. Channel improvements are the only flood damage prevention measures. There is residential and commercial development in the study area. Data were obtained from two gaging stations, one maintained since 1945 and the other since 1955. Information was also obtained from local residents and public officials, and newspaper files. The greatest recorded flood was in March, 1921, with the second greatest flood occurring in May, 1953. The peak discharge for the 1953 flood was 1,600 cubic feet per second (cfs). Peak discharges for an Intermediate Regional Flood and Standard Project Flood on Bayou Fountain are 6,500 cfs and 12,000 cfs, respectively. Channel velocities would be 6 feet per second, 2 ft/sec in the overbank areas. The rate of rise for flooding is 0.22 feet per day with floods remaining above bankful for 17 days. (Gentry-NC)
W77-10921

WATER MANAGEMENT FOR SHORELINE EROSION CONTROL ON THE CHIPPEWA FLOWAGE,
Wisconsin Univ., Madison. Environmental Resources Unit.
For primary bibliographic entry see Field 4D.
W77-10925

NORTH FORK MAQUOKETA RIVER AND TRIBUTARIES FLOOD PLAIN INFORMATION, CITY OF DYERSVILLE, IOWA.
Army Engineer District, Rock Island, Ill.
Prepared for the Iowa State Natural Resources Council, June 1973. 52 p, 7 tab, 22 plates, 42 fig.

Descriptors: *Floods, *Flood damage, *Flood profiles, *Flood control, *Flood data, *Non-structural alternatives, *Flood plains, *Flood plain zoning, *Iowa, Building codes, Flood peak, *Historic floods, Flood frequency, Peak discharge, Standard Project Flood.
Identifiers: *North Fork Maquoketa River(IA), *Bear Creek(IA), *Hewitt Creek(IA), *Dyersville(IA), Intermediate Regional Flood, Encroachment lines.

The study area includes the North Fork Maquoketa River, Bear Creek, Hewitt Creek, and an unnamed tributary to Hewitt Creek insofar as they affect the town of Dyersville and its suburbs. Developments in the flood plain are residential, commercial, and agricultural, and have been heavily damaged by past floods. There are no stream gages installed in the study area, but the Corps of Engineers established high water marks along the stream segments in the study area following the flood of September 13, 1972. The U.S. Geological Survey also established high water marks along the North Fork Maquoketa River following the August 2, 1972 flood. Newspaper files and historical documents provided supplementary information. Floods are caused by intense rainfall or snowmelt. Rainfall-induced floods occur an

e, while snowmelt occurs in the spring. The rst recorded flood occurred on June 15, 1925, sting at 941.8 feet at the gaging station at the up- eam side of the First Avenue bridge. The worst ent floods of record occurred on September 13, 2, cresting at 937.9 feet, and August 2, 1972, sting at 936.8 feet. The Intermediate Regional od (IRF) would crest at 941.2 feet at the same ing station, while the Standard Project Flood F) would crest at 947.8 feet. Although intended informational purposes, this report recom- nds and describes non-structural flood control asures, including encroachment lines, zoning, division regulations, building codes, and flood n regulations. (Nessa-NC)
7-10929

E NATIONAL FLOOD INSURANCE PRO- AM AND COASTAL REAL ESTATE VELOPMENT: THE EXPERIENCE OF STERLY, CHARLESTOWN, AND SOUTH GSTOWN, RHODE ISLAND,
v England River Basins Commission, Boston, s.
primary bibliographic entry see Field 6F.
7-10931

EAMFLOW TRANSMISSION LOSSES IN STERN KANSAS,
logical Survey, Lawrence, Kans.
Jordan.
nal of the Hydraulics Division, American ety of Civil Engineers, Vol. 103, No. HY8, eedings Paper 13156, p 905-919, August 1977. g, 2 tab, 4 ref, 2 append.

riptors: *Alluvial channels, *Floods, nsas, Hydrology, Runoff, Streams, Water Streamflow, Water resources, Groundwater, el studies, Storm runoff.
ifiers: *Alluvial streams, *Streamflow trans- on losses, Flow volume, Alluvial material, age region.

e was substantial uniformity in the transmis- loss characteristics of storm runoff for ns in western Kansas. Data from pairs of g stations for runoff events that had flow at pper station but little or no runoff in the age area between the upper and lower station ed losses that were proportional to the flow ne at the upper station. The variation among ns was less than the variation among dif- t runoff periods on the same stream. The nission loss in one mile (1.6 km) for medium- ge sized streams n western Kansas averaged 2% of the flow volume at the beginning of ile. Given the flow volume at some location, ss in the first mile could be estimated and alue could be used to calculated a loss for the ce to another location downstream. Availa- ata indicated that transmission losses oc- l in central Kansas, but transmission losses h flow were uncommon or nonexistent in n Kansas. Estimates of transmission loss d in streamflow modeling and flood forecast- uture studies amy determine transmission to soil moisture, evapotranspiration, bank e, and groundwater storage. (Roberts-ISWS)
0966

GED MATERIAL AS A NATURAL URCE--CONCEPTS FOR LAND IM- EMENT AND RECLAMATION,
Engineer Waterways Experiment Station, urg, Miss. Environmental Effects Lab.
aucier.
ble from the National Technical Informa- rvice, Springfield, VA 22161 as AD-A024 rice codes: A03 in paper copy, A01 in che. Miscellaneous Paper D-76-13, March 9 p, 28 fig.

tors: *Dredging, *Silts, Land, *Natural es, *Land management, *Land reclama- tion, Landfills, Navigation, Reclamation, Navigable waters, Lake sediments.
Identifiers: *Dredged material, Estuarine sediments, River sediments, Pollution potential.

Maintenance of navigation in the Nation's waterways requires the annual dredging of more than 400 million cubic yards of estuarine, lacustrine, and riverine sediments. Typically, the dredged material is fine grained, and a significant fraction of the material contains various contaminants originating from urban, industrial, and/or agricultural runoff. Because of the pollution potential of such material, it must be confined on land rather than disposed of in open water. Considering the small percentage usable as construction material and the poor foundation conditions afforded at the confinement facilities, the disposal alternative aggravates the conflict between waste disposal and productive uses of dredged material, with or without mechanical or chemical treatment. Several studies were initiated seeking ways to use the fine-grained, low density, high-water-content, nutrient-rich characteristics as assets. Initial and subsequent studies seek to identify limiting factors and relveant parameters, whether the parameters are technical, economic, social, or political, and to develop decision making methodologies. (Roberts-ISWS)
W77-10983

A COMPARISON OF ENVIRONMENTS OF RAIN FORESTS IN DOMINICA AND PUERTO RICO,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2G.
W77-10988

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT: VOLUME 8, RESERVOIR YIELD,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 8B.
W77-10991

SEALING MATERIAL FOR PREVENTING WATER-LEAKAGE AND METHOD OF MANUFACTURING SAME,
Toray Industries, Inc., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 8G.
W77-11015

TIJUANA RIVER FLOOD CONTROL PROJECT,
For primary bibliographic entry see Field 6E.
W77-11167

FLOOD DISCHARGES OF RIVERS DRAINING ACROSS PLAINS TO OCEANS USING THE SARTHE AND THE MAYENNE (IN WESTERN FRANCE) AS EXAMPLES (CONTRIBUTION TO THE METHODOLOGY OF FLOOD FLOWS BY AN EXTENSION OF THE GRADEX METHOD), (LES DEBITS DE CRUE DES RIVIERES DES PLAINES OCEANIQUES A TRAVERS L'EXEMPLE DE LA SARTHE ET DE LA MAYENNE (FRANCE DE L'OUEST) (CONTRIBUTION A LA METHODOLOGIE DES DEBITS DE CRUE PAR UN ESSAI D'EXTENSION DE LA METHODE DU GRADEX),
Tours Univ. (France).
For primary bibliographic entry see Field 2A.
W77-11205

ADVANCES IN BOX-JENKINS MODELING, 1. MODEL CCONSTRUCTION,
Waterloo Univ. (Ontario). Dept. of Systems Design.
For primary bibliographic entry see Field 2A.
W77-11214

ADVANCES IN BOX-JENKINS MODELING, 2. APPLICATIONS,
Waterloo Univ. (Ontario). Dept. of Statistics.
For primary bibliographic entry see Field 2A.
W77-11215

DISTRIBUTED NUMERICAL MODEL FOR ESTIMATING RUNOFF AND SEDIMENT DISCHARGE OF UNGAGED RIVERS, 1. THE INFORMATION SYSTEM,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 2A.
W77-11218

DISTRIBUTED NUMERICAL MODEL FOR ESTIMATING RUNOFF AND SEDIMENT DISCHARGE OF UNGAGED RIVERS, 2. MODEL DEVELOPMENT,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-11219

DISTRIBUTED NUMERICAL MODEL FOR ESTIMATING RUNOFF AND SEDIMENT DISCHARGE OF UNGAGED RIVERS, 3. COMPARISON WITH OTHER SIMPLE TECHNIQUES,
McGill Univ. Montreal (Quebec), Department of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 2A.
W77-11220

AN ANALYSIS OF FLOOD LEVEE RELIABILITY,
Princeton Univ., Princeton, N. J. Dept. of Civil Engineering.
E. Wood.
Water Resources Research, Vol 13, No 3, p 665-671, June 1977. 11 fig, 2 tab, 11 ref.

Descriptors: *Flood protection, *Levees, *Reliability, *Mathematical models, Failures, Risks, Statistical methods, Analytical techniques, Stochastic processes, Analysis, Probability, Floods, Systems analysis, Flood frequency, Costs, Frequency, Flood recurrence interval.

In most studies of flood levee reliability, the probability of failure is taken to be equal to the probability that the flood peak discharge will exceed the capacity of the channel-levee system. Such an analysis assumes that levees fail only by overtopping, whereas in many cases, levees fail at discharges much below the channel capacity. The discharge which levees fail was assumed to be a random variable with a particular distribution. The results on the flood frequency curve were presented for two conditions: one for the failure discharge having a uniform probability density function, and the other for failure discharges having a quadratic distribution. In similar manner, the effects on the net benefits from levee construction also were analyzed and results were given. For the example presented, a deterministic analysis could overestimate the expected return period by up to 300% and underestimate expected annual damage by 50%. The procedures developed also can be applied to the analysis of other systems, for example, the distribution of isotherms from thermal power plant outfalls, the reliability of large water resources systems for flood control or water supply, etc. Many of the extensions may require numerical analysis as opposed to the analytical derivations presented here, but that should not limit applications. (Humphreys-ISWS)
W77-11224

ON DETERMINING DISTANCES THROUGH STREAM NETWORKS,
Hull Univ. (England). Dept. of Geography.
R. I. Ferguson.

Water Resources Research, Vol. 13, No. 3, p 672-674, June 1977. 1 fig, 3 tab, 6 ref.

Descriptors: *Networks, *Drainage systems, *Streams, Regional analysis, Junctions, Analytical techniques, Distances, River systems, Drainage patterns(Geologic), Drainage density.
Identifiers: *Topology, Topological groups.

Simple methods were described for calculating the magnitudes and lengths of all links in a stream network and their topologic and geometric distances from the outlet, starting from the binary topologic string and digitized junction and source coordinates. By processing the complete network in reverse maze order, successive stages of the analysis yield the properties of all subnets. (Humphreys-ISWS)
W77-11225

MAPPING.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-11363

RESOURCES AND LAND INVESTIGATIONS (RALI) PROGRAM.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-11368

WATER-MANAGEMENT MODEL IN FLORIDA FROM LANDSAT-1 DATA,
Geological Survey, Tampa, Fla.; Geological Survey, Miami, Fla. Water Resources Div.; and Bendix Aerospace Systems Div., Ann Arbor, Mich.
A. L. Higer, E. H. Cordes, A. E. Coker, and R. H. Rogers.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D, Report No NASA TM X 58168. Symposium held June 9-12, 1975, Houston, Texas, p 2407-2442, September 1975. 20 fig, 1 tab, 18 ref.

Descriptors: *Water management(Applied), *Surface waters, *Remote sensing, *Satellites(Artificial), *Florida, Hydrologic data, Data collections, Methodology, Model studies, Rainfall, Streamflow, Water yield, Water levels, Lakes, Data transmission, Tracking techniques, Networks, Water supply, Water resources development.
Identifiers: *Southern Florida, NASA, LANDSAT.

A prototype data acquisition and dissemination network, installed and operated by the U.S. Geological Survey, is a viable approach for providing the near real-time data needed to solve hydrologic problems confronting the nearly 2.5 million residents of southern Florida. Water-stage and rainfall data from ground stations are transmitted from the Everglades via LANDSAT-1, previously known as ERTS (Earth Resources Technology Satellite), the NASA tracking stations, and the U.S. Geological Survey to the users in less than 2 hours, a significant improvement over conventional techniques requiring up to 2 months. LANDSAT imagery significantly enhances the utility of the ground station measurements. Water stage (depth) is correlated with water-surface areas from the imagery to obtain water stage-volume relations in near real time for management decisions concerning the distribution of water to the people, fauna, and flora of southern Florida. (See also W77-08062) (Woodard-USGS)
W77-11370

WATER RESOURCES DATA FOR MAINE, WATER YEAR 1975.
Geological Survey, Augusta, Maine. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11371

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1975--VOLUME 2. COLORADO RIVER BASIN.
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11372

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1975.
Geological Survey, Towson, Md. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11373

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1976.
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11374

SURFACE MODIFICATIONS FOR WATER MANAGEMENT AND SALINITY CONTROL IN A NONIRRIGATED AREA,
Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 3C.
W77-11394

AN ASPHALT INCORPORATOR AND PACKER FOR LINING IRRIGATION DITCHES,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
N. B. McLaughlin, F. B. Dyck, and T. G. Sommerfeldt.
In: Transactions of the American Society of Agricultural Engineers, Soil and Water, p 1085-1088, Special Edition 1976. 7 fig, 1 ref.

Descriptors: *Channel improvement, *Asphalt, *Linings, Irrigation, Irrigation systems, Ditches.
Identifiers: Channel lining.

In laboratory experiments, an asphalt emulsion mixed with soil has shown promise of being a suitable lining material for irrigation ditches. Prototype machinery developed for lining a field lateral with the mixture in order that it may be evaluated under field conditions is discussed. The incorporator is a large rototiller with a double-cone rotor whose longitudinal section conforms to the ditch cross section. The rototilling action mixes asphalt with the upper 8 cm of soil in the ditch profile. The packer is a large double-con roller with a longitudinal section that also conforms to the ditch cross section. Opeation of the two machines in the field is discussed. (Skogerboe-Colorado State)
W77-11411

BIOLOGICAL AQUATIC WEED CONTROL BY FISH IN THE LOWER SONORAN DESERT OF CALIFORNIA,
E. F. Legner, W. J. Hauser, T. W. Fisher, and R. A. Medved.
California Agriculture, Vol 29, No 11, November 1975. p 8-10.

Descriptors: *Aquatic weed control, *Herbivores, Biocontrol, Aquatic algae, Sago pondweed, Fish behavior, Fish migration, Fish guiding, Fish management, Fish food organisms, Food chains, California.
Identifiers: Lower Sonoran Desert(Calif), Imperial Valley(Calif), Coachella Valley(Calif), Palo Verde Valley(Calif), *Tilapia mossambica, *T zillii.

Description is given of current efforts to use her bivorous fish to control submerged aquatic weed in the Imperial, Coachella and Palo Verde valley of southern California, especially in irrigatio systems and recreational lakes. Candidate weed feeding fish studied include three African specie of Tilapia: T. hornorum Trewazas, T. mossambic Peters and T. zillii (Gervais), the South America Mollenesia latipinna LeSueur, and the nativ desert pupfish, Cyprinodon macularius (Bair an Girard). Of these, Tilapia mossambica and T. zill have been most valuable in weed control. Anothe fish which is currently under study but which h not yet been released into the irrigation system the white amur, Ctenopharyngodon idellus. T principal weed species in order of importance a sago pondweed (Potamogeton pectinatus L. Eurasian watermilfoil (Myriophyllum spicatum and southern naiad (Najas guadalupensis Moron The algae Chard sp. is abundant in several loc tions and hollyleaf naiad (Najas marina L.) a Chara sp. are typically abundant in only a few l calities of the low desert. A high degree of int compatibility has been shown among all species fish studied thus far. However, territorial behavi of Tilapia is seen as a problem, along with the ne for manual dispersal for T. zillii. (Harris-Wisco sin)
W77-11423

AN ASSESSMENT OF THE IMPACT WATER IMPOUNDMENT AND DIVERSIO STRUCTURES ON VEGETATION SOUTHERN ARIZONA,
Arizona Univ., Tucson. Office of Arid Lands S dies.
J. S. Conn, D. A. Mouat, and R. B. Clark.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as N76-186 Price codes: A05 in paper copy, A01 in microfic Bulletin No 11, December 1975. 84 p, 59 fig, 1 t 5 ref, 2 append.

Descriptors: *Impounded waters, *Arizo *Diversion structures, *Vegetation effects, Ov land flow, Slopes, Alluvium, Soils, Flow cont Land forming, Land management, Moist availability, Surface waters.
Identifiers: Bajada, Cover vegetation, Sono Desert.

An analysis of 19 water impoundment and div sion structures located within the Sonoran De of Southwest Arizona and their effects on veg tion are presented. Differences between veg tion upslope and downslope from diversion st tures were pronounced for some structures more moderate for others; some differences n have been due to the effects of the diversion st tures. Most structures occur at or near geomorp boundaries. Diversions, which occur at the baja alluvial plain interface, protect agricultural fi and urban areas from flood. The plain's bound marks changes in slope angle, soils, vegetation land use. Bajada slopes are steeper and m deeply dissected than those of the alluvial pl thus restricting agricultural and urban land to plain. Bajada soils are usually of a coarser text Vegetation types also differ, partly as a resul different soil types and moisture availability c ditions of the two landforms. Bajada vegeta usually has a greater cover and density than th alluvial plains. Differences between vegetation slope and downslope from the structure minimized when water is allowed to pass thro the structure; a marked change in vegeta parameters occurs when water is restric (Jahns-Arizona)
W77-11429

PREDICTION MODELS FOR MONTHLY NOFF,
Regional Engineering Coll., Rourkela (India).
G. Krishnaswamy.
Irrigation and Power, Vol 33, No 4, p 503-514, tober 1976. 2 fig, 7 tab, 5 ref, 1 append.

escriptors: *Monthly, *Runoff forecasting, ainfall-runoff relationships, *Mathematical odels, Surface runoff, Statistical methods, quations, Linear programming, Precipitation ex-ss, Water loss, Recession curves, Withdrawal.
entifiers: *Linear regression models, *Nonlinear gression models, Parabolic recession depletion.

vo models for prediction of monthly runoff are esented, with equations for each developed and plained. The first, a linear regression model, in-lves a statistical relationship representing the noff for any month considering the precipitation cess for a four-month season (the month der study for runoff and three preceding nths). Losses from surface runoff are also ken into consideration; all precipitation excesses assumed to appear as surface runoff within r months. A nonlinear regression model is also esented, with the same four-month season used hough a full year can be considered. While the t model assumes that losses will be the same in ery month of the season, with all precipitation cesses following a parabolic recession type pletion, the second model takes into account the t that losses differ from month to month de-nding on various factors such as climatological nditions, and soil properties. The nonlinear del assumes losses vary in a sinusoidal manner; wbacks of both models are discussed. (Jahns-zona)
7-11437

ALUATION OF RECESSION PHENOMENON VEGETATED BORDER IRRIGATION STEM,
aipur Univ. (India). Coll. of Technology and ricultural Engineering.
primary bibliographic entry see Field 3F.
7-11445

CKS ISLAND DEAUTHORIZATION ARINGS ON S 3106, WHICH WOULD AUTHORIZE TOCKS ISLAND RESERVOIR OJECT FROM PARTICIPATION IN THE LAWARE RIVER BASIN PROJECT).
primary bibliographic entry see Field 6E.
7-11448

TOMAC RIVER (HEARINGS ON THE TE OF THE POTOMAC RIVER AS TO TER SUPPLY AND WATER POLLUTION).
primary bibliographic entry see Field 6E.
7-11449

VELOPMENT OF COUNTY AND LOCAL DINANCES DESIGNED TO PROTECT THE LIC INTEREST IN FLORIDA'S COASTAL CHES,
sard L. Holland Law Center, Gainesville, Fla.
primary bibliographic entry see Field 6E.
-11455

PS GAMES IN MID-AMERICA,
primary bibliographic entry see Field 6E.
-11473

Groundwater Management

ELING THE CONJUNCTIVE AVAILA-TY OF SURFACE-AND GROUNDWATER GRABEN IN THE ARID SOUTHWEST OF UNITED STATES,
e Univ., Orono. Dept. of Civil Engineering.
Brutsaert.
roceedings of the IFIP Working Conference Computer Simulation of Water Resources ms. G. C. Vansteenkiste (Ed.), Ghent, Belgi-July 30-Aug. 2, 1974. American Elsevier shing Company, Inc., New York, N.Y., p 31, 1975. 8 fig, 6 ref.

Descriptors: *Economics, *Evaluation, *Water resources, *Rio Grande River, *Water management(Applied), *Simulation analysis, *Hydrologic data, *Conjuctive use, *Groundwater, Surface waters, Behavior, New Mexico, Water demand, Arid climates, Pumping, Equations, Operations research, Mathematical models.
Identifiers: *Conjuctive availability, Hydrologic basins, Mass balance, Multiple regression analysis, Water availability, *Graben.

This study is part of an interdisciplinary analysis of the economic evaluation of the water resources of the Rio Grande region of New Mexico. It was elemental in obtaining dynamic water availabilities in time and space. The relationship of dynamic groundwater availability and aquifer behavior under projected stresses was modeled by a groundwater system simulator based on a mass balance of the hydrologic basin. Conditions from extreme dry to extreme wet were modeled, combined with a range of different water demands. A vast amount of information was thus obtained in the form of aquifer responses for different conditions. An analogous relationship was constructed from these data by stepwise multiple regression analysis and was of the following form: d = f(d, L) where d = change in water-table elevation for the time period considered, dn = water table elevation at the end of the previous time, and L = a lump factor combining surface water inflow and outflow, precipitation, and beneficial and nonbeneficial water uses. Other results readily obtainable from the simulation runs were river accretion or depletion curves as a function of time. These curves show the diversion effects of groundwater pumping upon the river. (See also W77-10806) (Bell-Cornell)
W77-10810

MANAGEMENT OF GROUNDWATER AND SURFACE WATER VIA DECOMPOSITION,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
Y. Y. Haimes, and Y. C. Dreizin.
Water Resources Research, Vol 13, No 1, p 69-77, February 1977. 2 fig, 1 tab, 23 ref. OWRT B-050-OHIO(3).

Descriptors: *Groundwater, *Management, *Surface waters, *Conjunctive use, *Methodology, Streams, Networks, Reservoirs, Optimization, Control, Water supply, Regional analysis, Costs, Pumping recharge, Water requirements, Equations, Mathematical models, Systems analysis.
Identifiers: *Multilevel approach, Benefit maximization.

Developed is a methodology for solving the problems of conjunctive use of a large-scale complex groundwater system, a network of streams, and reservoirs all interacting with one another. Decomposing the model of a large-scale aquifer system as well as that of a stream network into interacting submodels provides an improved mathematical model of the entire physical system. A theorem is proved that establishes the necessary conditions for the existence of a solution to the optimal control problem associated with the management of the groundwater system. A sample problem is formulated in which the options of groundwater operations and surface water supply are conjunctively utilized to meet the water needs of several water users in a basin; the objective function is benefit maximization. The problem of optimal management is solved via decomposition and multilevel approach. (Bell-Cornell)
W77-10845

LINKED MODELS FOR MANAGING RIVER BASIN SALT BALANCE,
California Univ., Davis, Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-10849

TOXIC METALS IN GROUND WATER OF THE FRONT RANGE, COLORADO,
Colorado School of Mines, Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
For primary bibliographic entry see Field 5A.
W77-10853

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1975.
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10854

WATER RESOURCES DATA FOR MISSOURI, WATER YEAR 1975.
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10855

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1975.
Geological Survey, Richmond, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10856

HYDROLOGIC MAPS AND DATA IN THE MIMBRES BASIN, NEW MEXICO,
Geological Survey, Albuquerque, N.M. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10858

SUMMARY STATEMENTS OF WATER RESOURCES INVESTIGATIONS 1976-77,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 9C.
W77-10863

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1977,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
E. L. Bolke.
Utah Department of Natural Resources, (Boise), Division of Water Resources, Cooperative Investigations Report No 16, 1977. 64 p, 37 fig, 2 tab, 15 ref.

Descriptors: *Groundwater resources, *Utah, *Irrigation, *Water levels, *Water wells, Available water, Hydrologic data, Aquifers, Pumping, Water yield, Groundwater recharge, Surface-groundwater relationships, Precipitation(Atmospheric), Water level fluctuations, Maps, Graphical analysis.

Changes in ground-water levels in Utah from the spring of 1976 to the spring of 1977 reflected the generally decreased availability of surface water and the increase in ground-water withdrawals. Water levels generally declined in most major ground-water basins in the State. The estimated total withdrawal of water from wells in Utah in 1976 was about 860,000 acre-ft, which is about 70,000 acre-ft more than in 1975 and 140,000 acre-ft greater than the average annual withdrawal during 1966-75. Both the increase over 1975 and the increase over the 10-year average were due primarily to increases in withdrawals for irrigation. Precipitation in 1976 was below average in most of Utah, especially during the latter part of the year. (Woodard-USGS)
W77-10864

INJECTION OF ACIDIC INDUSTRIAL WASTE INTO THE FLORIDAN AQUIFER NEAR BELLE

GLADE, FLORIDA: UPWARD MIGRATION AND GEOCHEMICAL INTERACTIONS 1973-75,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-10870

SALT-WATER ENCROACHMENT IN AQUIFERS NEAR THE HOUSTON SHIP CHANNEL, TEXAS,
Geological Survey, Houston, Tex. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-10872

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN A PART OF CURRY COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1976,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10873

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN CENTRAL (MAP LC-19) AND NORTHERN (LN-19) LEA COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1976,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10874

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN PORTALES VALLEY, ROOSEVELT COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1976,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10875

GROUND-WATER RESOURCES OF BENSON AND PIERCE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak. Water Resources Div.
P. G. Randich.
North Dakota State Water Commission, Bismarck, North Dakota County Ground-Water Studies 18--Part III, and North Dakota Geological Survey, Grand Forks, Bulletin 59--Part III, 1977. 76 p, 41 fig, 3 plates, 2 tab, 62 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Water utilization, Water supply, Hydrogeology, Water wells, Data collections, Maps, Water level fluctuations, Transmissivity, Storage coefficient.
Identifiers: *Benson and Pierce Counties(N Dak).

Ground water is obtainable in Benson and Pierce Counties, North Dakota, from aquifers in preglacial rocks of Cretaceous age and from aquifers in glacial drift of Pleistocene age. Aquifers in the preglacial rocks are more widely distributed, but those in the drift provide higher yields to wells and better quality water. Aquifers in the preglacial rocks occur in the Dakota Group and the Pierre and Fox Hills Formations. Only small quantities of water are generally obtainable from the Pierre and Fox Hills, although in places the Fox Hills may yield as much as 100 gpm to individual wells. Water from both aquifers is soft and contains high concentrations of sodium. Nine major aquifers were identified in the glacial-drift deposits. These are classified into buried-valley, buried-outwash, and surficial-outwash aquifers. The aquifers contain a total of nearly 1.8 million acre-feet of available ground water. The largest and potentially most productive aquifer is the New Rockford, which underlies about 80 squares miles in southwestern Benson and Pierce Counties. The New Rockford aquifer is tapped by only a few small-capacity wells. It should yield as much as 1,500 gpm to properly constructed wells. The glacial-drift aquifers yield water that differs considerably in chemical quality, but the water is satisfactory for most uses. About 3.2 million gallons per day of ground water is pumped for municipal, domestic, and livestock uses in the two-county area. (Woodard-USGS)
W77-10876

FLOW ANALYSIS OF KARST SYSTEMS WITH WELL DEVELOPED UNDERGROUND CIRCULATION,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-10878

THE POTENTIAL FOR GROWTH AND DEVELOPMENT IN TENNESSEE,
Arkansas State Univ., State University. Dept. of Geography.
For primary bibliographic entry see Field 6D.
W77-10916

HYDROGEOLOGIC CONSIDERATIONS IN LIQUID WASTE DISPOSAL,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5E.
W77-10926

STEADY STATE BI-LEVEL SUBSURFACE DRAINAGE THEORY FOR SOILS OF VARYING HYDRAULIC CONDUCTIVITY,
Marathwada Agricultural Univ., Parbhani (India). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W77-10961

TWO-DIMENSIONAL SEARCHES FOR HIGH-YIELD WELL SITES,
For primary bibliographic entry see Field 8B.
W77-10967

MIGRATION OF LANDFILL LEACHATE THROUGH GLACIAL TILLS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5B.
W77-10968

INDUSTRIAL USE OF BRACKISH AND SALINE WATER IN THE HAIFA BAY AREA,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Dept. of Coastal Plain.
For primary bibliographic entry see Field 3C.
W77-11077

THE ARIZONA GROUNDWATER CONTROVERSY AT MID-CENTURY,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 6E.
W77-11102

WATER QUALITY IN VICINITY OF FENTON HILL SITE, 1975,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5A.
W77-11129

FLOW IN FRACTURED POROUS MEDIA,
Princeton Univ., N.J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-11213

VISCOELASTIC AQUIFER MODEL APPLIED TO SUBSIDENCE DUE TO PUMPING,
Cornell Univ., Ithaca. N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W77-11217

NUMERICAL MODEL FOR SATURATED-UNSATURATED FLOW IN DEFORMABLE POROUS MEDIA, 1. THEORY,
California Univ., Berkeley. Lawrence Berkeley Lab.; and California Univ., Berkeley. Dept. of Mineral Sciences and Mineral Engineering
For primary bibliographic entry see Field 2F.
W77-11223

WATER RESOURCES DATA FOR MAINE, WATER YEAR 1975.
Geological Survey, Augusta, Maine. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11371

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1975--VOLUME 2. COLORADO RIVER BASIN.
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11372

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1975.
Geological Survey, Towson, Md. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11373

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1976.
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11374

FLOWING WELLS IN MICHIGAN 1974,
Geological Survey, Lansing, Mich. Water Resources Div.
W. B. Allen.
Michigan Geological Survey, Lansing, Water formation Series Report 2, 1977. 27 p, 5 fig plates, 9 tab, 16 ref.

Descriptors: *Artesian wells, *Michig *Aquifers, *Well data, *Water yield, Artes heads, Hydrogeology, Glacial drift, Bedrock, D collections, Maps.
Identifiers: *Flowing wells(Mich).

Flowing wells yielding fresh water occur in b the glacial drift and the bedrock in Michigan. M known flowing wells are in the Lower Penin because the greater population in that part of State has led to more frequent drilling. A c parison of flowing-well areas in 1900 with thos 1970 shows a probable decline in head in the cial drift and the Marshall and Saginaw bedr formations in the central and southern parts of Lower Peninsula. Wells having the greatest ported flows are the Marshall and Saginaw For tions; wells having the greatest heads are from Cambrian, Ordovician, and Silurian rock u Flowing wells in Michigan are largely used domestic water supplies, although a few are u for municipal and industrial supplies. In gene water from most flowing wells is suitable domestic use; however, high iron, chloride, hardness impair water quaity at some locati (Woodard-USGS)
W77-11375

OTENTIOMETRIC SURFACE OF FLORIDAN QUIFER MAY 1975, AND CHANGE OF OTENTIOMETRIC SURFACE 1969 TO 1975, OUTHWEST FLORIDA WATER MANAGE-ENT DISTRICT AND ADJACENT AREAS,
eological Survey, Tampa, Fla. Water Resources
v.
r primary bibliographic entry see Field 7C.
77-11376

OTENTIOMETRIC SURFACE OF THE LORIDAN AQUIFER IN THE NORTHWEST LORIDA WATER MANAGEMENT DISTRICT, AY 1976,
eological Survey, Tallahassee, Fla. Water sources Div.
r primary bibliographic entry see Field 7C.
77-11377

RESH GROUND WATER STORED IN QUIFERS UNDER THE CONTINENTAL HELF: IMPLICATIONS FROM A DEEP TEST, NTUCKET ISLAND, MASSACHUSETTS,
ological Survey, Reston, Va. Water Resources ;; and Geological Survey, Reston, Va. Geolog-Div.
r primary bibliographic entry see Field 2F.
77-11378

FECTS ON GROUND-WATER QUALITY OM IRRIGATING PASTURE WITH WAGE EFFLUENT NEAR LAKELAND, ORIDA,
ological Survey, Tallahassee, Fla. Water sources Div.
primary bibliographic entry see Field 5B.
7-11381

ALLOW AQUIFERS RELATIVE TO SUR-CE WATER, LOWER NORTH PLATTE ER VALLEY, WYOMING,
ional Park Service, Atlanta, Ga. Southeast Re-al Office.
Herrmann.
ter Resources Bulletin, Vol 12, No 2, p 371-April 1976. 6 fig, 1 tab, 5 ref.

criptors: Grounwater, *Wyoming, *Aquifers, gation, Irrigation effects, Pumping, Pumping ts, Model studies, Numerical analysis, oundwater recharge, Water resource, Alluvial fer.
tifiers: *Platte River Valley(Wyo).

occurrence of ground water in the lower th Platte Valley, Goshen County, Wyoming, studied to determine safe yield within the allu-aquifer under varying discharge and recharge litions. The alluvium of the North Platte is ex-ively developed for irrigation purposes and the cts of large-scale pumpage are of major con-. Actual withdrawals are estimated to by 00 acre-feet. Should pumping reach potentially er levels an overdraft is expected. Effect of nd water withdrawals are established from ections of the flow regime within the alluvial fer. A time dependent, numerical model was oyed to predict aquifer response to increased drawals. The results suggest that more effi-use of surface waters and/or increased use of nd water will reduce the annual subsurface n flow to the North Platte River and its tribu-by an amount equal to the reduced ground r increment. Alternatives are available for gement of the lower North Platte alluvial er. The preferred course is to correlate sur-and subsurface water rights, in light of con-nce, economics, and best means of storage maximum utilization of the single water rce. (Skogerboe-Colorado State)
11402

GROUND WATER SYSTEM EVALUATION FOR WADI NISAH-SAUDI ARABIA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. J. Abdulrazzak.
Master of Science thesis, 1976. 114 p, 25 fig, 11 tab, 18 ref, 3 append.

Descriptors: *Aquifer management, *Water management(Applied), *Groundwater resources, *Computer models, *Water demand, Groundwater, Sandstones, Sand aquifers, Model studies, Water resources, Water supply, Aquifers, Underground storage, Arid lands, Recharge, Water sources, Saline water intrusion, Mathematical models, Hydrology, Hydrogeology, Wells.
Identifiers: Wadi Nisah(Saudi Arabia).

The Wadi Nisah aquifer in Saudi Arabia is evaluated using a groundwater model to assess water development potential and as a tool of future management of the system. A relatively simple model was selected and its reliability evaluated. The feasibility of utilizing additional groundwater supplies from Wadi Nisah to meet the Riyadh, Saudi Arabia water demands is also evaluated. The geology, hydrogeology, regional climate and hydrology of the area are discussed. Practical application of the model, conclusions, and recommendations are presented. The study shows that the Pickett groundwater model can be applied to the development and management of the Wadi Nisah aquifer. It is also shown that the Biyadh in Wadi Nisah is suitable for large-scale development of groundwater and is capable of satisfying part of the water demand for the city of Riyadh. (Jamail-Arizona)
W77-11426

ION ACTIVITY PRODUCTS OF CALCIUM CARBONATE IN WATERS BELOW THE ROOT ZONE,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 2K.
W77-11438

THE CLASS ONE EQUIVALENCY FOR CERTAIN RECLAMATION PROJECTS (HEARINGS ON H.R. 13101, WHICH PROVIDES FOR CONSIDERATION OF THE COMPARATIVE PRODUCTION POTENTIAL OF IRRIGABLE LANDS IN DETERMINING NONEXCESS ACREAGE UNDER FEDERAL RECLAMATION LAWS).
Hearings--Subcommittee on Water and Power Resources, Committee on Interior and Insular Affairs, U.S. H. Rep., July 19-20, 1976, Serial No. 94-77. 137 p.

Descriptors: *Federal reclamation law, *Water management(Applied), *Irrigation, *Land classification, Reclamation states, Federal government, Administrative agencies, Legislation, Irrigation districts, Irrigation effects, Irrigation water, Irrigation programs, Land development, Water distribution(Applied), Crop production, Crop response, Irrigated land, Agriculture, Acreage, Farms.

The house bill considered would authorize the Secretary of Interior to establish acreage entitlements for land holdings eligible to receive project water from federal reclamation projects at a level equivalent to 160 acres of class 1 lands for lands of less productive potential than class 1 lands. The equivalency concept would be applied only to projects in acres where the average frost-free growing season would not exceed 180 days. The equivalncy concept is based on the fact that within any given reclamation project area there is usually an appreciable range in the farming quality of the lands that compose the irrigable area. The House Subcommittee on Water and Power Resources commenced the hearings with a statement strongly in favor of the proposed legislation. The Secretary of the Interior was strongly opposed to its passage prior to analysis of the impacts on existing irrigation districts. Testimony heard includes statements from members of Congress from Wyoming, Montana and California, managers of various irrigation districts in the western states, and the executive director of the National Water Resources Association. The Department of the Interior also submitted a report on the bill. (Sloan-Florida)
W77-11446

4C. Effects On Water Of Man's Non-Water Activities

INDEX OF LAKE BASIN LAND USE FOR LAND USE PLANNING PURPOSES,
Vermont Agricultural Experiment Station.
For primary bibliographic entry see Field 5G.
W77-10852

REDWOOD NATIONAL PARK STUDIES, DATA RELEASE NUMBER 2, REDWOOD CREEK, HUMBOLDT COUNTY, AND MILL CREEK, DEL NORTE COUNTY, CALIFORNIA, APRIL 11, 1974-SEPTEMBER 30, 1975,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. T. Iwatsubo, K. M. Nolan, D. R. Harden, and G. D. Glysson.
Open-file report 76-678, December 1976. 247 p, 6 fig, 24 tab, 70 ref.

Descriptors: *Hydrologic data, *Streams, *Biological properties, *Chemical properties, *Physical properties, Environmental effects, Road construction, Lumbering, Ecosystems, Water quality, Sediments, National parks, *California.
Identifiers: *Redwood National Park(Calif), Redwood Creek, Mill Creek.

An interdisciplinary study has been undertaken in Redwood National Park, Calif., to describe parts of the ecosystems and recent changes in the intensity of erosion and sedimentation, define processes that may alter the natural ecosystems, and assess the impact of recent road construction and timber harvest. This report is the second of a series that will present data collected in this study. Stream-discharge and water-quality data were collected at 53 sampling stations in the Redwood Creek and Mill Creek drainage basins. Measurements included the following variables: Stream stage and discharge; turbidity; sediment; onsite water-quality determinations of temperature, pH, total alkalinity, specific conductance, and dissolved-oxxygen concentration; chemical analyses of water samples for major dissolved solids, selected trace elements, nitrogen, phosphorus, and organic carbon; chemical analyses of bottom sediment for organic carbon and pesticides; bacteria; benthic invertebrates; fish; periphyton; phytoplankton; and seston. Additional data include changes in geometry at 10 stream-channel cross sections along Mill Creek and the distribution of erosional landforms in the Mill Creek drainage basin; quantity and chemical composition of rainwater; and the intragravel-streambed condition at selected stations in the Redwood Creek drainage basin. (Woodard-USGS)
W77-10857

IMPACT OF THE MARSH BUGGY ON THE WETLANDS,
Nicholls State Univ., Thibodaux, La. Dept. of Earth Science.
R. A. Detro.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 223-231, 29 ref.

Descriptors: *Resources development, *Environmental effects, *Wetlands, *Ecosystems, Salinity, Saline water intrusion, Water pollution effects, Coasts, Baseline studies, Marshes.
Identifiers: *Outer Continental Shelf, Marsh buggy, Hydrocarbon exploration.

The marsh buggy is the vehicle which opened 'the wetlands frontier' to hydrocarbon exploration. It transported men and equipment on all wetland surfaces with ease. As man sought to apply management techniques to production of marsh resources, he became aware of the harmful environmental effects of the buggy. Trappers first noticed damage to their 'sets' and muskrat and nutria nests. They also recognized land loss and vegetation changes from deeply incised wheeled buggy tracks. Where turf became exposed or broken open water areas increased and salinity changes occurred. The tracked buggy wrought fewer changes yet it brings about breaks in natural barriers. Tidal scouring within tracks accelerates salt water intrusion and changes in vegetation regimes. Water-control structures partly alleviate these problems. (See also W77-11022) (Sinha-OEIS)
W77-11035

ENVIRONMENTAL IMPLICATIONS OF MAN-MADE LINEAR ELEMENTS IN COASTAL WETLANDS,
Coastal Environments, Inc., Baton Rouge, La.
For primary bibliographic entry see Field 6G.
W77-11044

ARID LANDS OF SUB-SAHARAN AFRICA: APPENDICES TO THE STAFF FINAL REPORT.
National Research Council Washington, D.C. Advisory Panel on Arid Lands of Sub-Saharan Africa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 595, Price codes: A13 in paper copy, A01 in microfiche. Report to Agency International Development, Washington, D.C. 1975. 277 p, 4 fig, 9 tab, 228 ref, 11 append.

Descriptors: *Africa, *Arid lands, *Long-term planning, *Conferences, Communication, Transportation, Dry farming, Range management, Crop production, Livestock, Human population, Droughts, Decision making, Economics, Social aspects.
Identifiers: *Sahel.

This report includes details of the Conference on International Development Problems in the Sahel which was in Bellagio, Italy, October 24-29, 1974. A number of proposals for development and aid to the nations of the Sahel are discussed; areas of concern include communication, transportation, dryland and irrigated crop production, livestock and range production, technological and industrial development, and general planning matters. Information is presented on weather and climate in the Sahel, environmental problems of the least-developed countries in the region, and food and livestock production. Changes described are mostly due to fluctuating climatic conditions, population growth and migration. There is a definite limit to the carrying capacity of the Sahel; excessive stocking rates have compounded the impacts of drought. Policy decisions made elsewhere, especially those by major developed economics, will have the greatest effect on development within the region. (Jahns-Arizona)
W77-11122

SURFACE-WATER QUALITY IN THE YAMPA RIVER BASIN, COLORADO AND WYOMING—AN AREA OF ACCELERATED COAL DEVELOPMENT,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-11366

FACTORS INFLUENCING NATURAL WATER QUALITY AND CHANGES RESULTING FROM LAND-USE PRACTICES,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-11425

4D. Watershed Protection

DETERMINATION OF SEDIMENT YIELD BY TRANSFERRING RAINFALL DATA,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2J.
W77-10804

A CATCHMENT SIMULATION MODEL DEVELOPED FOR URBAN AND URBANISING CATCHMENTS WITH PARTICULAR REFERENCE TO THE USE OF AUTOMATIC OPTIMIZATION TECHNIQUES,
Anglian Water Authority(England).
For primary bibliographic entry see Field 2E.
W77-10823

REDWOOD NATIONAL PARK STUDIES, DATA RELEASE NUMBER 2, REDWOOD CREEK, HUMBOLDT COUNTY, AND MILL CREEK, DEL NORTE COUNTY, CALIFORNIA, APRIL 11, 1974-SEPTEMBER 30, 1975,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-10857

WATER MANAGEMENT FOR SHORELINE EROSION CONTROL ON THE CHIPPEWA FLOWAGE,
Wisconsin Univ., Madison. Environmental Resources Unit.
S. H. Born, and P. A. Stephenson.
Journal of Soil and Water Conservation, March-April 1973. p 83-86, 5 fig, 6 ref.

Descriptors: *Water management(Applied), *Drawdown, *Erosion, *Erosion control, *Shore erosion, *Bank protection, *Lakes, *Reservoirs, *Water levels, *Water level fluctuations, *Wisconsin, Impoundments, Environmental control.
Identifiers: *Chippewa Flowage(WI), Environmental decision-making.

The study reported in this paper was undertaken because the Federal Power Commission license for the Chippewa Flowage, a 17,000 acre impoundment in northwest Wisconsin, had expired after 50 years. Environmentalists, among others, opposed relicensing because of alleged environmental damage, one aspect of which was severe shoreland erosion, possible caused by water level fluctuations. Available data, along with limited field and laboratory investigations, were used as an alternative to more lengthy study techniques to derive one aspect of an environmental impact statement. The physical conditions and erosional consequences of alternative water management policies for the Chippewa Flowage, were studied. Several water management considerations are presented: lowering summer water levels may retard but not eliminate erosion from waves; winter drawdown would minimize ice-related shoreline erosion, but would expose the littoral zone to runoff and direct rainfall in the spring; frequent and rapid changes in water level can cause excessive pore-water pressures in certain sediments. The report concludes that erosion in the Chippewa Flowage was not the result of fluctuating water levels but was the consequence of impounding water in an area with substantial topographic re
lief. A realistic erosion prevention policy would b
a 3-4 foot winter drawdown which should be raise
before the height of spring runoff. (Gentry-NC)
W77-10925

**NONUNIFORM FLOW IN AGGRADING CHAN
NELS,**
Punjab Agricultural Univ., Ludhiana (India). Dep
of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-10963

U.B.C. WATERSHED MODEL,
British Columbia Univ., Vancouver. Dept. of Civ
Engineering.
For primary bibliographic entry see Field 2A.
W77-10969

**EROSION DEFENSE STRUCTURES ON TH
PUGET SOUND SHORELINE,**
Western Washington State Coll., Bellingha
Dept. of Geography and Regional Planning.
T. A. Terich.
In: Time-Stressed Coastal Environments: Asse
ment and Future Action, Proceedings of 2nd A
nual Conference of The Coastal Society, held Ne
Orleans, LA, November 17-20, 1976. p 249-254
fig.

Descriptors: *Beach erosion, *Shore protectio
Estuarine environment, *Washington, Baseli
studies, Resource development.
Identifiers: *Outer Continental Shelf, *Pu
Sound(Wash).

Localized beach erosion forces individual prop
ty owners around the Puget Sound shoreline
construct erosion defense structures. Little inf
mation or help is available to assist their nee
This results in an array of erosion defense instal
tions that often fail and mar the natural beauty
the beach. (See also W77-11022) (Sinha-OEIS)
W77-11038

**HUMAN INDUCED STRESS ON THE CAUC
SIAN COAST OF THE BLACK SEA,**
Illinois Univ. at Urbana-Champaign. Dept.
Geography; and Akademiya Nauk Gruzins
SSR, Tiflis.
C. S. Alexander, and V. P. Zenkovich.
In: Time-Stressed Coastal Environments: Ass
ment and Future Action, Proceedings of 2nd
nual Conference of The Coastal Society, held N
Orleans, LA, November 17-20, 1976. p 260-26
fig, 9 ref.

Descriptors: *Resources developm
*Environmental effects, *Recreation, Eros
Coasts.
Identifiers: *Outer Continental Shelf, *Black
Stressed environments, Coastal zone.

Human induced stress on the Caucasian sectio
the Black Sea Coast results from exploitativ
well as remedial actions. Under natural condit
the interplay of climate, hinterland topogra
and shore zone morphology appears to have
capable of maintaining a well-developed shi
beach. Serious anthropogenic interference to
general beach system commenced some 40 y
ago. Recreational facilities were constructed o
increasingly large scale. Gravel was removed
the beach for construction purposes, moles
built for harbors and dams were constructe
the rivers leading to the shore. Much of the
sequent remedial work intensified rather tha
leviated the problem. This paper describes
physical setting of the coast, paying attention
vulnerabilities, analyzes the human induced s
and the subsequent corrective measures, an
tempts to evaluate the future success of t
measures. (See also W77-11022) (Sinha-OEIS)
W77-11040

SHORELINE PROTECTION IN JAPAN,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
H. J. Walker.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of Second Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 269-278, 5 fig, 9 ref.

Descriptors: *Shore protection, *Coastal structures, Erosion, Coasts.
Identifiers: *Outer Continental Shelf, *Japan, Stressed environments, Visual stress.

New types of structures are continually being developed in Japan. One of the most recent additions is what has been labeled the 'Igloo.' It is a wave dissipating wall in which vertical moving waves are converted into horizontal waves by curved vertical plates within the structure. In 1975, Igloos were constructed along 4 separate coasts in Japan and to date have proven very effective. Also, according to the company, they are 'in harmony with the environment,' a claim one could hardly make for tetrapods. If such 'environmental blending' proves acceptable to the public, one of the stresses which has received additional attention in recent years, the visual stress, will be lessened greatly. (See also W77-11022) (Sinha-OEIS)
W77-11041

NEW SOIL IMPLEMENT MAKES A GOOD IMPRESSION,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 3F.
W77-11096

FLOOD DISCHARGES OF RIVERS DRAINING CROSS PLAINS TO OCEANS USING THE ARTHE AND THE MAYENNE (IN WESTERN FRANCE) AS EXAMPLES (CONTRIBUTION TO THE METHODOLOGY OF FLOOD FLOWS BY EXTENSION OF THE GRADEX METHOD),
LES DEBITS DE CRUE DES RIVIERES DES PLAINES OCEANIQUES A TRAVERS L'EXEMPLE DE LA SARTHE ET DE LA MAYENNE (FRANCE DE L'OUEST) CONTRIBUTION A LA METHODOLOGIE DES DEBITS DE CRUE PAR UN ESSAI D'EXTENSION DE LA METHODE DU GRADEX),
Paris Univ. (France).
For primary bibliographic entry see Field 2A.
W77-11205

HYDROLOGY OF SMALL WATERSHEDS IN WISCONSIN'S DRIFTLESS AREA,
North Central Forest Experiment Station, La Crosse, Wis.
For primary bibliographic entry see Field 2A.
W77-11209

ASSESSING THE ACCURACY OF SUSPENDED SEDIMENT RATING CURVES FOR A SMALL STREAM,
Exeter Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W77-11210

CHRONES OF TRAVEL TIME AND DISTRIBUTION OF FLOOD STORAGE FROM A TRACER STUDY ON A SMALL WATERSHED,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-11216

REGIONALIZED DROUGHT FLOW HYDROGRAPHS FROM A MATURE GLACIATED PLATEAU,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2E.
W77-11221

THE CEQUEAU MODEL: DESCRIPTION AND EXAMPLES OF ITS USE IN PROBLEMS RELATED TO WATER RESOURCE MANAGEMENT,
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 2A.
W77-11239

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

TOXIC METALS IN GROUND WATER OF THE FRONT RANGE, COLORADO,
Colorado School of Mines, Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
R. W. Klusman, and K. W. Edwards.
Ground Water, Vol 15, No 2, p 160-169, March-April 1977. 6 fig, 7 tab, 14 ref. OWRT A-023-COLO(4). 14-31-0001-4006, and 14-31-0001-5006.

Descriptors: *Heavy metals, *Groundwater, *Colorado, Trace elements, Water quality, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Zinc, Hydrogen ion concentration, Oxidation-reduction potential, Specific conductivity, Distribution, Mineralogy, Plumbing, Water pollution, Geochemistry, Geologic control, On-site investigations, Sampling, Statistical methods.
Identifiers: *Front Range, Arsenic, Silver.

A study of toxic trace metal distribution in groundwaters of the Front Range mineral belt, Colorado, and adjacent areas was performed in order to determine the relationship of water quality to mineralization and to determine the magnitude of potential health effects. A total of 149 samples was collected and analyzed for arsenic, cadmium, copper, iron, lead, manganese, mercury, silver, and zinc. Field determinations of pH, Eh, and specific conductance were also made. The trace element data exhibited a lognormal distribution and were described utilizing the geometric mean and geometric deviation. Four populations were recognized in the samples: (1) samples in the mineral belt with plumbing contamination; (2) samples in the mineral belt without plumbing contamination; (3) samples outside the mineral belt with plumbing contamination; and (4) samples outside the mineral belt without plumbing contamination. Differences in these populations for several elements were observed utilizing the t test. Groundwaters in the mineral belt are estimated to exceed the U.S. Public Health Service limit in 14% of the samples for Cd, 1% for Cu, 51% for Fe, 74% for Mn, 2% for Hg, and 9% for Zn. Groundwaters outside the mineral belt have similar probability of exceeding the limit for Hg and lesser probabilities for all other elements. (Visocky-ISWS)
W77-10853

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1975.
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10854

WATER RESOURCES DATA FOR MISSOURI, WATER YEAR 1975.
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10855

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1975.
Geological Survey, Richmond, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10856

HYDROLOGIC MAPS AND DATA IN THE MIMBRES BASIN, NEW MEXICO,
Geological Survey, Albuquerque, N.M. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10858

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR BURAS, LOUISIANA (NEW ORLEANS TO VENICE, LOUISIANA, HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 8G.
W77-10865

EFFECTS OF PHREATOPHYTE REMOVAL ON WATER QUALITY IN THE GILA RIVER PHREATOPHYTE PROJECT AREA, GRAHAM COUNTY, ARIZONA, WITH A SECTION STATISTICAL ANALYSIS,
Geological Survey, Phoenix, Ariz. Water Resources Div.
R. L. Laney, and H. W. Hjalmarson.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, price $3.00. Professional Paper 655-M, 1977. 23 p, 8 fig, 2 plates, 7 tab, 16 ref.

Descriptors: *Pollutant identification, *Water quality, Effects, *Brush control, *Phreatophytes, Chemical properties, Dissolved solids, *Arizona, Flood plains, Groundwater, Streams, Inflow, Bicarbonates, Calcium, Chlorides, Hardness(Water), Sodium, Evapotranspiration, Streamflow, Tamarisk, Soil moisture.
Identifiers: Gila River(Ariz).

Water quality was measured during the period June 1964 to June 1972 from four major hydrologic sources of a 15-mile reach of the Gila River Phreatophyte Project study area in southeastern Arizona. The sources include the Gila River, tributaries to the Gila river, alluvial deposits which support phreatophyte growth on the flood plain, and basin fill deposits which underlie the alluvial deposits. Chemical composition of the water in the area ranged frm the sodium-chloride type in the Gila River to calcium-bicarbonate and sodium-bicarbonate in the basin fill deposits. Dissolved solids of each hydrologic source varied both temporall and spacially, with minimum concentrations of 200 mg/liter measured in the basin fill and maximum concentration of 19,000 mg/liter measured in the unsaturated zone of the alluvial deposits. Concentrations were minimal during high streamflow and maximum during prolonged periods of low streamflow. The effects of the phreatophyte removal on the specific conductance of water in the alluvial deposits analyzed, using three statistical tests, indicate that the removal of phreatophytes did not significantly affect the specific conductance of water in the alluvial deposits. (Woodard-USGS)
W77-10868

USE OF AN AIRBORNE FRAUNHOFER LINE DISCRIMINATOR FOR THE DETECTION OF SOLAR STIMULATED LUMINESCENCE,
Geological Survey, Flagstaff, Ariz. Water Resources Div.; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2K.

W77-10869

GROUND-WATER RESOURCES OF BENSON AND PIERCE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10876

REDESIGN, FABRICATION AND TEST OF A 1000-GPM HIGH SEAS OIL RECOVERY SYSTEM AND DESIGN ONLY OF A 500-GPM HIGH SEAS OIL RECOVERY SYSTEM,
Ocean Systems, Inc., Reston, Va.
For primary bibliographic entry see Field 5G.
W77-10879

EVALUATION OF A PASSIVE MICROWAVE TECHNIQUE FOR THE MEASUREMENT OF OIL FILM THICKNESS IN A TEST TANK ENVIRONMENT,
Naval Research Lab., Washington, D.C. Advanced Space Sensing Applications Branch.
J. P. Hollinger, and J. E. Kenney.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 829, Price codes: A04 in paper copy, A01 in microfiche. NRL Memorandum Report 3308, April 1976. 54 p, 21 fig, 2 ref.

Descriptors: *Pollutant identification, *Water pollution control, *Oil spills, *Remote sensing, *Instrumentation, Measurement, Baseline studies, Oil pollution.
Identifiers: *Outer Continental Shelf, *Passive microwave radiometry, Oil film thickness, Resources management.

A multifrequency passive microwave technique for the measurement of oil film thickness in a test tank environment was investigated. The objective was to develop this technique for application to the quantization of performance data in oil cleanup and containment device evaluation tests. Measurements were made at 22.2 and 31.4 GHz using the U.S. Environmental Protection Agency's Oil and Hazardous Materials Simulated Environmental Test Tank (OHMSETT) of oil films with an average thickness ranging from 0.4 to 4.1 mm. The experimental approach consisted of three parts: (1) calibration measurements, (2) smooth water tests and (3) rough water tests. The test tank, microwave instrumentation and experimental setup are described first, then the calibration, smooth and rough water measurements are discussed. Conclusions and recommendations are presented. (Sinha-OEIS)
W77-10880

INVESTIGATION OF THE BEHAVIOR OF TRACE ELEMENTS IN OCEAN WATER BY THE DESORPTION METHOD,
For primary bibliographic entry see Field 5B.
W77-10889

REMOTE SENSING STUDY OF ELECTRIC GENERATING STATION THERMAL DISCHARGES TO BARNEGAT BAY AND GREAT EGG HARBOR, NEW JERSEY.
Environmental Protection Agency, Denver, Colo. National Field Investigations Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 333, Price codes: A05 in paper copy, A01 in microfiche. EPA Office of Enforcement, Report No. EPA-330/3-73-003, September 1973. 84 p, 15 fig, 3 tab, 10 ref.

Descriptors: *Remote sensing, *Electric powerplants, *Heated water, *Water quality, *Monitoring, Baseline studies, Thermal pollution, *New Jersey, Bays, Harbors.
Identifiers: *Outer Continental Shelf, Environmental impact, Thermal discharges, Barnegat Bay(NJ), Great Egg Harbor(NJ).

An aerial remote sensing study of thermal discharges to New Jersey coastal waters from two large thermal-electric generating stations was conducted on 13 July 1973. The study encompassed the Great Egg Harbor Bay and the central portion of Barnegat Bay. Thermal discharges evaluated were from the Oyster Creek Nuclear Generating Station. This study has shown that remote sensing techniques could be implemented into a compliance monitoring program to quickly and cost effectively ascertain the real time behavior of thermal discharges and the resultant thermal plumes. A procedure could readily be developed to apply the aerial thermal data to each discharge to document compliance or noncompliance with water quality standards and to evaluate the effectiveness of proposed effluent (thermal) guidelines. (Sinha-OEIS)
W77-10892

PESTICIDE RESIDUE ANALYSIS OF STORM-DRAIN WATERS, 1975,
California Univ., Livermore. Lawrence Livermore Lab.
T. M. Distler, and C. M. Wong.
Available from the National Technical Information Service, Springfield, VA 22161 as UCID-17079, Price codes: A02 in paper copy, A01 in microfiche. Report UCID-17079, March, 1976. 8 p, 4 tab, 4 ref.

Descriptors: *Monitoring, *Pesticides, Insecticides, California, Methodology, Chemical analysis, *Laboratory tests, Runoff, Soil analysis, Water quality, Streambeds, Analytical techniques, *Chlorinated hydrocarbon pesticides, *Organophosphorous pesticides, *Herbicides, *Pesticide residues, *Pollutant identification, *Storm drains.
Identifiers: Bromacil, Chlordane, Dicofol, Diuron, Folpet, Malathion, Carbaryl, 2,4,-D.

Runoff-water samples for the first, third, and fourth quarters of 1975 were analyzed for pesticide residues at LLL and independently by the LFE Environmental Analysis Laboratories. For the compounds analyzed, upper limits to possible contamination were placed conservatively at the low parts-per-billion level. In addition, soil samples were also analyzed. Future work will continue to include quarterly sampling and will be broadened in scope to include quantitative analyais of a larger number of compounds. A study of recovery efficiency is planned. Because of the high backgrounds on soil samples together with the uncertainties introduced by the cleanup procedures, there is little hope of evaluating the distribution of a complex mixture of pesticides among the aqueous and solid phases in a drainage sample. No further sampling of soil from the streambed is therefore contemplated. (Katz)
W77-10933

ACUTE TOXICITY OF SELECTED ORGANIC COMPOUNDS, TO FATHEAD MINNOWS,
Environmental Research Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W77-10934

ASSAYS OF TOXIC POLLUTANTS BY FISH BLOOD,
Sias Research Labs., Brookline, Mass.
For primary bibliographic entry see Field 5C.
W77-10942

ENTOMOLOGICAL SPECIAL STUDY NO. 44-019-75/76, PESTICIDE ANALYSIS OF SURFACE WATER SAMPLES COLLECTED IN THE DEPARTMENT OF THE ARMY PESTICIDE MONITORING PROGRAM 1 SEP 1972-DEC 1974,
Army Environmental Hygiene Agency, Aberdeen Proving Grounds, Md.
C. C. Roan, and J. H. Vinopal.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-03 880, Price codes: A02 in paper copy, A01 i microfiche. Report 44-019-75/76, Oct. 1975, 20 p, tab.

Descriptors: *Chlorinated hydrocarbon insect cides, Metrodology, *Aldrin, *Diazonon *Dieldrin, *Endrin, Water quality, Water pollutio effects, Analyses, Analytical techniques, Monito ing, Laboratory tests, On-site investigatio *Pesticide residues, Pollutant identification.
Identifiers: *Pesticide analysis.

This report gives pertinent analytical detail specific collection, locations, and analytic results of surface water analyses of samples c lected from the scheduled component of the D partment of the Army Pesticide Monitoring Pr gram during the period of 1 September 1972 th 31 December 1974. A total of 306 surface wat samples collected from 44 military installatio were analyzed. Thirteen samples representing fi military installations were postive for residu Four different pesticides, including dieldr diazinon, aldrin, and endrin, were found in t water samples. Dieldrin was the most preval pesticide residue detected in the samples. Disc sions regarding the possible origin of the posit pesticide findings noted are also presented in t report. (Katz)
W77-10945

RESULTS OF AQUATIC SURVEYS AT PI BLUFF ARSENAL, ARKANSAS, SEPTEMB 1973 - OCTOBER 1974,
Edgewood Arsenal, Aberdeen Proving Grou Md., Biomedical Lab.
For primary bibliographic entry see Field 5C.
W77-10947

ENVIRONMENTAL QUALITY RESEARC FISH AND AUFWUCHS BIOASSAY, ANNU REPORT,
California Univ., Irvine.
For primary bibliographic entry see Field 5C.
W77-10951

JP-4 AND JP-9 FUEL TOXICITY STUD USING FRESH WATER FISH AND A WUCHS, ANNUAL REPORT,
California Univ., Irvine.
For primary bibliographic entry see Field 5C.
W77-10952

AUTOMATED MEASUREMENT OF RI PRODUCTIVITY FOR EUTROPHICAT PREDICTION,
Virginia Univ., Charlottesville. Dept. of Envi mental Sciences.
M. G. Kelly, G. M. Hornberger, and B. J. Cosb Biological Monitoring of Water and Effl Quality, ASTM STP 607, p 133-146, 1977. 4 f tab, 16 ref. OWRT C-5333(No. 4231)(2).

Descriptors: *Methodology, *Te *Eutrophication, *Rivers, *Biological prope Oxygen requirements, Productivity, Water q ty, *Monitoring, Control systems, Data co tions, *Forecasting, *Pollutant identifaction.
Identifiers: *Eutrophication prediction.

A method for monitoring net and gross comm oxygen productivity, community respir photosynthetic efficiency and reaeration c cient was tested in 5 contrasting rivers. technique used relatively inexpensive digital collection and processing, and allowed dete of incipient eutrophication due to nutrient

and excess oxygen demand for organic waste input. Oxygen concentration, temperature and solar radiation were recorded over a 24 hour period and the data were used to calculate the parameters necessary for water quality monitoring. A few weeks data taken during summer low-flow conditions were then used to discriminate water quality. (Katz)
W77-10953

CHLOROHYDROCARBONS IN MARQUETTE FISH HATCHERY LAKE TROUT (SALVELINUS NAMAVCUSH),
Northern Michigan Univ., Marquette. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-10954

HEPTACHLOR IN RELATION TO MAN AND THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.
For primary bibliographic entry see Field 5B.
W77-10957

INTEGRATED AUTOMATIC WATER SAMPLE COLLECTION SYSTEM,
Michigan State Univ., East Lansing. Dept. of Electrical Engineering and Systems Science.
For primary bibliographic entry see Field 7B.
W77-10972

HYDROGEN ION EXCHANGE ON AMORPHOUS SILICA IN SEAWATER,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2K.
W77-10979

REMOTE MEASUREMENT OF 'TURBIDITY' AND OTHER WATER QUALITY PARAMETERS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
J. R. McCluney.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-28499, Price codes: A04 in paper copy, A01 in microfiche. NASA-TM-X-70933, July 1975. 71 p, 5 fig, 2 tab, 39 ref.

Descriptors: *Turbidity, *Optical properties, Remote sensing, Physical properties, Light penetration, Opacity, Water quality, Electronics, Instrumentation, Analytical techniques, Model studies, Satellites(Artificial), Mathematical studies, Aerial photography.
Identifiers: Radiance spectrum, Optical processes, Suspended particulates, Optical characteristics, Organic particulates.

There are two general approaches which can be taken in the analysis of multispectral water color data collected by aircraft or satellite remote sensors. With the theoretical modeling approach, optically important constituents of natural waters are related mathematically to the upwelling radiance spectrum received by the remote sensor. With the empirical approach, the relationships are determined empirically by comparing remote sensing data with surface truth data. There are several levels of mathematical sophistication which can be applied to both approaches. It was found that the two approaches are closely related and should be pursued simultaneously for maximum utilization of the laboratory and field measurement data which will be needed. A set of minimum surface and measurement parameters and techniques as suggested. (Henley-ISWS)
W77-10985

ANALYSES OF TARS, CHARS, GASES, AND WATER FOUND IN EFFLUENTS FROM THE SYNTHANE PROCESS,
Energy Research and Development Administration, Pittsburgh, Pa. Pittsburgh Energy Research Center.
A. J. Forney, W. P. Haynes, S. J. Gasior, G. E. Johnson, and J. P. Strakey, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PERC/TPR-75/2, Price codes: A03 in paper copy, A01 in microfiche. Report PERC/TPR-75/2, November 1975. 9 p, 2 fig, 7 tab, 4 ref.

Descriptors: *Coals, *Methane , *Fuels, *Chemical analysis, *Pollutant identification, Water analysis, Water pollution, Water quality, Gases, Trace elements, Water properties, Natural gas, Wastes, Organic compounds, Phenols, Analytical techniques, Water pollution sources.
Identifiers: *Coal gasification, *Synthane process, *Tar analysis, *Char analysis, *Coal-to-gas process, Gasification, Synthane gasification, Gas analysis, Synthetic gas.

Extensive studies were made of the various effluents found in the Synthane coal-to-gas process. Analyses were made of the waters, gases, and trace elements present in some of the streams. Results of analyses showed the water effluents are the area where extensive research is needed. (Henley-ISWS)
W77-10989

PHYTOPLANKTON OF THE UPWELLING AREA OF NORTHWEST AFRICA: I. PIGMENTS AND PRODUCTION (CRUISE 'SAHARA II' OF THE RESEARCH VESSEL 'CORNIDE DE SAAVEDRA'), (IN SPANISH),
Instituto de Investigaciones Pesqueras, Barcelona (Spain).
For primary bibliographic entry see Field 5C.
W77-11045

A COLORIMETRIC METHOD FOR DETERMINATION OF SAXITOXIN,
Alaska Univ., College. Inst. of Marine Science.
R. M. Gershey, R. A. Neve, D. L. Musgrave, and P. B. Reichardt.
Reprinted from: Journal of the Fisheries Research Board of Canada, Vol 34, no 4, p 559-563, 1977. 2 fig, 3 tab, 20 ref. SG-04-6-158-44039.

Descriptors: Water resources, *Colorimetry, *Pollutant identification, Shellfish, *Clams.
Identifiers: *Saxitoxin, Saxidomus gigantea, Paralytic poison.

Saxitoxin, the paralytic shellfish poison, can be conveniently determined by colorimetry after hydrogen peroxide oxidation and reaction of the resultant guanidine with biacetyl. This colorimetric method has been used to assay saxitoxin quantitatively at concentrations down to 0.5 microgram/ml. Saxitoxin levels in the Alaskan butter clam (Saxidomus gigantea) have also been determined by this test coupled with a preliminary chromatographic cleanup procedure. (NOAA)
W77-11047

ELUCIDATING SALINATION MECHANISMS BY STABLE ISOTOPE TRACING OF WATER SOURCES,
Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5B.
W77-11056

BRACKISH GROUNDWATER BODIES AS A RESULT OF GEOLOGICAL HISTORY AND HYDROLOGICAL CONDITIONS,
Rijksinstituut voor Drinkwater voorziening, Delft (Netherlands).
For primary bibliographic entry see Field 2F.
W77-11057

THE RECOVERY OF INDICATOR BACTERIA ON SELECTIVE MEDIA,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
A. W. Hoadley, and C. M. Cheng.
J Appl Bacterial. Vol 37, No 1, p 45-57. 1974.

Descriptors: *Indicators, *Bioindicators, E. coli, Phosphates, Pseudomonas, Streptococcus, Aerobic bacteria, Bacteria, Toxicity.
Identifiers: Buffer.

The recovery of Pseudomonas aeruginosa, Escherichia coli, and Streptoccus faecalis from aqueous suspending media has been studies with a rich plating medium (trypticase-soy agar) and selective media. Tap water was highly toxic to all strains investigated. Recovery of P. aeruginosa was most successful when phosphate buffer was the diluent. Phosphate buffer did not improve the recovery of E. coli, S. faecalis remained viable when suspended in double distilled water, deionized distilled water or phosphate buffer. Following a lag period, all strains grew in 0.1% peptone water or stream water. Injury, preventing recovery of viable cells on selective media, occurred during suspension in all aqueous media tested, including those which supported growth. Difficulties inherent in the interpretation of bacter iological results obtained during surveys of water sources and a need to reduce the selectively of recovery media against injured cells are suggested.—Copyright 1974, Biological Abstracts, Inc.
W77-11111

WATER QUALITY IN VICINITY OF FENTON HILL SITE, 1975,
Los Alamos Scientific Lab., N. Mex.
W. D. Purtymun, W. H. Adams, A. K. Stoker, and F. G. West.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-6511-MS, Price codes: A02 in paper copy, A01 in microfiche. Report LA-6511-MS, September 1976, 21 p, 4 fig, 5 tab, 6 ref, 2 append.

Descriptors: *Water quality, Surface waters, Groundwater, Water chemistry, Flow, *New Mexico, *Pollutant identification, Path of pollutants, Ions.
Identifiers: Jemez River(N Mex), Rio Guadalupe(N Mex).

)The quality of surface water in the drainage area of the Jemez River and Rio Guadalupe were found to vary slightly at individual locations due to variations in stream flow. Predominant ions were the same at each location but annual average concentrations of these ions and total dissolved solids decreased slightly when compared to data collected in 1974. Chemical constituents in ground water from routine sampling locations, springs, and one well varied slightly during the year and a slight decrease was seen in predominant ions and total dissolved solids in comparison with previous data. Samples from five springs and two holes showed that chemical quality of water from these sources has remained about the same when compared to previous analyses. Two surface water gaging stations will be abondoned in 1976. Regression analysis of the mean annual discharge at the two stations vs mean annual discharge at the permanent USGS station indicated a very good correlation. (Chilton-ORNL)
W77-11129

WATER RESOURCES RESEARCH PROGRAM - NEARSHORE CURRENTS AND WATER TEMPERATURES IN SOUTHWESTERN LAKE MICHIGAN, (JUNE-DECEMBER 1975),
Argonne National Lab., Ill. Energy and Environmental Systems Div.
K. D. Saunders, and L. S. Van Loon.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/WR-76-2, Price codes: A11 in paper copy, A01 in

microfiche. Report ANL/WR-76-2, May 1976. 237 p, 5 fig, 2 tab, 4 ref, 2 append. W-31-109-Eng-38.

Descriptors: *Monitoring, *Measurements, Currents(Water), Temperature, Lakes, *Lake Michigan, Great Lakes, Pollutant identification, *Water temperature.

The mooring array used in taking measurements was a 1.6 km square with a current-meter mooring at each corner and in the center, each having affixed to it one Bendix Q-15 current meter and one YSI temperature sensor. Average water depth was 12 m and the meters and sensors were placed at middepth. Data from current and wind observations allowed for graphs showing U, V flow components versus time, specific kinetic energy versus time, flow speeds and directions versus time, composite velocity histograms and associated U, V-component histograms, and progressive-vector diagrams. The currents in this region were predominantly shore parallel-either northwest or southeast flows. Current speeds between the various meters showed general agreement. The temperatures of the water showed evidence of several downwelling and upwelling periods. From June through August temperatures ranged from approximately 15 to 20 C followed by a long, steady cooling until November 16, when the temperature fell to about 9 C. (Chilton-ORNL)
W77-11131

EXPERIMENTAL APPARATUS AND ANALYSIS TECHNIQUE FOR STUDYING THE LOW REYNOLDS NUMBER HYDRODYNAMIC BEHAVIOR OF WATER-BORNE PARTICULATES,
Argonne National Lab., Ill., Radiological and Environmental Research Div.
R. R. P. Chase, and G. T. Tisue.
In: Report ANL-75-60, Part III, (1976). p 41-44, 1 fig. W-31-109-Eng-38.

Descriptors: *Laboratory equipment, Laboratory tests, Analytical techniques, Reynolds number, Suspended load.
Identifiers: Hydrodynamics, Water-borne particulates.

The laboratory apparatus described consists of an isothermal sedimentation chamber, collimated light sources, photographic optics, and monitoring devices. The apparatus is capable of providing dynamic information on water-borne particulates in the size range of 2 microm to 700 microm, while stimulating a realistic environment. Data obtained from the apparatus may be used in large scale transport models using Lagrangian dynamics, the study of resuspension phenomena and their modeling, the determination of vertical eddy diffusivities, and resolution of residence-time problems. (See W77-11132) (Chilton-ORNL)
W77-11137

ACIDITY IN RAINFALL,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
G. T. Tisue, and J. Kacoyannakis.
In: Report ANL-75-60, Part III, (1976). p 45-50, 2 fig, 2 tab, 3 ref. W-31-109-Eng-38.

Descriptors: Chemistry, *Pollutant identification, *Analytical techniques, Acidity, Hydrogen ion concentration, *Rainfall, *Acidity.

Ten rainwater samples were examined. The initial pH's varied between 3.79 and 4.99 and the base neutralizing capacities between 5.01 and 18.9 times 10 to the minus 5 equiv/liter. This measured base neutralizing capacity is greater than would be predicted from simple theory for a mixture of strong acids and carbonic acid. It was suggested that, in addition to carbonic acids, other acids which could be present in rainwater and contribute to the excess base neutralizing capacity include arsenic acid, phosphoric acid, sulfurous acid, carboxylic and dicarboxylic acids as well as phenols. (See also W77-11132) (Chilton-ORNL)
W77-11138

MIXED FUNCTION OXIDASES IN MARINE ORGANISMS IN RELATION TO PETROLEUM HYDROCARBON METABOLISM AND DETECTION,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
For primary bibliographic entry see Field 5C.
W77-11241

GENERAL TEST CONDITIONS AND PROCEDURES FOR CHLORINE TOXICITY TESTS WITH ESTUARINE AND MARINE MACROINVERTEBRATES AND FISH,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
D. T. Burton.
Chesapeake Science, vol.18(1), 1977, p 130-136. 1 tab, 13 ref.

Descriptors: *Chlorine, *Chlorination, Marine Fish, Marine animals, *Bioassay, Methodology, *Toxicity, Mortality, Estuaries, Estuarine fisheries, *Laboratory tests, *Laboratory equipment, Water quality, *Statistical methods, Pollutant identification.

A brief introduction to toxicity testing with estuarine and marine macroinvertebrates and fish is presented. Toxicity testing terminology, test conditions, and procedures are discussed with an emphasis on toxicity testing using chlorine as the toxicant. (Katz)
W77-11243

BIOASSAY PROCEDURES FOR MARINE PHYTOPLANKTON WITH SPECIAL REFERENCE TO CHLORINE,
Virginia Inst. of Marine Science, Gloucester Point.
M. H. Roberts, Jr.
Chespeake Science, vol. 18, no. 1, 1977, p 137-139. 7 fig, 3 ref.

Descriptors: *Chlorine, *Bioassay, Methodology, *Phytoplankton, Marine algae, Laboratory tests, Marine plants, Laboratory equipment, Dialysis, *Water pollution effects, Pollutant identification.
Identifiers: *Experimental design, Dose-response curves, *Marine phytoplankton, Dialysis culture, *Static culture system, *Chemostat, *Continuous culture system.

Bioassay procedures to determine the reaction of marine phytoplankton to chlorine are described. These include a static culture system, chemostat, dialysis, and continuous culture system. (Katz)
W77-11245

METHOD FOR SAMPLING INVERTEBRATE DRIFT FROM A SMALL BOAT,
Ichthyological Associates, Inc., Pottstown, Pa.
R. P. Rutter, and W. S. Ettinger.
The Progressive Fish Culturist, vol. 39(1), 1977, p 49-52. 1 tab, 2 fig, 4 ref.

Descriptors: On-site investigation, *Methodology, *Benthos, Laboratory equipment, *Sampling, *Invertebrates, Rivers, Thermal power plants, Water pollution effects, Pennsylvania, Nets, *Aquatic insects.
Identifiers: *Schuylkill River(Penn), Cromby generating station, *Invertebrate drift, *Drift beam.

A method is described for sampling invertebrate drift from a small boat, using a beam to which conventional drift samplers are attached; the beam is mounted on the oarlocks. This method permits sampling-unit replication and enables the collection of drift from the upper strata of water in large rivers in areas that might be inaccessible to conventional methods. (Katz)
W77-11249

STUDIES ON DETERMINATION OF ALKYL MERCURY IN FISH AND SHELLS BY THE STEAM DISTILLATION METHOD, (IN JAPANESE),
Yamaguchi Prefectural Research Inst. of Health (Japan).
H. Kumagai, and K. Saeki.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 6, 1977, p 755-759. 2 tab, 1 fig, 11 ref.

Descriptors: *Mercury, Metals, *Fish, *Shrimp, *Clams, *Marine fish, *Chemical analysis, Laboratory tests, Methodology, *Public health, Chemical wastes, Path of pollutants, Pollutant identification, Bioindicators.
Identifiers: Tuna, Squid, Methyl mercury, Butyl mercury, Ethyl mercury, Alkyl mercury, Steam distillation method, Sting ray.

The study has shown that the alkyl mercury, that is, the methyl, ethyl or butyl compound, is entirely distilled by steam distillation, but phenyl or inorganic mercury is not. By the steam distillation method herein described, alkyl mercury in fish and shells can be completely extracted without emulsification. The data have shown quantitative recovery of methyl mercury added to a variety of samples. The coefficient of variation for repeated determinations on a tuna meat sample has been 2.0%. (Katz)
W77-11251

TRACE METAL CONTENT OF PLANKTON AND ZOOPLANKTON COLLECTED FROM THE NEW YORK BIGHT AND LONG ISLAND SOUND,
National Marine Fisheries Service, Milford, Conn. Experimental Biological Investigations.
R. A. Greig, A. Adams, and D. R. Wenzloff.
Bulletin of Environmental Contamination and Toxicology, Vol. 18(1), 1977, p 3-8. 3 tab, 2 fig, ref.

Descriptors: Metals, *Silver, *Cadmium, *Chromium, *Copper, *Nickel, *Lead, *Zinc, New York, Atlantic Ocean, *Zooplankton, Crustaceans, Shrimp, Water quality, Path of pollutants, *Trace elements, Crabs.
Identifiers: *New York Bight, *Long Island Sound, Comb jellyfish, Rock crabs, Jellyfish.

Baseline data on trace metal levels on zooplankton from Long Island Sound and the New York Bight were collected. The levels of silver, cadmium, and nickel in plankton did not differ markedly in various geographical locations. Copper, lead and zinc did differ as a function of either species or geographical location. (Katz)
W77-11254

CADMIUM AND OTHER HEAVY METALS IN SEA-SKATERS (GERRIDAE: HALOBATES, RHEUMATOBATES),
Scripps Institution of Oceanography, La Jolla, Calif.
L. Cheng, G. V. Alexander, and P. J. Franco.
Water, Air, and Soil Pollution, Vol. 6, No. 1, 1976, p 33-38. 2 tab, 14 ref.

Descriptors: *Metals, *Cadmium, *Copper, *Iron, *Lead, *Nickel, *Zinc, Seawater, Aquatic insects, California, Clinical analysis, Path of pollutants, Mangrove swamp, Pacific Ocean.
Identifiers: *Sea-skaters, *Marine insects, *Baja California, *Gulf of California, Halobates, Rheumatobates.

Exceptionally high concentrations of cadmium (100 to 200 ppm dry weight) were found in samples of Halobates collected off Baja California. In contrast, no detectable cadmium was found in Rheumatobates collected from mangrove lagoons in

Gulf of California. Concentrations of five other eavy metals in the two marine insects are also resented. (Katz)
W77-11256

TILIZATION OF FISH FOR WATER QUALI-Y DETERMINATION. COMPARISON WITH HE BIOTIC INDEX METHOD. APPLICATION O THE LAXIA (FRENCH RIVER IN THE AYS BASQUE) AND THE GABAS (FRENCH IVER IN THE LANDES DEPARTMENT), (IN RENCH),
tation d'Hydrobiologie Continentale, Biarritz rance). Laboratoire de Methodologie des Inven-ires.
. Laurent, and F. Calvert.
nnales de Hydrobiologie, Vol. 8, No. 1, 1977, p -87. 1 fig, 11 tab, 13 ref.

escriptors: *Freshwater fish, *Rivers, *Water ality, *Methodology, Statistical methods, nimal populations, Invertebrates, Benthos, quatic populations, Aquatic environments, ater pollution effects, *Fish populations, Fish, od, Organisms, Fish types, Aquatic insects, olluscs, Crustaceans.
entifiers: *Biotic index, France, Laxia River, bas River, *Diversity index, *Mean condition ctor.

llowing the study of two rivers (physico-emistry, invertebrates, fish for one river, and y fish for the other), it is shown that the diversi-index and the mean condition factor applied to fish stock, give results comparable with those ained by the physico-chemical study and by the tic index method to show up the alteration of an atic environment. Should these results be con-ned by further studies on other biotopes, the ersity index method applied to fish for pollution aracterization would present two advantages: to firm the other methods and to be workable by a highly specialized staff. (Katz)
7-11259

NTHIC INVERTEBRATES AS INDICATORS ORGANIC POLLUTION IN THE WESTERN LTIC SEA,
logische Anstalt Helgoland (West Germany).
Anger.
rnationale Revue der Gesamten drobiologie, Vol. 62 (2), 1977, p 245-254. 2 tab, , 18 ref.

criptors: Water pollution effects, *Animal pings, *Animal populations, Shallow water, thos, Invertebrates, *Sewage effluents, age, Organic wastes, *Organic matter, Water ution, *Sea water, Marine animals, On-site in-igation, *Domestic wastes, Amphipods, indicators.
tifiers: *Baltic Sea, Kiel Bay, *Organic pollu-indicators, *Polychaetes, Progressive species, ressive species, *Indicator species, Capitella ata, *Pollution gradients.

quantitative distribution of some important ic invertebrates in a shallow inshore area of Bay (Western Baltic Sea) is described. This n is partly polluted by domestic sewage from unicipality of Kiel. Three groups of species istinguished with reference to their densities ther population parameters in the different eas: Progressive species of the 1st and 2nd indicate a high and moderate to slight degree llution respectively by high population num-Regressive species are adverse indicators, t or occurring in exceptionally low numbers ected areas. In many cases the examination be concentrated on sand bottom, because a of species normally dwelling on aufwuchs up dense populations in sand, if it is organi-nriched. (Datz)
11281

THE EFFECT OF CHLORINE TOXICITY ON CERTAIN BLOOD PARAMETERS OF ADULT RAINBOW TROUT (SALMO GAIRDNERI),
Consumer Power Co., Jackson, Mich. Dept. of Environmental Services.
For primary bibliographic entry see Field 5C.
W77-11286

SURVIVAL OF TWO SPECIES OF AMPHIPODS IN AQUEOUS EXTRACTS OF PETROLEUM OILS,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5C.
W77-11289

SOME PROBLEMS IN SAMPLING STREAM FAUNA, WITH PARTICULAR REFERENCE TO THE VARIABILITY OF SAMPLES, (IN JAPANESE),
Hyogo Prefecture Environmental Science Inst. (Japan).
N. C. Watanabe, and S. Harada.
Japan Journal of Limnology, Vol. 37, No. 2, p 47-58, 1976. 8 tab, 4 fig, 33 ref.

Descriptors: *Sampling, *Biological communities, *Analytical techniques, *Benthic fauna, *Statistical methods, *Biomass, *Variability, *Diptera, *Screens, Methodology, On-site data collections, On-site investigations, Equipment.
Identifiers: Diversity, Caenis, Baetis.

Results obtained by using a wire gauze shovel for sampling stream fauna were analyzed statistically to determine reliability. From the coefficient of variation among the thirteen samples collected at random, the number of taxa in each unit area had a relatively small variability. Total individual numbers and the total biomass varied greatly. Both Shannon's and Simpson's diversity indices had very stable values. In order to estimate the total number of individuals within 10% of the true value at the 95% level of significance, no less than 39 repretitive samples with a 50 cm squre quadrant were required, in contrast to only six samples for the mean number of the taxa. Variability of samples in terms of single species depends on the aggregation of individuals. Samping with a 25cm squre quadrant is suggested due to the effort of sampling with a 50 cm square quadrant. (Katz)
W77-11292

CONTAMINATION OF BIOLOGICAL SAMPLES BY INGESTED SEDIMENT,
Moss Landing Marine Labs., Calif.
A. R. Flegal, and J. H. Martin.
Marine Pollution Bulletin, Vol. 8, No. 4, p 90-92, 1977. 2 tab, 6 ref.

Descriptors: *Heavy metals, *Path of pollutants, *Absorption, *Estuarine environment, *Sediments, *Iron, *Manganese, *Zinc, *Bioindicators, *Gastropods, *Intertidal areas, *Copepods, Cadmium, Copper, Invertebrates, Molluscs, Aquatic life, Analytical techniques, Zooplankton, Metals.
Identifiers: Acartia, Teluga, Acmaea.

An inorganic residue, presumed to be ingested sediment, was found in the rocky intertidal gastropods Tegula funebralis and Acmaea scabra and the estuarine gastropods Acartia tonsa and A. clausi. When expressed as a percentage of the sample weight, this residue fraction often correlated significantly with the elemental concentrations measured in the organisms. Elements identified included iron, manganese, titanium, and zinc. (Katz)
W77-11298

TOXICITY OF PYRETHOIDS TO JUVENILE ATLANTIC SALMON,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5C.
W77-11305

TOXICOLOGY OF METALS - VOLUME I,
Permanent Commission and International Association of Occupational Health. Subcommittee on the Toxicology of Metals.
For primary bibliographic entry see Field 5C.
W77-11316

EFFECTS OF CHLORINATED EFFLUENTS ON AQUATIC ECOSYSTEM IN THE LOWER JAMES RIVER,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 5C.
W77-11318

IDENTIFICATION OF AMMONIA AS THE TOXIC PRINCIPLE OF RED TIDE IN NOCTILUCA MILARIS, (IN JAPANESE),
Kagawa Univ., Takamatsu (Japan). Faculty of Agriculture.
T. Okaichi, and S. Nichio.
Bulletin of the Plankton Society of Japan, Vol 23(2), December, 1976, p 75-80, 1 tab, 3 fig, 5 ref.

Descriptors: *Phytoplankton, *Marine algae, *Toxicity, Mortality, Bioassay, *Ammonia, Chemical analysis, Laboratory tests, Chromatography, *Nitrogen cycle, Nitrogen compound, Methodology, Plant physiology, Plankton, *Red tide.
Identifiers: *Noctiluca, Seto Inland Sea.

Occurrences of red tide of Noctiluca milaris are very common in the Serto Inland Sea from spring to summer, and sometimes the organism cover several square kilometers of the sea. It was affirmed that acidic extract of N. miliaris was not only toxic to killifishes immersed in the extract but also to mice by intraperitoneal injecton. This paper deals with the extraction and the characterization of the toxic substance in the red tide of N. miliaris. Acidic extract of N. miliaris was purified by successive treatment with charcoal, Sephadex G-10 and Cu-Chelex-100 resin. After that the toxic substance was identified as ammonia on amino acid liquid chromtography. Ammonia, total nitrogen and ichthyotoxicity were determined on five samples of N. miliaris collected from the red tides which appeared along the coast of Kagawa Prefecture in 1972 and 1975. Ammonia contents varied from 6.6 to 68.9 mgNH3-N/g on dry basis, and the ichthyotoxicity was found to be closely related to the contents of ammonia in N. miliaris. It is concluded from these results that the most part of the toxicity of N. miliaris is due to ammonia contained. The accumulation of ammonia in the cell of N. mailiaris is also very interesting on the standpoint of marine nitrogen cycle. (Katz)
W77-11323

SUMMARY OF EXPERIMENTAL RESULTS: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENTS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-11326

COPPER GRANULES IN THE BARNACLE BALANUS BALANOIDES,
Natural Environment Research Council, Bangor (Wales). Marine Invertebrate Biology Unit.
For primary bibliographic entry see Field 5C.
W77-11335

A VISCOUS ANTITUMOR SUBSTANCE OBTAINED FROM A MARINE BACTERIUM NO. 9-12,
Kagawa Univ., Takamatsu (Japan). Aji Marine Biological Station.
K. Okutani.

Bulletin of the Japanese Society of Scientific Fisheries, Vol 43(3), 1977. p 323-328. 1 tab, 4 fig, 11 ref.

Descriptors: *Marine bacterium, *Sea water, Methodology, Public health, *Animal diseases, Microorganisms, Chemical analysis, Chromatography, *Proteins, *Pollutant identification.
Identifiers: *Marine bacterium No. 9-12, Extracellular substance, Antitumor activity, Mouse ascites, Carcinoma, Polysaccharide, Anti-tumor substance.

A marine bacterium No. 9-12, isolated from sea water, produced an extra-cellular viscous substance in sea water medium. The viscous substance was precipitated from the fermentation broth with acetone, extracted with M/100 EDTA and lyophilized after dialysis against water. The substance thus obtained exhibited antitumor activity for mouse sarcoma-180 (ascites type). Upon intraperitoneal injection of 1 mg/Kg/day x 5 and 5 mg/Kg/day x 5 of this substance, the growth of mouse ascites carcinoma was inhibited 84.4% and 87.2%, respectively. Chemical analysis showed that the substance contained 25.8% C, 4.2% H, 6.1% N, and 27.3% ash. The homogeneity of the crude extract was determined by column chromatography on Sephadex G-75, Sephadex G-200 and Sepharose 6B. The data suggested that the polysaccharide was separated from the protein moeity and that the polysaccaride was heterogenous. (Katz)
W77-11344

LABORATORY TECHNIQUE FOR OBTAINING FATHEAD MINNOW EGGS FOR USE IN TOXICITY EXPERIMENTS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5C.
W77-11347

ASSESSMENT OF THE ACUTE TOXICITY, GROWTH IMPAIRMENT, AND FLESH TAINTING POTENTIAL OF A BLEACHED KRAFT MILL EFFLUENT ON RAINBOW TROUT (SALMO GAIRDNERI),
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5C.
W77-11357

WATER RESOURCES DATA FOR MAINE, WATER YEAR 1975.
Geological Survey, Augusta, Maine. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11371

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1975--VOLUME 2. COLORADO RIVER BASIN.
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11372

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1975.
Geological Survey, Towson, Md. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11373

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1976.
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11374

RESPIRATORY BEHAVIOR OF FRESHWATER FISH IN CONDITIONS OF AQUATIC CONFINEMENT AND SEMI-CONFINEMENT, (IN FRENCH),
Lyon-1 Univ., Villeurbanne (France). Unite d'Enseignement et de Recherche de Medecine.
P. Harichauz, and J. Gorin.
Rev Int Oceanogr Med 43, p 97-109, 1976.

Descriptors: *Respiration, *Freshwater fish, *Polarographic analysis, Oxygen requirements, Fish behavior, Trout, Salmon.

Polarograhic recording of respiratory function in the fish showed a correlation of O2-dependence rate in Salmo trutta fario, with previous poisoning in the environment. Applied to an open-air system, 1-2 wk of continuous measurement showed a cyclic variation of respiratory activity in S. irideus. This is partially due to a daytime and nighttime alternation, but also to specific responses to natural extrinsic stimuli.–Copyright 1977, Biological Abstracts, Inc.
W77-11410

AQUATIC ENVIRONMENTAL QUALITY: PROBLEMS AND PROPOSALS,
Fisheries and Marine Service, Ottawa (Ontario). Oceanography Branch.
H. Harvey.
Journal of the Fisheries Res. Board of Canada, Vol 33, No 11, November 1976. p 2634-2670. 5 fig, 3 tab, 92 ref, 2 append.

Descriptors: *Canada, *Water quality, *Water pollution sources, *Research priorities, *Mercury, Baseline studies, Monitoring, Data collections, Mapping, Synoptic analysis, Toxicity.
Identifiers: Early warning systems, Water quality indices.

Whereas monitoring of water quality, chemical water quality and fish physiology and toxicology were found to be areas of strength in Canadian research and monitoring of aquatic environmental quality parameters by federal and provincial agencies, weaknesses were uncovered in similar ongoing research on the use of organisms and of whole systems as indicators of environmental quality. The overview, based on field interviews with more than 400 persons involved in Canadian water-based research and administration on both the national and provincial level, also showed that data interpretation lags seriously behind data collection in some monitoring areas and that underutilization of university-based expertise had restrained innovation in water quality studies. Views of the problems of water quality in Canada are summarized for current monitoring programs, early warning systems, municipal wastes, agriculture, forestry, mining, power generation, transportation and recreation. A review is made of current efforts to create water quality indices and a water quality atlas, and recommendations are given for future water quality monitoring and research. Constraints are discussed which affect understanding of the source, distribution and life expectancy of toxic substances in the environment, described especially in relation to mercury. (Harris-Wisconsin)
W77-11421

A NOTE ON SOIL AND WATER MERCURY LEVELS IN ISRAEL AND THE SINAI,
Hawaii Univ., Honolulu. Dept. of Botany and Microbiology.
S. M. Siegel, and B. Z. Siegel.
Water, Air and Soil Pollution, Vol. 5, p 263-268, 1976. 1 fig, 2 tab, 9 ref.

Descriptors: *Mercury, *Soil analysis, *Soil chemistry, *Water chemistry, *Water analysis, Sampling, Coastal plains, Pleistocene Epoch, Geochemistry.
Identifiers: *Israel, *Sinai.

Mercury analyses were conducted using 25 soil samples and 6 water samples collected from 21 sites in Israel and the Sinai in December 1972 and February to June 1974. All samples contained less than 1 mu g kg(-1) of Hg, although mineral scale from municipal water in Rehovot yielded 220 mu g kg(-1) and Dead Sea salt crystals contained 100 mu g kg(-1). Site locations and soil types are described. Results suggest that soil Hg levels are greater in locations with a history of thermal and tectonic activity. The low Hg level for waters suggests a low current rate of Hg input or high rate of removal before surfacing. Coastal plain sites in Israel were low in Hg but high levels were found eastward toward the Golan-Lake Kinneret area and at Ein Gedi near the Dead Sea. Low coastal plain levels in the Sinai contrasted with high levels in the interior toward the mountains. Relative high Hg levels in the Sinai reflect its continuing release at or near weathering mercury-rich igneous rock outcrops. (Jahns-Arizona)
W77-11443

CHROMATOGRAPHIC INVESTIGATION O INOSITOL PHOSPHATE ESTERS IN LAK WATERS,
Wisconsin Univ., Madison. Water Chemistry Lab
S. J. Eisenreich, and D. E. Armstrong.
Environmental Science and Technology, Vol 1 No 5, p 497-501, May, 1977. 4 fig, 20 ref, 2 tab
OWRT A-051-WIS(3).

Descriptors: *Water analysis, *Phosphate *Chromatography, *Pollutants identifica-tio Lakes, Water pollution sources,h Trace element Water pollution, Wat er chemistry, Water prope ties, Water quality, Foaming, Organic matter.
Identifiers: Esters, Inositol, Lake Mendota(Wisc

Alkaline bromination of destabilized foam a concentrated Lake Mendota water followed measurements of organic P and inositol in gel pe meation chromatography (GPC) fractions ga evidence for the presence of inositol phosph (IP) esters. The relative distribution of organic and inositol in GPC fractions by use of Sephad G-25 favored the lower IP esters (inosi triphosphate, inositol diphosphate, and inosi monophosphate). Based on results from GPC an ysis of nontreated foam and lake water, the esters were associated with high-molecular wei organic matter. The percentages of total P pres as IP esters averaged 19 and 26 for the foam a lake water, respectively. Estimated spring a summer IP concentrations in Lake Mendota w 3-15 micrograms P/liter. (Witt-IPC)
W77-11477

COMPOUNDS OF ZINC AND COPPER SEWAGE SLUDGE DETERMINED BY EL TRON SPECTROSCOPY,
Dayton Univ., Ohio. Dept. of Physics.
C. R. Cothern, R. F. Grote, W. E. Moddeman, C J. Ritter, and E. E. Zamicrowski.
Journal of Environmental Quality, Vol 6, No 2 165-168, April-June, 1977. 1 tab, 16 ref. OWRT 044-OHIO(2).

Descriptors: *Pollutant identificati *Spectroscopy, *Zinc, *Copper, *Bondi Metals, Analytical techniques, Sludge dispo Chemical properties, Chemical reactions.
Identifiers: Electron spectroscopy for chem analysis(ESCA), Photoelectron spectrosco Dayton(OH).

Chemical bonding of zinc and copper in slu was investigated by Electron Spectroscopy Chemical Analysis (ESCA). The Dayton, O tests were used to determine the availability toxic metals to plants in land applications of sl Measurements were made in a vacuum of .000 Torr. A compound with a known binding en was mixed with the samples to aid accu calibration. Analysis revealed that the Zn2 electron had a binding energy of 1023.8 + or

V. The Cu2p3/2 electron exhibited a binding energy of 937.2 + or - 0.3 eV. These were characteristic of zinc and copper being in the positive two oxidation state. Zinc and copper in sludge were bound to ligand with an electro-negativity of 3.5 + or - 0.1 n the Pauling scale. It was concluded that oxygen n the ligand contributed to this high value. Possible compounds included oxide, carbonate, hosphate, nitrate, sulfate, silicate, and/or carboxlate. ESCA has good potential as a means of dentifying chemical forms of metals in sludge, specially in combination with other techniques. Collins-FIRL)
/77-11482

VALUATION OF RECOVERY METHODS TO ETECT COLIFORMS IN WATER,
/est Virginia Univ., Morgantown. Div. of Plant ciences.
. K. Bissonnette, J. J. Jezeski, G. A. McFeters, nd D. G. Stuart.
pplied and Environmental Microbiology, Vol 33, o 3, p 590-595, March, 1977. 2 fig, 2 tab, 19 ref.

escriptors: *Coliforms, *Pollutant identification, nalytical techniques, Bacteria, Sewage effluents, valuation, Filtration, Membrane processes, reparation techniques, Waste water treatment.

oliform detection in water was evaluated by veral recovery methods. Methods tested were e pour plate, MPN, and membrane filtration ethods. It was found that multiple-tube fermenion techniques provided better recovery than ting or membrane filtration procedures. Memane filtration processes produced the poorest ults, especially as periods of organism exposure the stream environment increased. MPN hniques produced the best recoveries. Fecal liform recovery by membrane filtration was hanced by a 2-hour enrichment on a rich, nonective medium before exposure to selective dia. E. coli recoveries from pure-culture pensions and fecal coliform recovery from raw vage suspensions were significantly increased en compared to recoveries by direct primary posure to selective media. The enrichment iod seems to produce a non-toxic environment gradual adjustment and repair of injured cells. llins-FIRL)
7-11483

ROCEDURE FOR THE ROUTINE BIOLOGIL EVALUATION OF URBAN RUNOFF IN ALL RIVERS,
ssachusetts Univ., Waltham. Dept. of Environntal Sciences.
I. Pratt, and R. A. Coler.
ter Research, Vol 10, No 11, p 1019-1025, 1976. t, 1 tab, 16 ref.

criptors: *Monitoring, *Water quality control, ban runoff, *Rivers, *Pollutant identification, thic flora, Benthic fauna, Bioindicators, Water ution effects.
ntifiers: Biological indices.

thic macroinvertebrates were used in a edure to evaluate pollution in samll rivers. y offer the advantage of abundance and ease llection, a limited vagility and long life span, a capacity for a graded response to many s and degrees of stress. Species diversity is as a parameter of pollution detection. Artifisubstrates were suggested as a convenient od for obtaining data on upstreamnstream effects of urban runoff. Monitoring should be a reference site well upstream from ection receiving urban runoff and in the urban n where one is exposed to minimal levels of n runoff and one near maximum amounts. The per of substrates used should depend on the se of the survey and the time available for ction. Two baskets per site are minimal needs. llection frequency of eight collections per should suffice. Calculations are presented for processing the biological data. Interpretation should be guided by diversity and eveness indices. When monitoring sublethal effects, it should be considered that diversity of an artificial substrate is determined by differential drift and recruitment rates, and life histories of macrobenthic populations. (Collins-FIRL)
W77-11484

PROCEEDINGS OF WORKSHOP ON MICROORGANISMS IN URBAN STORMWATER,
Municipal Environmental Research Lab., Cincinnati, Ohio.
R. Field, V. P. Olivieri, E. M. Davis, J. E. Smith, and E. C. Tifft, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 030, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-600/2-76-244, 1976. 128 p, 28 fig, 42 tab, 47 ref.

Descriptors: *Pollutant identification, *Microorganisms, *Storm water, *Urban runoff, *Bioassay, Bacteria, Viruses, Disinfection, Analytical techniques, Water pollution control, Waste water treatment, Pathogenic bacteria.

The proceedings of a workshop on microorganisms in urban storm water were reported. The major objective was to exchange EPA data on such microorganisms, in order to understand their behavior and occurrence in urban storm runoff and combined sewer overflow. Assay procedures for pathogenic microorganisms were reviewed. Studies were conducted on the relationship between pathogenic and coliform microorganisms. Disinfection and aftergrowth of microorganisms were investigated and viruses in storm water were studied. (See W77-11490 thru W77-11492) (Collins-FIRL)
W77-11489

MICROORGANISMS IN URBAN STORMWATER -- A U.S. ENVIRONMENTAL PROTECTION AGENCY PROGRAM OVERVIEW,
Municipal Environmental Research Lab., Cincinnati, Ohio.
R. Field.
In: Report EPA-600/2-76-244, 1976. p 1-7, 6 ref.

Descriptors: *Microorganisms, *Storm water, *Pollutant identification, *Urban runoff, Analytical techniques, Flow, Temperature, Loads(Forces), Bioindicators, Biological properties, Physical properties, Chemical properties, Disinfection, Treatment facilities, Economics, Waste water treatment, Pathogenic bacteria.

The analysis and disinfection of microorganisms in storm water is discussed. The highly variable flow, temperature, pollutant load, and hydraulic quality of storm water discharge makes the analysis and disinfection of microorganisms difficult. The direct adoption of waste water analysis methods which utilize total coliform, fecal coliform, and fecal streptococcus methods can produce misleading conclusions. On-site disinfectant generation by raw materials' batching and electrolysis is necessary to economically provide the highly unpredictable quantities of disinfectant which are required. High-rate disinfection means and disinfection facility designs to accomodate the variable character of storm water should be developed. (See also W77-11489) (Collins-FIRL)
W77-11490

EXPERIENCES WITH RECOVERY OF VIRUSES FROM STORM WATER,
Syracuse Univ., N. Y. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W77-11492

5B. Sources Of Pollution

MASS TRANSFER STUDIES IN SORBING POROUS MEDIA I. ANALYTICAL SOLUTIONS,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-10801

ORGANIC MATTER AND NITROGEN DISTRIBUTION IN SOME MOUNTAIN HEATH COMMUNITIES OF THE SOURCE LAKE BASIN, WASHINGTON,
Oregon State Univ., Corvallis. Forest Research Lab.
C. C. Grier.
Arct Alp Res. 5(3 Part 1); p 261-267, 1973.

Descriptors: *Organic matter, *Nitrogen, *Washington, *Distribution, Vegetation, Soils, *Organic soils, Soil profiles, Path of pollutants, Litter, Lakes, Mosses.
Identifiers: Abies-Lasiocarpa, Cassiope-mertensiana, Cryptogramma-spp, Empetriformis, Lycopodium-spp, Phyllodoce, Sorbus-sitchensis, Vaccinium-deliciosum, Viola-spp, *Source Lake Basin(Wash).

The soils and vegetation (Phyllodoce empetriformis, Cassiope mertensiana, Vaccinium deliciosum, Abies lasiocarpa, Sorbus sitchensis, Viola spp., Cryptogramma-spp., and Lycopodium spp., with unidentified mosses and lichens) of subalpine mountain heath communities on colluvial, residual and organic soils in the Source Lake basin of the west-central Cascade Range, Washington, were described and sampled for organic matter and N content in foliage, living stems, attached dead stems, roots, litter and soil. Soil profile descriptions and vegetative cover data are presented. Total organic matter average 27.4, 39.3 and 100.2 kg m-2 and total N averaged 0.55, 1.09 and 1.71 kg m-2 in communities on the colluvial, residual and organic soils, respectively. Live and attached dead vegetation contained 1.17, 0.74 and 2.38 kg m-2 organic matter and 8.9, 5.0 and 13.7 gm-2 N in the same communities on colluvial, residual and organic soils, respectively. In all cases, the mass of live and attached dead vegetation constituted less than 5% of the total organic mass.--Copyright (c) 1974, Biological Abstracts, Inc.
W77-10803

COMPUTER SIMULATION IN WATER RESOURCES SYSTEMS.
Brussels Univ. (Belgium); and Ghent Rijksuniversiteit (Belgium).
For primary bibliographic entry see Field 2A.
W77-10806

A RECURSIVE APPROACH TO TIME-SERIES ANALYSIS FOR MULTIVARIABLE SYSTEMS,
Cambridge Univ. (England). Dept. of Engineering.
P. Young, and P. Whitehead.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N. Y. p 39-57, 1975. 3 fig, 26 ref.

Descriptors: *Time series analysis, *Estimating, *Water quality, *River systems, Reach(Streams), Dissolved oxygen, Biochemical oxygen demand, Model studies, Equations, Systems analysis, *Simulation analysis, Computer models.
Identifiers: Residual noise.

Described is a recursive approach to multivariable time-series analysis based on an extension of the earlier single input, single output Instrumental Variable-Approximate Maximum Likelihood (IVAML) procedures that have proved so useful in

practical applications. The use of techniques of statistical feature selection circumvents the problems of characterizing the multivariable stochastic disturbances. A method of dynamic system identification and estimation based on the multivariable IVAML procedure is outlined and applied to the problem of characterizing the dynamic relationship between biochemical oxygen demand and dissolved oxygen in a non-tidal river system. While the technique depends for its success on a number of largely heuristic approximations, it still has good potential for practical application due to its overall simplicity and ruggedness combined with reasonable statistical efficiency. (See also W77-10806) (Bell-Cornell)
W77-10807

A DYNAMIC-STOCHASTIC MODEL FOR WATER QUALITY IN PART OF THE BEDFORD-OUSE RIVER SYSTEM,
Cambridge Univ. (England). Control and Systems Div.
P. Whitehead, and P. Young.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 417-438, 1975. 11 fig, 1 tab, 17 ref.

Descriptors: *River systems, *Water quality, *Streamflow forecasting, *Simulation analysis, *Rainfall-runoff relationships, *Stochastic processes, *Methodology, Time series analysis, Hydrology, Estimating, Biochemical oxygen demand, Dissolved oxygen, Equations, Mathematical models, Systems analysis.
Identifiers: *BOD-DO model, Bedford-Ouse River system(England), Extended Kalman filter, Non-tidal, Uncertainty.

A number of methodologies are presented for the development of dynamic stochastic models of water quality in a river system, including models that describe the day-to-day variations in water quality and account for the inevitable uncertainties encountered in a system of this type. A deterministic streamflow forecasting model is enhanced by a 'black box' stochastic rainfall-runoff model, estimated using the Instrumental Variable Approximate Maximum Liklihood (IV-AML) method of time series analysis. Water quality models for biochemical oxygen demand-dissolved oxygen (BOD-DO) are then combined with the flow model and identified and estimated using the extended Kalman filter and a multivariate version of the IV-AML technique, respectively. This overall approach to identification and estimation has been applied to a 55 km stretch of the Bedford Ouse River System in eastern England. This research has demonstrated the initial feasibility of constructing realistic dynamic water quality models for nontidal river systems, herein providing a potentially useful and computationally efficient characterization of the flow-BOD-DO phenomena in the river system. (See also W77-10806) (Bell-Cornell)
W77-10811

PRACTICAL EXPERIENCES IN FORMULATING A WATER QUALITY MODEL FOR THE RIVER NECKAR,
Karlsruhe Univ. (West Germany).
H. H. Hahn, and R. W. Abendt.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 439-452, 1975. 4 fig, 1 tab, 7 ref.

Descriptors: *River systems, *Water quality control, *Mathematical models, Multiple purpose, Simulation analysis, Optimization, Decision making, Biochemical oxygen demand, Dissolved oxygen, Waste water(Pollution), Long-term planning, Data collections, Systems analysis.
Identifiers: *River Neckar(West Germany).

The Neckar River is central and vital to the densely populated area of Mittelwurttemberg. The area is furthermore heavily industrialized. Thus, the river serves many purposes. Above all, wastewater from domestic and industrial sources, including thermal wastes, accentuates the difficulties of the multipurpose use. Immediate amelioration of the water quality in the river along with long-range planning becomes mandatory. This discussion deals with the practical goals of water quality modeling. Realistically, they are not only to be seen in the formulation of an optimization model. This constitutes the last phase of any water quality modeling. The first benefits derive from its use in the phase of information gathering, information compaction and screening and testing of additional information. Still in the initial phases of the modeling activities, it will become apparent that such a way of exploiting information leads to a more intensive use of available data, that information transfer is simplified and that in a sort of trial-and-error method all kinds of alternative solutions may be tested or conceived. Only after the collection and exploitation of much information does it become meaningful to use simulation and optimization as preparation or aid for decision making. Considered herein are: (1) the different levels of accomplishment in formulating water quality models; (2) a brief characterization of the water quality model used in the example problem; (3) calibration of the model using available data material for the determination of model parameters; (4) improvement of the model; and (5) sample calculation for three river segments as an illustration. (See also W77-10806) (Bell-Cornell)
W77-10812

A WASTE CONTROL PROGRAM FOR A RIVER WITH HIGHLY VARIABLE CONCENTRATION OF CONSERVATIVE SUBSTANCE,
Hydraulic Research Inst., Brno (Czechoslovakia).
For primary bibliographic entry see Field 5G.
W77-10813

DYNAMIC MODELS AND COMPUTER SIMULATION OF WASTEWATER TREATMENT SYSTEMS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5D.
W77-10814

DESCRIPTION OF AN INTENDED PROJECT ON WATER QUALITY ESTIMATION,
Eidgenoessische Technische Hochschule, Zurich (Switzerland); and Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
J. Wetzel.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 497-501, 1975. 5 ref.

Descriptors: *Water quality, *Estimation, *Projects, Rivers, Water pollution control, Equations, Data collections, Mathematical models, Systems analysis, Dissolved oxygen, Flow.
Identifiers: Dissolved organic carbon, Suspended biomass.

The definition of a user dependent water quality function is proposed. To evaluate this function, water quality parameters must be known, which cannot be measured on-line. To overcome this difficulty, a model of the polluted river is established and estimation techniques are applied to calculate approximate values for the unknown parameters. Finally, a short description is given of the layout of practical experiments. The article considers the estimation of dissolved organic carbon (DOC) and suspended biomass (SB). (See also W77-10806) (Bell-Cornell)
W77-10817

STATIC AND DYNAMIC SIMULATION OF WATER TRANSPORT IN A COMPLEX NETWORK SYSTEM,
Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemical Engineering.
L. Lijklema, and G. van Straten.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., 1975 p 661-670. 5 fig, 3 ref.

Descriptors: *Simulation analysis, *Network *Water quality, Ecosystems, Basins, Canal Flow, Water levels, Velocity, Lakes, Management, Decision making, Hydrology, Equation Mathematical models, Systems analysis Eutrophication.
Identifiers: Static models, Dynamic models, Natural frequencies, Cultural eutrophication.

Increasing cultural eutrophication is threatening the unique ecosystem of the water basin of Volle hove. For management decisions a knowledge the transport and fate of phosphates would required. Presented is a study of the water tran port in the basin of Vollenhove, a polder district the north-west of the province of Overijssel in t Netherlands. Dynamic simulations, based on nodes and links model, show that considera oscillations in flows and water levels occur, duced mainly by the intermittent operation of t pumping station. The dynamic behavior refle the natural frequencies of the system. The resu have been compared with those obtained from static mode. It is concluded that: (1) the flow water through the network of waterways interco necting lakes is affected strongly by the dynam character of inputs and outputs; (2) the fl through the network under dynamic conditio reflects the natural frequencies of the syste Frictional resistance reduces the amplitude of resulting oscillations, but has a negligible eff upon the frequencies; and (3) static models tend underestimate the degree of mixing in the netwo (See also W77-10806) (Bell-Cornell)
W77-10828

CONTROL OF WATER QUALITY IN POLLUTED STREAMS,
Alberta Univ., Edmonton. Dept. of Electrical gineering.
For primary bibliographic entry see Field 5G.
W77-10834

OPTIMAL ALLOCATION OF ARTIFICIAL STREAM AERATION,
Consiglio Nazionale delle Ricerche, Milan (Ita Centro di Teoria dei Sistemi.
For primary bibliographic entry see Field 5G.
W77-10835

HEAVY METAL DISCHARGES INTO SHA LAKE AND KESWICK RESERVOIRS ON T UPPER SACRAMENTO RIVER, CALIFORN A RECONNAISSANCE DURING LOW FLOW
Geological Survey, Menlo Park, Calif.; W Resources Div.; and Geological Sur Lakewood, Colo. Water Resources Div.
D. K. Nordstrom, E. A. Jenne, and R. C. Aver
Available from the National Technical Info tion Service, Springfield, VA 22161 as PB-267 Price codes: A03 in paper copy, A01 in microfi Water-Resources Investigations 76-49, M 1977. 25 p, 2 fig, 1 plate, 7 tab, 30 ref, append.

Descriptors: *Water pollution sources, *Acid water, *Heavy metals, *Reservoirs, *Inf California, Acid streams, Trace elements, Pa

ollutants, Mixing, Toxicity, Chemical analysis, treamflow, Low flow, Environmental effects, akes, Ecology, Evaluation.
dentifiers: *Shasta Mining District(Calif), *Lake asta, Sacramento River, Spring Creek.

our out of seventeen streams entering the Shasta-eswick Reservoir system in California contribute to 94 percent of the heavy metal load into the per Sacramento River under the low flow condi-ns which existed in the fall of 1974. Of these ur streams, three contain acid mine drainage, th Spring Creek carrying more than 50 percent the total load for every element analyzed except d. The Pit River (the fourth stream) contains w concentrations of metals and has neutral pH lues; but since it carries the greatest discharge, computed loads also are high. The immediate nger to fishin the Shasta-Keswick region is not e contribution of acidity and toxic metals to the al load, but toxicity at the localized point of xing where the acid streams mix with lake ter. Zinc and cadmium, in addition to copper, present in high concentrations for five of the enteen streams and may exert significant ergistic effects. The presence of arsenic in ne of the ore minerals suggests that it also may ntribute to the toxicity of the mine drainage. oodard-USGS)
7-10860

E OF AN AIRBORNE FRAUNHOFER LINE SCRIMINATOR FOR THE DETECTION OF LAR STIMULATED LUMINESCENCE,
ological Survey, Flagstaff, Ariz. Water ources Div.; and Geological Survey, Reston, Water Resources Div.
primary bibliographic entry see Field 2K.
7-10869

ECTION OF ACIDIC INDUSTRIAL WASTE O THE FLORIDAN AQUIFER NEAR BELLE ADE, FLORIDA: UPWARD MIGRATION D GEOCHEMICAL INTERACTIONS 1973-75,
ological Survey, Tallahassee, Fla. Water ources Div.
. McKenzie.
n-file report 76-626, September 1976. 54 p, 5 5 tab, 10 ref.

criptors: *Water pollution sources, *Industrial tes, *Injection wells, *Waste disposal, rida, Liquid wastes, Acids, Path of pollutants, ndwater movement, Aquifers, Sampling, mical analysis, Water analysis, Water pollu-control, Evaluation.
tifiers: *Belle Glade area(Fla), Floridan fer.

966, a furfural plant at Belle Glade, Florida, n injecting hot, acidic liquid waste into the e, water-filled lower part of the Floridan fer, between the depths of 1,495-1,939 feet. eds above and below the injection zone were ected to attack by the acid waste. By 1969, ef- of the waste were detected in the water of the monitoring the upper part of the Floridan er at 1,400 feet. The disposal well was ened late in 1971 to 2,242 feet in an attempt to the upward migration of waste. The results of rch investigations by the U.S. Geological ey during 1966-73 indicated that the waste nued to move upward and laterally. This in-gated, continued by the U.S. Geological Sur-n 1973-1975, shows that the remedial actions pairing the disposal well liner and injecting dically into the deep monitor well at 2,060 ailed to contain the wastes within the lower f the Floridan aquifer. The data collected by rvey are supported by the owner's chemical-n-demand and pH determinations. A hydrau-nnection between the injection zone and the ring monitoring zone is implied. Plans call for ng into deepter strata. (Woodard-USGS)
0870

SALT-WATER ENCROACHMENT IN AQUIFERS NEAR THE HOUSTON SHIP CHANNEL, TEXAS,
Geological Survey, Houston, Tex. Water Resources Div.
D. G. Jorgensen.
Open-file report 76-781, 1977. 45 p, 19 fig, 8 tab, 20 ref.

Descriptors: *Saline water intrusion, *Aquifers, *Water wells, *Channels, *Leakage, Sea water, Gulf of Mexico, *Texas, Aquifer characteristics, Groundwater movement, Path of pollutants, Chemical analysis, Evaluation.
Identifiers: *Houston Ship Channel(Tex).

Interpretations based on analyses of inorganic constituents, dissolved organic carbon, and tritium in ground water and surface waters indicate that the Houston Ship Channel is the source of salt water that has been detected in shallow wells between Baytown and Houston, Texas. Analyses of the ratios of the stable isotopes of carbon, sulfur, hydrogen, and oxygen were inconclusive as to the source of the salt water, but were consistent with the hypothesis that the ship channel is the source. Estimates of the amount of vertical leakage indicate that the quantity of salt water encroaching from the surface or near surface to the Chicot aquifer, including leakage from the Houston Ship Channel, is not sufficient to appreciably alter the inorganic chemical quality of the ground water in any large segment of the aquifer. The effects of other contaminants, particularly organic substances, are not known. (Woodard-USGS)
W77-10872

SEDIMENT SUSPENSION AND TURBULENCE IN AN OSCILLATING FLUME,
California Univ., Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 2J.
W77-10887

INVESTIGATION OF THE BEHAVIOR OF TRACE ELEMENTS IN OCEAN WATER BY THE DESORPTION METHOD,
V. V. Gromov.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-TR-611, Price codes: A02 in paper copy, A01 in microfiche. From: Radickhimiya (RADKA), Vol 16, No 6, p 757-760, 1975. 15 p, 2 fig, 2 tab, 4 ref. Translated by S.J. Amoretty, Brookhaven National Laboratory, Technical Information Division, No. BNL-TR-611.

Descriptors: *Trace elements, *Monitoring, *Radioisotopes, *Radioactive wastes, *Water pollution, *Pollutant identification, Oceans, Manganese, Cobalt.
Identifiers: *Outer Continental Shelf.

The absorption and desorption of 239Pu, 106Ru, 99Tc, 60Co, and 54Mn in equilibrium with ocean water is investigated. The first three isotopes are found in the ocean as a result of the wide industrial use of atomic energy. Plutonium and technitium are new to the ocean environment and their behavior in the ocean has not been studied extensively. Manganese and cobalt are typical trace elements in ocean water, which have received increased attention because of the study of iron-manganese concretions. (Sinha-OEIS)
W77-10889

REMOTE SENSING STUDY OF ELECTRIC GENERATING STATION THERMAL DISCHARGES TO BARNEGAT BAY AND GREAT EGG HARBOR, NEW JERSEY.
Environmental Protection Agency, Denver, Colo. National Field Investigations Center.
For primary bibliographic entry see Field 5A.
W77-10892

COASTAL ZONE POLLUTION IN INDONESIA WITH EMPHASIS ON OIL. A RECONNAISSANCE SURVEY.
Lembaga Minyak Dan Gas Bumi, Djakarta (Indonesia).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 447, Price codes: A10 in paper copy, A01 in microfiche. Smithsonian Institution, Office of International and Environmental Programs, Washington, D.C., Report, April 1974. 186 p, 15 fig, 15 tab, 71 ref, 10 plates, 7 append.

Descriptors: *Water pollution, *Oil pollution, *Fisheries, *Industrial wastes, *Domestic wastes, *Environmental effects, *Pesticides, Water resources, Estuaries, Coasts, Pollutants, Surveys.
Identifiers: *Indonesia(Coastal zone).

In 1972 and 1973 the LEMIGAS Study Group on Pollution (SGP) and the Smithsonian Institution jointly undertook a survey on marine pollution by oil in Indonesia. This document contains a review of existing knowledge concerning oil pollution in tropical waters, a survey of Indonesian marine resources vulnerable to oil pollution, and a review of the present status of oil pollution based largely upon field interviews and visits to various installation on and offshore. It seems that pollution by oil in offshore waters is not yet a serious problem in Indonesia. The Indonesian fish catch statistics reviewed do not prove or disprove the adverse impact of oil pollution on high seas fisheries. 'Tambaks' or brackish water fish ponds are the most important coastal resources, in terms of present and potential value, that could be adversely affected by oil pollution. Other forms of pollution are also of immediate concern such as industrial effluents and organochlorine insecticides in agricultural run-off. Domestic waste waters may also be causing problems. Knowledge of coral reef ecosystems and of the manner in which they are affected by oil pollution is insufficient to permit conclusions. Tourism and recreation in the Kepulauan Seribu are adversely affected by beach oil pollution, apparently originating from ship traffic. Reliable information on marine pollution levels and marine resources, based on scientific research, surveys and statistical data collection, does not presently exist. Coastal water pollution is not presently monitored except for visual observations. (Sinha-OEIS)
W77-10907

EXPERIMENTAL ANALYSIS OF THE TRANSFERS OF A MICROPOLLUTANT (ZN65) TO THE TERMINAL CONSUMER IN A FRESH WATER ECOSYSTEM, (IN FRENCH),
Limoges Univ. (France). Animal Biology Lab.
For primary bibliographic entry see Field 5C.
W77-10913

GREAT LAKES: CHEMICAL MONITORING,
Wisconsin Univ., Madison, Lab. of Hygiene.
J. J. Delfino.
Environmental Science and Technology, Vol. 10, No. 10, 1976. p 986-990.

Descriptors: *Lake Michigan, *Chemical wastes, *Water chemistry, *Water pollution sources, *Watershed management, *Great Lakes, Chemistry, Land use, Fallout, Pesticides, Chemical wastes, Heavy metals, Atmospheric pollution, Thermal pollution, Radioactive wastes, Radioisotopes, Algae.
Identifiers: *Menomonee River Basin, Plutonium, Algal productivity.

Important research findings presented at the tenth Great Lakes Regional Meeting of the American Chemical Society are presented. The meeting's theme was Chemistry of the Great Lakes. The Menomonee River watershed study wa discussed. The study will evaluate: the types and quantities of pollutants moving within the watershed and ultimately reaching Lake Michigan;

the sources and characteristics of pollutants entering Lake Michigan as a function of various land uses; and models that can extrapolate the findings from this pilot watershed to other urban watersheds. Atmospheric loadings to the Great Lakes were reported on. Another study analzyed changes in the Lake's natural chemistry resulting from the addition of manmade contaminants such as sulfur, heavy metals, and chlorinated organic chemicals. Another study concluded that natural lake processes can influence aquatic algal productivity as much as manmade influence such as thermal pollution. The results of sediment studies were discussed. Sediment is seen as a record of the cultural usage of heavy metals such as lead, cessium and plutonium. It was learned that plutonium levels in the Lake exist in a state of dynamic equilibrium, in spite of greatly reduced inputs of these radioisotopes, due to an annual sedimentation and resuspension process. (Nessa-NC)
W77-10924

HYDROGEOLOGIC CONSIDERATIONS IN LIQUID WASTE DISPOSAL,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5E.
W77-10926

REVIEW OF PCB LEVELS IN THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
D. J. Finlay, F. H. Siff, and V. J. DeCarlo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 735, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-560/7-76-001, January 1976, 137 p, 35 tab, 22 fig, 36 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclor, Path of pollutants, *Water pollution sources, *Environmental effects, Environmental gradients, *Water, Sediments, Soils, Freshwater fish, Waterfowl, Benthic fauna, Birds, Lake Ontario, Lake Erie, Lake Superior, Lake Michigan, Lake Huron, Iowa, Mississippi River, New York, Hudson River, Maryland, Atlantic Ocean, Gulf of Mexico, California, Florida, Illinois, Michigan, Wisconsin, Foods, *Monitoring.
Identifiers: Cayuga Lake, Chester River, Marine environment, Bay of Fundy, Caribbean Sea, Escambia Bay(Fla), Jacksonville(Fla), Occurrence in Food.

This is a review of the current PCB data base to assess the PCB levels in the environment on a national level; the full spectrum of PCB levels reported in man and the environment were of interest. Data were obtained from a number of national monitoring programs, the literature and many unpublished reports up to December 1, 1975. (Katz)
W77-10935

INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF MONURON, SUBSTITUTE CHEMICAL PROGRAM,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5C.
W77-10936

EFFECT OF SEDIMENT ORGANIC MATTER ON MIGRATION OF VARIOUS CHEMICAL CONSTITUENTS DURING DISPOSAL OF DREDGED MATERIAL,
Cold Regions Research and Engineering Lab., Hanover, N. H.
B. E. Blom, T. F. Jenkins, D. C. Leggett, and R. P. Munmann.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 394, Price codes: A09 in paper copy, A01 in microfiche. Army Engineering Waterways Experiment Station, Vicksburg, Mississippi, 148 p, 20 tab, 38 fig, 109 ref.

Descriptors: *Sediments, *Dredging, *Water quality, *Organic matter, Freshwater, Saltwater, Laboratory tests, *Metals, Nutrients, Ammonia, Phosphate, Cadmium, Manganese, Analytical techniques, Nitrates, Nitrites, Iron, New York, Path of pollutants.
Identifiers: Orthophosphates, *Organic carbon, Soluble organic matter, *Organo-metallic complexes, *Interstitial water, Chemical oxygen demand, Detroit, *Riverine sediments.

The disposal of both freshwater and saltwater sediments in open waters has been experimentally investigated in the laboratory. The emphasis of the experimental work was directed towards identifying the role that sediment organic carbon has in controlling various water-quality parameters at disposal sites. Long-term studies examined the possibility of transport of material form sediments into an overlying water column as well as monitoring the changes in the aqeous phase which initially contained large amounts of suspended matter. For the latter case, metal and nutrient concentrations were initially high but decreased significantly with time. Exceptions to this behavior were noted. Specific components were identified which migrated from the sediment into the water column. They include ammonium-nitrogen, orthophosphate, cadmium, and manganese, the latter only in seawater media. Organic carbon and inorganic nitrogen underwent transformations with the systems investigated. Both sediment organic carbon and soluble organic matter were generally found to have no demonstrable effect on water quality. Exceptions to this general conclusion were found in two sediments containing significant amounts of petroleum hydrocarbons. (Katz)
W77-10937

THE INTERRELATIONSHIP OF MATERIAL TOXICITY STREAM PROPERTIES AND QUANTITY OF SPILLED MATERIAL IN ASSESSING THE RISK OF HAZARDOUS MATERIAL SPILLS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
P. A. Jensen, and R. W. Hann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 098, Price codes: A12 in paper copy, A01 in microfiche. Report TAMU-SG-75-212, May 1976, 261 p, 4 tab, 25 fig.

Descriptors: *Toxicity, Water pollution effects, *Water pollution sources, Water pollution, *Oil pollution, *Oil spills, Hazards, Methodology, Materials, *Risks, Tidal marshes, Tidal streams, Streams, *Risks.
Identifiers: *Spill probabilities, *Spill quantity, Aquatic system properties, *Spill impacts, Material toxicity, Hazardous materials, *Risk analysis, volatile liquids, Insoluble substances, Non-tidal systems.

The current status of regulatory efforts for the bulk carriage of oil and hazardous materials is reviewed. The hazard posed to water resources is examined using the method of risk analysis. A weakness of the present regulatory efforts, namely that aquatic system properties and spill quantity are not considered, is identified. With risk defined as the product of spill probability and severity, a procedure is suggested to better quantify one element of water pollution risk--severity of spill impact. The procedure identifies two major parameters which affect spill impact, concentration of material in the water and the concentration at which the material causes acute toxic effects. Methods are developed to quantify spill concentration in the water, a function of spill size and available dilution water, on a relative scale for use with existing relative toxicity ratings. The combined toxicity and dilution capacity ratings provid a significantly improved measure of water poll tion impact, and thus risk. The waterway relati dilution capacity quantification procedure is bas on median discharge and considers the effects longitudinal dispersion and the dynamics of fi mortality. (Katz)
W77-10938

STRIP MINING (CITATIONS FROM THE NT DATA BASE).
National Technical Information Service, Spri field, Va.
For primary bibliographic entry see Field 5G.
W77-10939

NITRATES IN EFFLUENTS FROM IRRIGAT LANDS - ANNUAL REPORT,
California Univ., Riverside. Dept. of Soil Scie and Agricultural Engineering.
P. F. Pratt, F. E. Broadbent, and A. D. McLaren
Available from the National Technical Infor tion Service, Springfield, VA 22161 as PB-252 8
Price codes: A17 in paper copy, A01 in microfic
Prepared for National Science Foundati Washington, D.C., Report NSF-RA-E-75-0 July, 1975. 388 p, 20 tab, 20 fig, 120 ref.

Descriptors: *Nitrates, *Nitrites, *Nutrie Nitrogen compounds, *Leaching, Leacha *Irrigation, Irrigation systems, Soils, Model dies, Effluent, *Nitrogen cycle, Soil bacteria, site investigation, Agricultural chemic *Agricultural runoff, Irrigated land, Root zone.
Identifiers: *Nitrate leaching, Nitrate los *Nitrite utilization, *Soil aeration, Nitrate tilization, Oxygen diffusion rates, Nitrous ox Concentrtion, *Bacterial denitrification r Solute transport, Anion exclusion, Nitro balance, Agricultural land.

The main objective of this research program develop a capability to predict nitrate leachin drainage waters from irrigated lands. The pro is subdivided into the following subprojects: ones that use extensive field approaches to as the nitrate concentrations and quantities of nitr nitrogen leached in drainage waters; (2) those have established intensive field trails using st isotopes of nitrogen to follow its fate through soil-crop system; and (3) projects that are cerned with nitrogen transformations in the and the microbiological and physical factors control these transformations. A fourth subpr deals with computer modeling of the soil-c water system and also the management model nitrogen and for water that might predict ni leaching. Twenty separate reports are include this compilation. (Katz)
W77-10941

ON THE AQUATIC INSECT COMMUNITIE SHORE ZONES AND INFLUENTS AS WELL EFFLUENTS OF LAKES IN SHINSHU, JAPANESE),
For primary bibliographic entry see Field 2H.
W77-10949

HEPTACHLOR IN RELATION TO MAN THE ENVIRONMENT,
Environmental Protection Agency, Washin D.C. Office of Pesticide Programs.
H. E. Fairchild.
Available from the National Technical Info tion Service, Springfield, VA 22161 as PB-257
Price codes: A04 in paper copy, A01 in microf
Report EPA 540/4-76-007, August, 1976. 65 tab, 12 fig, 125 ref.

Descriptors: *Heptachlor, *Chlorinated hydr bon pesticides, Chlorinated hydrocar Analytical techniques, *Environmental ef Path of pollutants, Pollutant identification, *P health, *Toxicity, Pesticides, Insecticides, chain, Epidemiology.

dentifiers: *Crop residues, *Food residues, Heptachlor toxicology, *Heptachlor epidemiolo-y, Cyclodiene insecticides, Chlordane, *Soil in-ecticides.

Scientific data are evaluated in the areas of fish, vildlife, distribution in the environment (air, soil, vater), residues in crops and food items, and tox-cology and epidemiology. This review sum-narizes rather than interprets scientific data stu-ied during the process of reviewing heptachlor. he review of heptachlor covers all uses of the esticide in the United States and should be ap-licable to future needs in the Agency. (Katz)
77-10957

RANSVERSE MIXING IN PARTIALLY TRATIFIED FLOW,
alifornia Univ., Berkeley. Dept. of Civil En-neering.
or primary bibliographic entry see Field 8B.
77-10965

TREAMFLOW TRANSMISSION LOSSES IN ESTERN KANSAS,
eological Survey, Lawrence, Kans.
or primary bibliographic entry see Field 4A.
77-10966

IGRATION OF LANDFILL LEACHATE HROUGH GLACIAL TILLS,
inois State Geological Survey, Urbana.
Cartwright, R. A. Griffin, and R. H. Gilkeson.
round Water, Vol. 15, No. 4, p 294-305, July-Au-st 1977. 9 fig, 6 tab, 14 ref.

escriptors: *Leachate, *Landfills, *Percolation, linois, *Glacial drift, Clay minerals, Attenua-n, Water pollution, Anaerobic conditions, ydraulic conductivity, Chemical analysis, ocontrol, Cation exchange, Hardness(Water), lorides, Sodium, Potassium, Ammonium salts, avy metals, Calcium, Iron, Laboratory tests, lumns.
ntifiers: Laboratory columns, Sterilized chate, Buffering capacity.

achate was collected by anaerobic techniques m the 15-year old Du Page County sanitary dfill near Chicago, Illinois, and was passed ough 44 laboratory columns containing various xtures of calcium-saturated clays and washed rtz sand. Leachate was run through the umns for periods of from 6 to 10 months, and uents were periodically collected and tested for chemical constituents. Sterilized leachate was d in a duplicate set of columns to determine the ects of gross biological activity. Chlorine and ain organic compounds were relatively unat-ated by passage through the clay columns; novalent cations, such as Na, K, and NH4, e moderately attenuated; and heavy metals, h as Pb, Cd, and Zn, were attenuated by even ll amounts of clay. Concentrations of Ca and were much higher in the column effluents than were in the original leachate. The active hate reduced the hydraulic conductivity to a h greater degree than the sterile leachate. d data show a 'hardness halo' corresponding to Ca release in the columns. The relative at-ation rates of some of the ions also were con-ed by field data, but the change in hydraulic ductivity was not as clearly shown. (Visocky-S)
-10968

STIMULATION OF METABOLISM IN ADAPTING TO GROWTH IN WARM TER, (IN UKRANIAN),
demiya Nauk URSR, Kiev. Instytut obiologii.
primary bibliographic entry see Field 5C.
-10971

INITIAL DILUTION WITH DEEPWATER DIFFUSERS,
Caldwell Connell Engineers, Melbourne (Australia).
I. G. Wallis.
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1621-1626, July 1977. 3 fig, 3 tab, 3 ref, 2 append.

Descriptors: *Waste water disposal, *Oceans, *Diffusion, *Waste water(Pollution), Water pollution, Effluents, Sewage effluents, Outfall sewers, Model studies, Mathematical models, Waste dilution, Pollution.
Identifiers: *Deepwater diffusers.

Wastewater generated in many coastal communities is discharged into the ocean through deepwater diffusers. One measure of the performance of a diffuser is the initial dilution of the effluent (that is, the dilution when all initial momentum and buoyancy have been used). In an unstratified ocean, the approximate initial, dilution depends on the thickness of the surface effluent field and may be predicted from the discharge, the depth and the length of the diffuser. A dimensional graph that may be used to predict initial dilution was presented. (Sims-ISWS)
W77-10974

MODELING NITRATE MOVEMENT AND DISSIPATION IN FERTILIZED SOILS,
Agricultural Research Service, Columbia, Mo. Dept. of Hydraulic Engineering.
K. E. Saxton, G. E. Schuman, and R. E. Burwell.
Soil Science Society of America Journal, Vol. 41, No. 2, p 265-271, March-April 1977. 5 fig, 1 tab, 27 ref.

Descriptors: *Model studies, *Leaching, *Nitrates, *Iowa, Water pollution sources, Solutes, Fertilizers, Movement, Soil profiles, *Path of pollutants, Mathematical model, Agricultural watersheds, Soil water movement, Percolation, Soil moisture, Pollutants, Demonstration watersheds, Crops, Corn(Field).

It is important to know the fate of nitrogen (N) fertilizers to ensure crop production and to avoid pollution, but frequent measurement of soil N is difficult. Therefore, a digital model was developed to calculate the occurrence, movement, and dissipation of nitrate-nitrogen (NO3-N) within the soil profile of fertilized agricultural lands. Daily NO3-N amounts and distributions within a 1.8-m soil profile were calculated by representing the major processes influencing NO3-N for the entire year. Daily soil moisture amounts and movement were predicted by a previously developed soil moisture-evapotranspiration model. Profiles of NO3-N measured periodically on two research watersheds in western Iowa, one normally fertilized (168 kg/ha per year) and the other excessively fertilized (448 kg/ha per year) with N, were used for model verification. The daily calculations for the fertilized cornfields with moderately permeable soils included NO3-N movement, dissipation, and profile leaching. The predicted NO3-N profiles closely represented those measured. Like most prediction methods, this one was developed to a state of utility, but revisions, improvements, and additions always are possible and desirable. Many of the model representations could be improved by including additional details and refinements. And some assumptions, like negligible denitrification, could be eliminated if proper representations were available. (Humphreys-ISWS)
W77-10975

MATERIAL TRANSPORT THROUGH POROUS MEDIA: A FINITE-ELEMENT GALERKIN MODEL,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 2F.
W77-10981

ACOUSTIC METHOD FOR DETECTING LEAKS FROM SUBMERGED PIPELINES,
Exxon Production Research Co., Houston, Tex. (Assignee).
For primary bibliographic entry see Field 5G.
W77-10995

STUDY OF MINERALIZATION IN AN AGRICULTURAL SOIL OF RESIDUAL MUDS OF VARIOUS ORIGINS, (IN FRENCH),
Ecole Nationale Superieure d'Agronomique et des Industries Alimentaires de Nancy (France). Laboratoire Matiere Org. Environ.
For primary bibliographic entry see Field 5G.
W77-10998

ELUCIDATING SALINATION MECHANISMS BY STABLE ISOTOPE TRACING OF WATER SOURCES,
Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
J. R. Gat.
In: Brackish Water as a Factor in Development, International Symposium, January 5-10, 1975, Beer-Sheva, Israel, Ben-Gurion University of the Negev, p 15-23. 7 fig, 27 ref.

Descriptors: *Meteoric water, *Encroachment, *Saline water systems, Stable isotopes, *Water sources, Oxygen isotopes, Deuterium, Brackish water, Model studies, Brines, Sea water, Saline water intrusion, Magmatic water, Evaporation, Arid lands, Hydrology, Groundwater.
Identifiers: Evaporites, Ultrafiltration.

Stable isotope characterization, along with more conventional chemical methods, is helpful in elucidating salinization mechanisms that operate in brackish water sources. Brackish waters and brines appear in the meteoric water cycle through such processes as dissolution of rocks and evaporites, salt retention and concentration by shale ultrafilters, salt concentration in residues of (surface) evaporation processes and admixtures of nonmeteoric saline waters such as seawater, paleobrines and possibly magmatic exhalations. One indicator of salinity origin is the abundance of oxygen 18 and deuterium in saline water sources compared with the isotopic composition of local or regional cyclic waters. The expected pattern involves conservation of the isotopic composition in the process of dissolution of anhydrous evaporites; heavy isotope species enrichment by surface evaporation processes, with a theoretically predictable correlation between the degree of enrichment of oxygen 18 and deuterium; and a different enrichment pattern for ultrafiltration process residues. Seawater's distinctive isotope composition can be traced to its mixtures with meteoric waters. Isotope characteristics associated with the different pathways of salinization and its mechanisms are outlined. Studies include those on salinity in a coastal aquifer, in arid zone hydrology and in groundwaters. (See also W77-11055) (Jahns-Arizona)
W77-11056

EFFECTS OF IRRIGATION MANAGEMENT ON THE QUALITY OF IRRIGATION RETURN FLOW IN ASHLEY VALLEY, UTAH,
Superior Farming Co., Bakersfield, Calif.
R. D. Bliesner, R. J. Hanks, L. G. King, and L. S. Willardson.
Soil Science of America Journal, Vol. 41, No. 2, p 424-428, March-April 1977. 5 fig, 3 tab, 11 ref.

Descriptors: *Leaching, *Irrigation effects, *Utah, *Return flow, *Irrigation water, Salinity, On-site investigations, Sprinkler irrigation, Soil management, Alfalfa, Electrical conductance, Soil profiles, Lysimeters.
Identifiers: Ashley Valley(Utah).

A study was conducted to evaluate reduced leaching fractions under different field water

management conditions. Three qualities of water were applied at three leaching fractions to areas of an alfalfa (Medicago sativa L.) field having three depths to the water table. A sprinkler irrigation was used, with the electrical conductivity of the irrigation water and soil solution extract at various depths measured for each application. Results indicate that soil profile salinity is relatively unaffected by leaching fraction for short periods of time (1 to 2 years), due to high relative concentrations of calcium and sulfate in the irrigation water and soil solution. The electrical conductivity of waters applied averaged 0.98, 2.22 and 2.80 mmhos/cm, respectively, for the season. Leaching fractions for the low leaching treatment of each water quality averaged 0.003, with other treatments ranging from 0.082 to 0.343. The total amount of salt removed in irrigation return flow from such an area varies directly with drainage water quantity since the concentration is relatively constant. (Jahns-Arizona)
W77-11079

THE NATURAL ABUNDANCE OF N15 IN THE SOIL-WATER SYSTEM OF A SMALL CATCHMENT AREA,
Queensland Univ., Brisbane (Australia). Dept. of Agriculture.
For primary bibliographic entry see Field 2G.
W77-11081

WATER QUALITY IN VICINITY OF FENTON HILL SITE, 1975,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5A.
W77-11129

DISSOLUTION OF AMOPHOUS SILICON ON LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
J. I. Parker, H. L. Conway, and E. M. Yaguchi.
In: Report ANL-75-60, Part III, (1976). p 58-60, 1 fig. W-31-109-Eng-38.

Descriptors: *Ecosystems, Limnology, Lakes, Silicon, Diatoms, Recycling, *Lake Michigan.

Data from monthly sample collections in Lake Michigan showed that average concentration of diatom frustules per gram dry sediment in the water column was 3.08 times 10 to the eighth power. Average concentration in sediment traps at 37 m was three times lower than the water column average, six times lower in the 60 m traps, and 50 times in the bottom sediment. The vertical distribution of particulate amorphous silicon was similar to that of frustules. The annual input of dissolved reactive silicon was estimated to be only about 3.0% of the annual silicon requirement by diatoms, suggesting that approximately 97% of the silicon is recycled per annum. (See also W77-11132) (Chilton-ORNL)
W77-11140

LYSIMETER AND FIELD MEASUREMENTS OF CHLORIDE AND BROMIDE LEACHING IN AN UNCULTIVATED LOAMY SAND,
Wisconsin Univ.-Madison. Dept. of Soil Science.
P. G. Saffigna, D. R. Keeney, and C. B. Tanner.
Soil Science Society of America Journal, Vol. 41, No. 3, p 478-482, May-June 1977. 4 fig, 4 tab, 12 ref.

Descriptors: *Leaching, *Halides, *Lysimeters, *Chlorides, *Bromides, Tracers, Dispersion, Soils, Soil water, Soil water movement, Solvents, On-site investigations, Drainage, Soil profiles, Soil physics, Soil science, *Path of pollutants.
Identifiers: Halide movement.

Field and lysimeter measurements were made of Cl and Br leaching in a Plainfield loamy sand at Hancock, Wisconsin. Chloride and Br were excellent companion tracers, moving in a 1:1 ratio through the 500-cm field profile to the water table even when differences in halide leaching occurred between adjacent sites. Half of the Cl or Br applied to the lysimeters was leached through the 125-cm lysimeter profile in 13 or 17 cm of drainage during 22- and 205-day experiments, respectively. Edge effects in the lysimeter were studied by applying Br near the edge and Cl in the center. Bromide was detected in the lysimeter drainage before Cl, but overall, edge effects were small. Lateral movement of Cl and Br in the lysimeter profile was less than 20 cm, which helps explain why large localized variations in solute transport can persist to considerable depth in this sandy soil. The differences in the distribution of halide between adjacent soil profiles within the lysimeter and field exceeded the average differences between the field and the lysimeter soil profiles. (Sims-ISWS)
W77-11232

WATER AND SALT FLOW THROUGH COMPACTED CLAYS: I. PERMEABILITY OF COMPACTED ILLITE AND MONTMORILLONITE,
Western Australia Univ., Nedlands. Extension Service.
For primary bibliographic entry see Field 2G.
W77-11234

HYDRAULIC AND THERMAL PROPERTIES OF A SANDY SOIL AS INFLUENCED BY INCORPORATION OF SEWAGE SLUDGE,
Minnesota University, St. Paul; and Agricultural Research Service, St. Paul, Minn.
S. C. Gupta, R. H. Dowdy, and W. E. Larson.
Soil Science Society of America Journal, Vol. 41, No. 3, p 601-605, May-June 1977. 7 fig, 1 tab, 16 ref.

Descriptors: *Soil properties, *Sewage sludge, *Hydraulic properties, *Thermal properties, Soil moisture, Soil water, Retention, Hydraulic conductivity, Bulk density, Soil temperature, Organic matter, Diffusivity, Thermal conductivity, Soil physics, Soil science.

Soil water retention was increased by incorporation of sewage sludge into a sandy soil. Most of the increase resulted from water absorbed by organic matter (15-bar water). At any given water content, unsaturated hydraulic conductivity and soil water diffusivity decreased as rates of sludge addition increased. However, saturated hydraulic conductivity increased as rates of sludge addition increased. Thermal conductivity decreased with increasing rates of sludge application. However, the heat capacity of all oven-dried sludge-soil mixtures was the same as that of the control treatment. The combination of a lower thermal conductivity and a higher specific heat (due to higher water content) buffered sludge-amended soil against sudden temperature changes. Thus, maximum and minimum daily temperatures on plots receiving sludge were a few degrees lower and higher, respectively, than those temperatures on the control treatment. (Sims-ISWS)
W77-11236

CONTAMINATION OF THE BIRD LIFE OF THE CAMARGUE BY ORGANOCHLORINE RESIDUES (CONTAMINATION DE L'AVIFAUNE CAMARGUAISE PAR DES RESIDUS ORGANOCHLORES), (IN FRENCH),
Ontario Ministry of the Environment, Ottawa. Service Canadien de la Faune.
For primary bibliographic entry see Field 5C.
W77-11277

HEAVY METAL ACCUMULATION IN THE VICINITY OF A DESALINATION PLANT,
Department of the Environment, Reading (England). Central Water Planning Unit.
M. G. Romeril.
Marine Pollution Bulletin, Vol. 8, No. 4, p 84-87, 1977. 4 tab, 9 ref.

Descriptors: *Seasonal, *Copper, *Water pollution sources, *Heavy metals, *Invertebrates, *Marine plants, *Absorption, *Industrial water, *Iron, *Zinc, Sand, Path of pollutants, Salinity.
Identifiers: *Fucus, *Desalination plants, *Limpet, *Bioaccumulation.

The brine effluent produced by a flash distillation desalination plant contains elevated levels of some heavy metals. The effluent produced from such a plant operating in Jersey during the summer months leads to increased metal concentrations in limpets and some Fucus species. This is most evident with copper which remains at elevated levels during the winter period of plant inactivity, probably due to the copper coating retained on boulders and pebbles on the uppershore. Limpets contained about 20 micrograms copper/gram which is about four times the copper concentration of unaffected animals. (Katz)
W77-11278

UPTAKE OF COPPER AND LEAD BY A METAL TOLERANT ISOPOD, ASELLUS MERIDIANUS RAC.,
Cambridge Univ. (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 5C.
W77-11279

FORMATION OF TOXIC PRODUCTS FROM NO. 2 FUEL OIL BY PHOTOOXIDATION,
Academy of Natural Sciences of Philadelphia, Avondale, Pa. Stroud Water Research Center.
R. A. Larson, L. L. Hunt, and D. W. Blankenship.
Environmental Science and Technology, Vol. 1 No. 5, p 492-496, May 1977. 11 fig, 42 ref.

Descriptors: *Toxins, *Oil, *Oil wastes, *Fuel *Toxicity, *Irradiation, *Phenols, *Oil spill *Yeasts, *Bioassay, *Light, Pollutants, Organ matter, Environmental effects, Laboratory test Chemical analysis, Chemical reactions, Acids.
Identifiers: *Carbonyl compound *Photooxidation, Bakers yeast.

Oxygenated compounds toxic to baker's yeast a relatively soluble in water were formed upon sim lated environmental ultraviolet irradiation of a N 2 fuel oil. Toxicity reached a maximum within 2 and appeared to be principally due to react peroxides; addition of a mild reducing ag (thiacyclohexane) eliminated a large percentage the light-induced toxicity. On continued irrad tion, other classes of toxic compounds w produced. Carbonyl compounds (largely deriv from benzylic hydrocarbons) and phenols creased at approximately linear rates for at le seven days. The phenolic compounds present the original oil were largely destroyed replaced by higher-boiling phenols (includ hydroxyl-substituted aryl ketones). Quinones w not detected. The acids present included ac with phenolic substitutents. (Katz)
W77-11291

ACCUMULATION AND RETENTION DIETARY 14C-DDT BY ATLANTIC M HADEN,
National Marine Fisheries Service, Beaufort, N
For primary bibliographic entry see Field 5C.
W77-11297

FREQUENCY DISTRIBUTIONS OF TR METAL CONCENTRATIONS IN FIVE FRE WATER FISHES,
Savannah River Ecology Lab., Aiken, S. C.
J. P. Giesy, Jr., and J. G. Wiener.
Transactions of the American Fisheries Soc Vol. 106, No. 4, p 393-403, 1977. 3 tab, 2 fig, 4

Descriptors: *Cadmium, *Chromium, *Co *Iron, *Zinc, *Sunfishes, *Herrings, *Silver *Shiners, *Trace elements, *Distribu

*Absorption, *Path of pollutants, Metals, Nutrients, Baseline studies, Geochemistry, Analytical techniques, *Statistical methods, Freshwater fish, Fish.
Identifiers: Esox, Lepomis, Tissue analysis, Bioaccumulation.

Whole body concentrations of Cd, Cr, Cu, Fe, and Zn were determined for samples of chain pickerel (Esox niger), bluegill (Lepomis macrochirus), blueback herring (Alosa aestivalis), brook silverside (Labidesthes sicculus), and golden shiner (Notemigonus crysoleucas) from a 1,120-hectare impoundment near Aiken, South Carolina. Species differences in mean concentrations were found for all five elements. Frequency distributions of 23 species-element groupings were compared to the normal, lognormal, Weibull, and expotential distributions. The lognormal, normal, Weilbull, and expotential distributions had the best fit to 57, 17, 6, and 0 percent of the species-element groupings, respectively. Four of the 23 species-element groupings departed significantly from all four of the distributions, primarily as a result of strong positive skewness. All species for which Cd and Cr were studied exhibited significant positive skewness, while skewness was less pronounced for concentrations of Cu, Fe, and Zn. Most species to which the Weilbull distribution gave the best fit did not depart significantly from either the lognormal or normal distribution. Therefore, in most cases either the normal or lognormal distribution may be satisfactorily employed as statistical models of frequency distributions of trace metal concentrations in fishes. Known required elements (Cu, Fe, and Zn) tested more towards normality than Cd and Cr, which followed lognormal distributions. (Katz)
W77-11300

NATURAL VARIABILITY IN DISTRIBUTION OF AN INTERTIDAL POPULATION OF MACOMA BALTHICA SUBJECT TO POTENTIAL OIL POLLUTION AT PORT VALDEZ, ALASKA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.
T. Myren, and J. J. Pella.
Marine Biology, Vol. 41, p 371-382, 1977. 3 tab, 7 fig, 38 ref.

Descriptors: *Elevation, *Commercial shellfish, Mollusks, *Populations, *Alaska, *Spatial distribution, *Size, *Animal populations, Distribution patterns, *Variability, *Temporal distribution, *On-site investigations, Intertidal areas, Aquatic habitats, Density, Baseline studies, Monitoring, Invertebrates, Environmental gradient.
Identifiers: *Macoma balthica, *Port Valdez (Alaska), Temporal variation.

Natural variability in the abundance of an intertidal population of the lamellibranch Macoma balthica was measured during 1971 and 1972 in a bay area near the proposed oil storage and tanker loading facility at the southern terminus of the Trans-Alaska pipeline in Port Valdez, Alaska. M. balthica were divided for analysis into a large and small size category. Small temporal changes in population densities throughout the entire study area were detected for both size categories over several of the 7 sampling times of the 2-year period. Large and persistent differences in density were found among elevation contour intervals for each size category; however, variations in the density profiles on elevation occurred among sampling times. Large M. balthica became more variably distributed and the small category less variably distributed among elevation contours during the 2-year period. Densities of both size categories were more stable at the higher elevations of the study site. Large M. balthica were more homogeneously distributed along a given elevation contour interval than the small category. Mobility and time available to redistribute at a horizontal location would explain the more homogeneous distribution of large M. balthica if competition for food resources exists. (Katz)
W77-11301

PCBS IN THE UNITED STATES INDUSTRIAL USE AND ENVIRONMENTAL DISTRIBUTION, TASK I.
Vesar, Inc., Springfield, Va.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 012, Price codes: A21 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 560/6-76-005, February 1976. 334 p, 48 tab, 32 fig, 9 ref, 6 append.

Descriptors: *Polychlorinated biphenyls, *Arochlor, Organic compounds, Chlorinated hydrocarbon pesticides, *Industrial plants, Industrial production, *Industrial wastes, Waste water treatment, Waste water disposal, *Sources of pollution, *Regulation, Environmental control, Environmental effects, Path of pollutants.
Identifiers: Environmental transport, Environmental hazards, Environmental loads, *Environmental transport model, Industrial use, *Environmental distribution.

This document presents the current state of knowledge about the production, usage, and distribution of polychlorinated biphenyls (PCBs) in the United States. The information presented is derived from detailed studies on the production and first tier user industries, the past and present generation, and disposition of PCB-containing wastes, environmental transport and cumulative loads, potential alternatives to PCBs usage, inadvertent losses to and potential formation in the environment, and current regulatory authorities for PCBs control. These results indicated that, although PCBs content of industrial wastes can be reduced through various approaches (treatment, substitution, etc.), there exists a potentially severe future hazard in the form of large amounts of PCBs currently contained in land disposal sites. Further definition of this and other aspects of the PCBs problem, and determination of ways to minimize the hazard, are recommended. (Katz)
W77-11317

ACUTE TOXICITY OF OIL DISPERSANTS TO MARINE FISH LARVAE,
Aberdeen Univ. (Scotland). Dept. of Natural History.
For primary bibliographic entry see Field 5C.
W77-11333

ZINC-65 SPECIFIC ACTIVITIES IN THE MIGRATORY PACIFIC HAKE MERLUCCIUS PRODUCTS,
Oregon State Univ., Corvallis. School of Oceanography.
N. H. Cutshall, J. R. Naidu, and W. G. Pearcy.
Marine Biology, Vol 40, p 75-80, 1977. 3 fig, 1 tab, 22 ref.

Descriptors: *Zinc, *Path of pollutants, *Zinc radioisotopes, *Radioecology, *Columbia River, *Marine fish, Size, Radioisotops, Nuclear reactors, Migration patterns, Metals, California.
Identifiers: *Pacific hake.

Pacific Hake (Merluccius productus), migrating northward along the California coastline during summer, encounter the southwesterly flowing plume of the Columbia River. Radioactive 65Zn associated with the plume waters is taken up by the migrating hake. Smaller fish reflect this contamination earlier than larger fish. Zinc-65 specific activities increase toward north as far as 46N, off the mouth of the Columbia River, and then decline northward along the coast of Washington. Specific activities of 65Zn in muscle tissues are consistently higher than those in whole-fish samples. (Katz)
W77-11336

DYNAMICS OF SOME TRACE ELEMENTS IN ORGANS AND TISSUES OF THE RUDD,
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
V. I. Vorob'yev, and V. F. Zaytsev.
Hydrobiological Journal Vol 11(2), 1975. p 57-66, 1 tab, 10 ref. (Translation from Russian).

Descriptors: *Freshwater fish, *Path of pollutants, *Metals, *Iron, *Copper, *Aluminum, Laboratory tests, Chemical analysis, Seasonal, *Trace elements, Fish physiology, Fish diseases.
Identifiers: Tissue concentrations, Gill filaments, Kidneys, Swim bladder, Scales, Sex differences, *Rudd.

A study was made of the dynamics of iron, copper, aluminum in rudd organs and tissues during the spring, summer and fall in 1969 and 1970. Significant sex differences were observed of the fish in spring. Concentration of these substances were highest in the spring. In the fall iron accumulated mostly in the kidneys of fish. (Katz)
W77-11342

EXTENT OF EFFLUENT INFLUENCE ON LAKE WATER DETERMINED BY BACTERIAL POPULATION DISTRIBUTIONS,
Ontario Ministry of the Environment, Rexdale. Lab Service Branch.
D. A. Rokosh, S. S. Rao, and A. A. Jurkovic.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 844-849, 1977. 5 fig, 7 ref.

Descriptors: *Lake Superior, Bacteria, Coliforms, *Pulp wastes, *Pulp and paper industry, *Industrial wastes, On-site investigations, *Water pollution effects, *Path of pollutants, Methodology, Canada.
Identifiers: Heterotrophic bacteria, Fecal coliforms, *Industrial effluents, Effluent outfall, *Total coliforms, Organic sulfur reducers, *Nipigon Bay(Ont).

Populations of heterotrophic bacteria, total and fecal coliforms, and sulfur cycle bacteria were measured in a large body of water receiving the effluent of a pulp and paper industry. Elevated bacterial populations were detected near the effluent outfall but persistent populations, larger than those in unaffected lake water, extended as far as 19 km from the effluent outfall. This ability to detect influences to distances up to 19 km adds a new dimension to a description of a mixing zone receiving industrial effluents. (Katz)
W77-11350

TRANSFER OF THE CHLORINATED HYDROCARBON PCB IN A LABORATORY MARINE FOOD CHAIN,
Scripps Institution of Oceanography, La Jolla, Calif.
E. D. Scura, and G. H. Theilacker.
Marine Biology, Vol. 40, p 317-325, 1977. 4 tab, 2 fig, 34 ref.

Descriptors: *Aroclors, *Polychlorinated biphenyl, Laboratory tests, Methodology, Bioassay, Water pollution effects, *Path of pollutants, *Food chains, Marine animals, *Marine fish, *Algae, *Rotifers, California, Trophic level.
Identifiers: Northern anchovy, Algal flagellate, Dunaliella, Brachionus, *Chlorinated hydrocarbons.

The transfer of chlorinated hydrocarbons (CHC) in a laboratory simulation of a three trophic level marine food chain was studied. The food chain consisted of the algal flagellate Dunaliella sp., the rotifer Brachionus plicatilis, and the larva of the northern anchovy Engraulis mordax. Each trophic level appeared to be in a steady-state at the time of first sampling, 5 days after inoculation. Apparent partition coefficients were calculated for each trophic level. The CHC contamination in the diet of the rotifers and anchovy larvae was also calcu-

lated. Unfed anchovy larvae accumulated the same amount of CHC as fed larvae and the final concentration appeared to be dependent on the CHC concentration in the seawater. The data in this report suggest that CHC accumulation is not a food-chain phenomenon but rather the result of direct partitioning of the compounds between the seawater and the test organism. (Katz)
W77-11356

SURFACE-WATER QUALITY IN THE YAMPA RIVER BASIN, COLORADO AND WYOMING--AN AREA OF ACCELERATED COAL DEVELOPMENT,
Geological Survey, Lakewood, Colo. Water Resources Div.
D. A. Wentz, and T. D. Steele.
Paper presented at: Conference on Water for Energy Development, Engineering Foundation, Asilomar Conference Grounds, Pacific Grove, California, December 5-10, 1976. 28 p, 11 fig, 1 tab, 4 ref.

Descriptors: *Coal mine wastes, *Path of pollutants, *Streams, *Colorado, *Wyoming, Bottom sediments, Sediment yield, Sampling, Baseline studies, Chemical analysis, Trace elements, Dissolved solids, Iron, Manganese, Nitrogen, Phosphorus, Carbon, Water temperature, Evaluation.
Identifiers: *Yampa River basin(Colo and Wyo).

Coal production in the Yampa river basin of Colorado and Wyoming is expected to exceed 20 million tons annually by 1990. Increased coal production and related development could increase withdrawals of surface water, which currently (1976) supplies the bulk of water used in the basin. Analyses have been carried out to determine ambient surface-water quality in the basin prior to accelerated coal-resource development. Regional temperature patterns, sediment yields, and relations between specific conductance and concentrations of major inorganic chemical constituents have been determined from available historical data. Time-trend analyses of historical stream temperatures at the mouths of the two main subbasins show no discernible changes since 1951. Over the same period, there has been a 14-percent increase in dissolved-solids concentration in one subbasin, although no change has occurred in the other. The historical data were complemented by a reconnaissance of 82 stream sites during low-flow conditions in August and September 1975. At three sites, concentrations of trace elements in water and in bottom sediments were higher than ambient levels determined for the basin. Iron and manganese concentrations exceeded current drinking water standards recommended by the U.S. Public Health Service (1962) at 40 sites; high concentrations of nitrogen, phosphorous, and organic carbon were found at six sites. Diversity indices for benthic macroinvertebrates provide no concrete evidence for additional anomalous sites in the basin. (Woodard-USGS)
W77-11366

RIVER-QUALITY ASSESSMENTS,
Geological Survey, Reston, Va. Water Resources Div.; Advisory Committee on Water Data for Public Use, Longboat Key, Fla. Working Group on River-Quality Assessment; and Geological Survey, Portland, Oreg. Water Resources Div.
P. E. Greeson, C. J. Velz, and D. A. Rickert.
Water Resources Bulletin, Vol. 13, No. 3, p 445-453, June 1977. 24 ref.

Descriptors: *Water quality, *Assessments, *River basins, *Water pollution sources, *Water quality control, Evaluation, Watershed management, Dissolved oxygen, Trace elements, Algae, Land use, Erosion, Planning.
Identifiers: *Willamette River basin(Oreg).

In 1972, the U.S. Geological Survey began a pilot program of river-quality assessments. The objectives of the program are (1) to define the character, interrelationships, and apparent causes of existing river-quality problems, and (2) to devise and demonstrate the analytical approaches and the tools and methodologies needed for developing water-quality information that will provide a sound technical basis for planners and managers to use in assessing river-quality problems and evaluating management alternatives. The most noteworthy finding of a pilot assessment of the Willamette River basin, Oregon, was that across-the-board advanced waste treatment was not the answer to the problem of meeting stringent water-quality standards established for the river. The assessment also found that existing water-quality data generally are inadequate for defining the critical cause-effect relationships that control river-quality problems and that intensive, synoptic surveys keyed to local problems and conditions would be required in most river basins to develop an adequate information base for managing important river-quality problems. The study illustrated that rigid nationwide standards and regulations are likely to result in unneeded expenditures in some river basins and in undesirable quality in others. (Woodard-USGS)
W77-11379

EFFECTS ON GROUND-WATER QUALITY FROM IRRIGATING PASTURE WITH SEWAGE EFFLUENT NEAR LAKELAND, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
R. C. Reichenbaugh.
Water-Resources Investigations 76-108, April 1977. 56 p, 13 fig, 12 tab, 16 ref.

Descriptors: *Path of pollutants, *Supplemental irrigation, *Sewage effluents, *Groundwater movement, *Artificial recharge, Water analysis, Water wells, Bacteria, Nitrogen compounds, Irrigation, Pastures, Florida.
Identifiers: *Lakeland area(Fla), Secondary treated effluent.

Since 1969 an average of 25,000 gpd of domestic secondary-treated effluent has been used to supplement irrigation of 30 acres of grazed pasture north of Lakeland, Florida. Monitor wells were contructed near the effluent-irrigated pasture. The water table in the surficial aquifer under the pasture varied from 1.0 to 3.3 feet below land surface. Total nitrogen was less than 20 percent of the effluent content after percolating 8 feet; no increase in nitrogen was detected 20 feet below the surface, or in down-gradient ground water. There was no evidence of phosphorus or carbon contamination of ground water. Low numbers of bacteria (generally coliform) were noted in some samples from nine wells. Four wells sampled contained bacteria of probable fecal origin. Low-rate application of the effluent to the pasture apparently has had little effect on the soil and ground water. (Woodard-USGS)
W77-11381

REAERATION COEFFICIENTS OF STREAMS--STATE-OF-THE-ART,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.
R. E. Rathbun.
Journal of the Hydraulics Division, ASCE Proceedings, Vol 103, No HY4, Paper 12878, p 409-424, April 1977. 2 fig, 6 tab, 39 ref.

Descriptors: *Reaeration, *Streams, *Equations, *Dissolved oxygen, *Analytical techniques, Measurement, Reviews, Evaluation.
Identifiers: *Predictive equations, *Reaeration coefficient.

The reaeration coefficient is one of the parameters necessary for the modeling of dissolved oxygen concentrations in streams. Hence, techniques for measuring or predicting this coefficicent must be available. There are three basic techniques for measuring the reaeration coefficients of streams. These are the dissolved-oxygen balance, the disturbed equilibrium, and the tracer techniques. The tracer technique has the advantage that it does not require the measurement of any of the sources and sinks of dissolved oxygen in the stream. There are numerous equations in the literature for predicting reaeration coefficients, and these equations give a wide range of predicted coefficients for a specific set of hydraulic conditions. Application of these equations to five streams for which reaeration coefficients were measured with the tracer technique shows that no one equation is best for all the streams. There is also a definite tendency for the calculated coefficients to be larger than the experimental values. (Woodard-USGS)
W77-11382

REGULATION OF FORESTRY RELATED NON-POINT SOURCE POLLUTION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Debevoise and Liberman, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-11458

SURVEILLANCE IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W77-11478

SOME ASPECTS OF THE DAILY DEVELOPMENT OF THE PLANKTON IN THE ENVIRONMENT OF THE PORT OF MARSEILLE, (IN FRENCH),
Aix-Marseille-2 Univ. (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 2L.
W77-11486

PROCEEDINGS OF WORKSHOP ON MICROORGANISMS IN URBAN STORM WATER,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W77-11489

MICROORGANISMS IN URBAN STORM WATER – A U.S. ENVIRONMENTAL PROTECTION AGENCY PROGRAM OVERVIEW,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W77-11490

5C. Effects Of Pollution

ORGANIC MATTER AND NITROGEN DISTRIBUTION IN SOME MOUNTAIN HEATH COMMUNITIES OF THE SOURCE LAKE BASIN, WASHINGTON,
Oregon State Univ., Corvallis. Forest Research Lab.
For primary bibliographic entry see Field 5B.
W77-10803

THE INFLUENCE OF THE QUALITY OF WATER ON ECOLOGICAL SYSTEMS,
Liege Univ. (Belgium). Institut de Mathematique.
D. M. Dubois.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y. p 535-543, 1975. 3 fig, 4 ref.

escriptors: *Water quality, *Plankton, imulation analysis, Sea water, Computers, havior, Equations, Mathematical models, stems analysis, Effects.
entifiers: Spatial structuration, Prey, Predator.

cently, a general model was proposed to explain e fluctuations and the spatial structuration in nkton populations in the sea. An index of fluc-tions, directly connected to the diversity and e stability of ecological systems, was given for e model by Dubois. The spatial structuration of eracting populations is well explained by the del. A critical wavelength is a basic charac-istic of this structuration. The purpose of this rking-paper is to exhibit the great influence of e quality of water on ecological systems. The ality of water can be characterized not only by table values of such properties as temperature, inity, dissolved oxygen and dissolved nutrients, t also by such mechanical properties as move-nt of water and turbulent diffusion. Several es have been simulated on computers and it is own that populations exhibit fluctuations and a tial inhomogeneity with a rather long lifetime. e also W77-10806) (Bell-Cornell)
7-10818

ATIC AND DYNAMIC SIMULATION OF ATER TRANSPORT IN A COMPLEX NET-ORK SYSTEM,
chnische Hogeschool Twente, Enschede etherlands). Dept. of Chemical Engineering.
r primary bibliographic entry see Field 5B.
7-10828

DWOOD NATIONAL PARK STUDIES, DATA LEASE NUMBER 2, REDWOOD CREEK, UMBOLDT COUNTY, AND MILL CREEK, L NORTE COUNTY, CALIFORNIA, APRIL 1974-SEPTEMBER 30, 1975,
ological Survey, Menlo Park, Calif. Water sources Div.
r primary bibliographic entry see Field 4C.
7-10857

AVY METAL DISCHARGES INTO SHASTA KE AND KESWICK RESERVOIRS ON THE PER SACRAMENTO RIVER, CALIFORNIA: RECONNAISSANCE DURING LOW FLOW,
ological Survey, Menlo Park, Calif.; Water sources Div.; and Geological Survey, kewood, Colo. Water Resources Div.
r primary bibliographic entry see Field 5B.
7-10860

ATER QUALITY DATA DURING SEP-MBER 10-13, 1974 AT WARD COVE AND NGASS NARROWS, ALASKA.
vironmental Protection Agency, Anchorage, aska. Alaska Operations Office; Environmental otection Agency, Seattle, Wash. Region X.; and vironmental Protection Agency, Seattle, Wash. alysis Div.
ailable from the National Technical Informa-n Service, Springfield, VA 22161 as PB-253 994, ce codes: A04 in paper copy, A01 in microfiche. A Working Paper No. EPA-910-8-76-097, April 5. 60 p, 2 fig, 9 tab, 10 ref.

scriptors: *Water quality, *Pulp wastes, aste water disposal, *Environmental effects, ater pollution effects, *Baseline studies, laska, Estuaries, Bottom sediments.
ntifiers: *Outer Continental Shelf, Ward ve(Alas), Tongass Narrows(Alas).

brief water quality survey was conducted in the uarine waters of Ward Cove and the adjacent rine waters of Tongass Narrows near tchikan, Alaska, during the week of September 1974 to determine the present influences of ste discharges from the Ketchikan Pulp Mill mpany following the installation and operation of its primary treatment system for pulping wastewaters, and to assay any improvements in these receiving waters as a consequence of equipping the mill with this treatment facility. Visual and biological observations of the bottom deposits and surface waters showed no hydrogen sulfide bubbles in the Ward Cove area; these undoubtedly were present during the 1968-1969 study but not reported. Small mats of sludge and pulp fibers observed in surface reaches of Ward Cove Near mill outfalls were not observed during the 1974 survey. Polychaete worms, not of frequent occurrence in the samples from the 1968-1969 study, were noted at all but two stations, 1 and 6, in Ward Cove during the 1974 survey. Thus, it was apparent that some improvement had occurred in the bottom deposits, even though there were no major improvements elsewhere in the study area. (Sinha-OEIS)
W77-10890

OIL SPILL AND OIL POLLUTION REPORTS, FEBRUARY 1975 - APRIL 1975,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W77-10891

STUDIES OF PRIMARY PRODUCTIVITY AND PHYTOPLANKTON ORGANISMS IN THE COLVILLE RIVER SYSTEM,
Alaska Univ., College. Inst. of Marine Science.
V. Alexander, C. Coulon, and J. Chang.
In: Environmental Studies of an Arctic Estuarine System, Environmental Protection Agency Ecological Research Series No. EPA-660/3-75-026, June 1975. p 299-426, 37 fig, 21 tab, 24 ref. Grant R801124-03.

Descriptors: *Primary productivity, *Cold regions, *Phytoplankton, *Baseline studies, Resources development, Environmental effects, Arctic.
Identifiers: *Outer Continental Shelf, Colville River, Beaufort Sea.

The Colville River is a relatively unknown drainage system in terms of its aquatic biological components. For this reason, biological studies formed an important part of this baseline study. This portion of the report deals specifically with phytoplankton organisms, which received a considerable amount of attention because they form the basis upon which the aquatic biological system exists, and even the most elementary taxonomic work has not been done in this region. Primary productivity rates are low in the offshore area, but are considerably higher than those found in the open Arctic Ocean, possibly in part as a result of nutrient supply by the Colville River. Inorganic nitrogen compounds brought down by the river are removed rapidly in Simpson Lagoon. Relatively high nitrate uptake rates suggest that there is significant utilization by the offshore phytoplankton of nitrate brought down with the river water. Maximum offshore productivity rates are usually found in the deeper, colder, more saline waters. An especially high rate in deep water outside Pingok Island at the Beaufort Sea station may be related to upwelling in this area, and thus nutrient enrichment. (See also W77-10893) (Sinha-OEIS)
W77-10900

THE NEARSHORE BENTHOS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10901

ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CT. FIRST YEAR'S STUDIES JULY 1974 - JULY 1975.
National Marine Fisheries Service, Highlands, N.J. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-10906

EXPERIMENTAL ANALYSIS OF THE TRANSFERS OF A MICROPOLLUTANT (ZN65) TO THE TERMINAL CONSUMER IN A FRESH WATER ECOSYSTEM, (IN FRENCH),
Limoges Univ. (France). Animal Biology Lab.
G. Parouty, and C. Chaisemartin.
C R Seances Soc Biol Fil. 168(1), p 78-82, 1974.

Descriptors: *Path of pollutants, Pollutant identification, Ecosystems, *Zinc radioisotopes, Salts, Food chains, Daphnia, Crayfish, Microorganisms, Toxicity, Trophic level, Water pollution effects.
Identifiers: Loach, Lymnaea, Orconectes-Limosus, *Zinc-65.

Vital elements or pollutants are absorbed by freshwater organisms either directly from the water or from food ingested. When a 'prey' organism concentrates a toxic element in a polluted environment, other organisms that feed upon it may show a similar tendency toward concentration. The concentration factor rises as the number of trophic levels in the alimentary chain increases. The transfer of salts of Zn65 was measured in Orconectes limosus in a short trophodynamic chain, a phytophage chain (Lymnaea) and predator (crayfish), or in a long chain: phytophage (Daphnidae), oophage (loach) and predator (crayfish). An interference study was made between direct absorption from the water and transfers of small quantities of Zn ions in the trophic chain of 2 freshwater communities. Biological concentration through a food chain alone is difficult to detect when sublethal levels are involved. In the secondary consumer (loach) the contamination via the alimentary tract is minimal compared with that produced by the water environment, even if the concentration of the latter is weak compared with the content present in the food. In the predator (crayfish), direct absorption and loss from water is the major mechanism of Zn ion accumulation. Decontamination occurs during the meal itself. A further partial rejection of excess Zn, favored by normal feeding, diminishes the percentage of Zn65 activity retained. The specific threshold of toxicity of the metal ions increases in high Ca waters. The importance of the route of transmission (water or food) depends on the quantities of food offered and its availability.—Copyright 1975, Biological Abstracts, inc.
W77-10913

GREAT LAKES: CHEMICAL MONITORING,
Wisconsin Univ., Madison, Lab. of Hygiene.
For primary bibliographic entry see Field 5B.
W77-10924

IMPACT ON TEXAS WATER QUALITY AND RESOURCES OF ALTERNATE STRATEGIES FOR PRODUCTION, DISTRIBUTION, AND UTILIZATION OF ENERGY IN TEXAS IN THE PERIOD 1974-2000,
Texas Univ. at Austin.
G. A. Rohlich, E. F. Galwardi, and D. Malish.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 330, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Texas, Governor's Energy Advisory Council, Office of the Lieutenant Governor, Capitol Station, Austin, Texas, January 1975. 105 p, 34 tab, 23 fig, 43 ref, append.

Descriptors: *Electric power production, *Water quality, *Energy, *Texas, Water pollution sources, Electric power production, Electric power demand, Water requirements, Water consumption, Thermal pollution, Costs, Projections.
Identifiers: Neches River Basin(Tex), Colorado River(Texas).

This report considers the impact of alternate strategies of energy production and utilization on Texas water quality. The analyses include infor-

mation and projections on water demands, water consumption, wastewater flows, pollution loads, costs for control of thermal discharges and for waste treatment facilities, and energy requirements for control of environmental quality. 1970 was selected to establish baseline conditions. Projections have been made for several intervening periods between 1970 and 2000. The sectors considered in the analyses include energy production, municipalities, and industry. The industrial sector includes separate analyses for steam electric power, manufacturing, pulp and paper, chemicals, petroleum refining, and primary metals. The first part of the report presents an overview of the impact of projected energy and water demands and alternate fuel strategies on the state's water resources. The second part of the report presents analyses for the Colorado and Neches River Basins. These basins represent relatively different regions with regard to water resources and industrial and population concentrations. The third part of the report (Appendix A) presents analyses and a comparison of a baseline scenario and a market forces scenario. The data and assumptions for these scenarios were provided by the Governor's Energy Advisory Council. (Nessa-NC)
W77-10930

ACUTE TOXICITY OF SELECTED ORGANIC COMPOUNDS, TO FATHEAD MINNOWS,
Environmental Research Lab., Duluth, Minn.
V. R. Mattson, J. W. Arthur, and C. T. Walbridge.
U.S. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-76-097, October, 1976. 12 p, 3 tab, 17 ref.

Descriptors: *Bioassay, Freshwater fish, Minnows, Juvenile fish, *Laboratory tests, *Toxicity, *Acids, *Alcohols, Hydrocarbons, Lake Superior, Water pollution effects.
Identifiers: *Aldehydes, *Ketones, *Pentachlorophenol, *Ethanol, Pimephales Fathead minnow, Relative toxicity, Static bioassays, Lake Superior water, *Reconstituted water.

Static nonrenewal laboratory bioassays were conducted with 26 organic compounds commonly used by industry. The selected compounds represented the five following chemical classes: acids, alcohols, hydrocarbons, ketones and aldehydes, and phenols. Juvenile fathead minnows (Pimephales promelas) were the test animal, and test duration was limited to 96 hr. Lake Superior water served as the diluent source for all test compounds. Additional tests were served as the diluent source for all test compounds. Additional tests were conducted with a reconstituted diluent water for five compounds. The alcohol compounds were generally 10 to 100 times less toxic than chemicals tested in the other four chemical classes. Compounds in the other four classes had a similar toxicity range. The most lethal chemical tested was pentachlorophenol (96-hr LC50 of 0.6 mg/1.) and the least lethal was ethanol (96-hr LC50 of 13,480 mg/1.). Most of the minnow deaths occurred during the first 24 hr. Comparative chemical tests in the two diluent waters gave similar lethal responses. (Katz)
W77-10934

REVIEW OF PCB LEVELS IN THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5B.
W77-10935

INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF MONURON, SUBSTITUTE CHEMICAL PROGRAM,
Midwest Research Inst., Kansas City, Mo.
T. L. Ferguson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 110, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Report 540/1-75-028, NTIS PB-248 110, November 1975, 113 p, 17 tab, 2 fig, 11 ref.

Descriptors: *Herbicides, *Toxicity, Pathology, Biochemistry, Water Fowl, Ducks(Wild), *Environmental effects, Goats, Mammals, Enzymes, *Economic justification, *Economics, Foods, Pesticides, Bioassay.
Identifiers: *Monuron, *2,4,5-T, *Alternative chemicals program, Photodecomposition products, Rats, Hepatic microsomal enzymes, Tumorigenicity, Food tolerance, *Fish toxicity.

This is the 8th in a series of in-depth scientific literature searches which review the safety and efficacy of substitute chemicals registered by EPA as possible replacements for cancelled or suspended pesticides or pesticides in litigation. The reviews are part of the Substitute Chemical Program, initiated under PL 93-135 (Oct. '73). This report on Monuron, a registered substitute herbicide for certain cancelled and suspended uses of 2,4,5-T, covers all uses on Monuron and is intended to be adaptable to future needs. The data contained in this report was not intended to be complete in all areas. Data searches ended in April, 1975. The review was coordinated by a team of EPA scientists in the Criteria and Evaluation Division of the Office of Pesticide Programs. Draft copies of the report have been reviewed by the scientific staffs of EPA's National Environmental Research Centers and their associated laboratories. E. I. duPont de Nemours and Co., a manufacturer of Monuron, reviewed the draft of this report and made certain comments and additions. (Katz)
W77-10936

THE INTERRELATIONSHIP OF MATERIAL TOXICITY STREAM PROPERTIES AND QUANTITY OF SPILLED MATERIAL IN ASSESSING THE RISK OF HAZARDOUS MATERIAL SPILLS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-10938

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: MERCAPTOBENZOTHIAZOLES,
Syracuse Research Corp. N.Y.
J. Santodonato, L. N. Davis, P. H. Howard, and J. Saxena.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 662, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 560/2-76-006, June 1976. 146 p, 45 tab, 11 fig, 180 ref.

Descriptors: *Public health, Environment, *Environmental effects, *Corrosion control, Toxicity, *Human disease, Mammals, Sources of pollution, Water pollution effects, Plants, Animals, Laboratory tests, Methodology.
Identifiers: *Environmental contaminants, *Mercaptobenzothiazoles, 2-Mercaptobenzothiazide, Dithiobisbenzothiazole, N-cyclohexyl-2-benzothiazide, Rubber accelerating conversion inhibitors.

The potential environmental hazard from the commercial use of 2-mercaptobenzothiazoles (MBT) are reviewed. Most of the mercaptobenzothiazoles are consumed as rubber accelerators in vulcanization processes, although the sodium salt of MBT is used as a corrosion inhibotor in water-based cooling systems. Information on physical and chemical properties, production methods and quantities, commercial uses and factors affecting environmental contamination, as well as information related to health and biological effects, are reviewed. (Katz)
W77-10940

ASSAYS OF TOXIC POLLUTANTS BY FISH BLOOD,
Sias Research Labs., Brookline, Mass.
W. A. Curby, R. D. Winick, and E. I. Ray.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 183, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-76-069, September, 1976. 67 p, 2 tab, 6 fig, 15 ref.

Descriptors: *Methodology, *Bioassay, Fish diseases, *Animal pathology, Particle shape, Particle size, *Cadmium, Metals, *Copper, Seawater, Freshwater laboratory tests, Laboratory equipment, *Toxicity, *Killifishs, Water pollution effects, Pollutant identification.
Identifiers: Cytology, *Fundulus, *Fish blood, *Erythrocytes, Photomicrograph, Biological multichannel analyzer, *Freshwater adaptation.

We have developed a biological multichannel analyzer which, using a sensor that operates on the Coulter principle, measures and distributes mixed cell populations by cell size. It provides an analog distribution and digital printed readout for future analysis. Although primarily a pulse height analyzer (applied successfully to studying bacteria, mammalian blood and inert particles) it operates as a pulse shape analyzer if the instant at which each pulse height is read is varied. This technique, applied to the peripheral whole blood from freshly sacrificed Fundulus heteroclitus shows the alterations with time and the variations caused by trace amounts of cadmium and copper in the aquatic environment. The size frequency distribution patterns of each trace element environment differ from each other, and each, markedly from the norm. We have investigated and recorded the response of F. heteroclitus whole blood cells from fishes living in several aquatic environments of fixed pH and dissolved oxygen and temperature. We compared these data with those obtained from fish subjected to dissolved traces of chemical pollutants. (Katz)
W77-10942

THE SEDIMENT ENVIRONMENT OF PORT VALDEZ, ALASKA: THE EFFECT OF OIL ON THIS ECOSYSTEM,
Alaska Univ., College.
H. M. Feder, M. Cheek, P. Flanagan, S. C. Jewitt, and M. H. Johnston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 97[illegible] Price codes: A15 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-76-086, July 1976. 322 p, 79 tab, 36 fig, 144 ref.

Descriptors: *Environmental effects, *Oil waste, *Oil pollution, *Oil spills, Water pollution effects, Intertidal areas, Microbiology, On-site investigation, Geochemistry, Zooplankton, *Sediment, *Mollusks, *Bioassays, Animal populations, Crustaceans, Nematodes, *Toxicity, Laboratory tests, Mortality, *Alaska, *Baseline studies, *Ecosystems.
Identifiers: *Port Valdez(Alas), *Meiofauna, Environmental assessment, *Prudhoe Bay crude oil, Meiofaunal densities, Macoma, Harpacticoid copepods.

The Port Valdez intertidal sediment system was studied for three years. Physical, geological, geochemical, hydrocarbon, and biological features were examined. Sediments were poorly sorted gravels to plastic clays, and had low amounts of organic matter. Bacterial numbers varied from site to site, and decreased in numbers with depth. Meiofauna consisted primarily of nematodes and harpacticoid copepods. Most meiofaunal species were restricted to the upper three centimeters throughout the year. Meiofaunal densities were typically highest in summer and lowest in winter. Reproductive activities of copepods tended to be seasonal with only one species reproduc

throughout the year. Bacterial populations were unaffected by single applications. It is concluded that oil is removed rapidly by tidal action. Three species of copepods exposed to oil in the field significantly increased in density in experimentally oiled plots. Uptake and release of added oil by intertidal sediments and the clam (Macoma balthica were examined in the field. Petroleum was not detectable two months after application to sediments. (Katz)
W77-10944

ENTOMOLOGICAL SPECIAL STUDY NO. 44-019-75/76, PESTICIDE ANALYSIS OF SURFACE WATER SAMPLES COLLECTED IN THE DEPARTMENT OF THE ARMY PESTICIDE MONITORING PROGRAM 1 SEP 1972-DEC 1974,
Army Environmental Hygiene Agency, Aberdeen Proving Grounds, Md.
For primary bibliographic entry see Field 5A.
W77-10945

AMMONIA TOXICITY,
Environmental Protection Agency, Denver, Colo. Region VIII.
W. T. Willingham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 447, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-908/3-76-001, Feb. 1976, 71 p, 4 tab, 3 fig, 43 ref.

Descriptors: *Toxicity, *Fresh water fish, *Ammonia, Ammonia compounds, *Hydrogen ion concentration, Water pollution effects, *Water temperature, *Dissolved oxygen, Carbon dioxide, Dissolved solids, Animal physiology, Fish physiology, Stress, Reviews, Water quality.
Identifiers: Toxic concentration, *Un-ionized ammonia, *Ammonia toxicity, *Percentage of unionized ammonia, Toxic action mechanisms.

Several authors have reported that the harmful effects of ammonia are primarily related to the pH and temperature of the water because only the un-ionized ammonia is toxic. The un-ionized fraction increases with rising pH values and with rising temperature. Other factors such as dissolved oxygen, alkalinity, free carbon dioxide, sodium ions, total dissolved solids, prior exposure to ammonia, physical stress, general physiological status, and the presence of other ammonia, physical stress, general physiological status, and the presence of other additive toxins or other mitigating parameters will have a great affect on the overall toxicity of ammonia to aquatic organisms. The actual reported toxic concentrations of ammonia vary from 0.16 mg/l to 16.5 mg/l NH3-N. This apparent variability often resulted from the investigator's failure to report pH and temperature values which may have biased their results. It appears that the highest concentration of un-ionized ammonia which apparently will not cause any adverse effects is 0.02 mg/l NH3-N. (Katz)
W77-10946

RESULTS OF AQUATIC SURVEYS AT PINE BLUFF ARSENAL, ARKANSAS, SEPTEMBER 1973 - OCTOBER 1974,
Edgewood Arsenal, Aberdeen Proving Ground, Md., Biomedical Lab.
L. S. Manuel, E. S. Bender, and J. G. Pearson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-024 932, Price codes: A04 in paper copy, A01 in microfiche. Technical Report EB-TR-76038, April 1976. 58 p, 3 tab, 5 fig, 21 ref.

Descriptors: On-site investigation, *Benthos, Aquatic insects, *Aquatic population, Streams, Sampling, Scour, Runoff, Invertebrates, Methodology, Water quality, Water chemistry, Industrial wastes, *DDT, *Phosphorous, Chlorination, *Arkansas, Water pollution effects, Monitoring.
Identifiers: *Pine Bluff Arsenal, *Species diversity, *Macroinvertebrates, Elemental phosphorous, *Munitions, *Manufacturing.

Biological surveys of the streams on Pine Bluff Arsenal (PBA) were conducted from July 1973 through October 1974. Each stream was sampled monthly at two stations, one above the bluff line and one below the bluff line. Species diversity in the streams was adversely affected by runoff and scouring at the sampling stations in the upper stream. Analysis of macroinvertebrate collections and water chemistry data gathered during the water-quality monitoring program conducted at PBA permitted an evaluation of the quality of the water in each drainage. Eastwood Bayou, Hospital Creek, and Production Area Creek are considered to have good water quality because they had high species diversity and received only small and/or intermittent discharges. Tulley Creek was apparently recoverng from past perturbations caused by runoff the DDT-contaminated lands in the North Production Area. Triplett Creek is adversely affected by a chlorinated effluent from the north sewage oxidation pond and by the DDT and other possible pollutants from contaminated lands in the North Production Area. White Phosphorous Creek is severely polluted by the discharge of elemental phosphorous from the white phosphorus munitions filing plant. (Katz)
W77-10947

TOXICITY OF COPPER TO DAPHNIDS IN RECONSTITUTED AND NATURAL WATERS,
Miami Univ., Oxford, Ohio.
R. K. Winner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 915, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/3-76-051, May 1976, 62 p, 24 tab, 24 fig, 17 ref.

Descriptors: *Toxicity, Bioassay, Methodology, *Copper, Metals, Water pollution effects, Water quality, *Daphnia, *Animal nutrition, Zooplankton, Laboratory tests, *Mortality, *Aquiculture.
Identifiers: *Reconstituted water, *Daphnia culture, Chronic copper stress, Pond water, Algal foods, Test animals.

The toxicity of copper was compared for Daphnia magna cultured in reconstituted versus pond water and fed on trout-pellet versus vitamin enriched, algal foods. Effects of a chronic copper stress were highly variable when animals were tested in reconstituted waters. This variability is thought to be due to variability in the quality of the distilled-water matrix. The vitamin-enriched algal food was found to be superior to the trout-granule food in culturing D. magna. Control animals lived much longer and test animals were less sensitive to a chronic copper stress. The acute and chronic toxicity of copper was also compared for four species of Daphnia. When tested in pond water and fed vitamin-enriched algae, the two largest species (D. magna and D. pulex) were significantly less sensitive to an acute copper stress than the two smallest species (D. parvula and D. ambigua). There was, however, no significant difference in sensitivity to a chronic copper stress when reduced longevity was used as the index. Application factors for the four species varied from 0.47 to 0.62 and were not significantly different. (Katz)
W77-10948

TOXICOLOGY OF CYCLOTRIMETHYLENETRINITRAMINE (RDX): DISTRIBUTION AND METABOLISM IN THE RATE AND THE MINIATURE SWINE,
Armed Forces Radiobiology Research Inst., Bethesda, Md.
N. R. Schneider, S. L. Bradley, and M. E. Andersen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 892, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Naval Medical Research and Development Command, July, 1976, 24 p, 5 tab, 8 fig, 21 ref.

Descriptors: *Animal diseases, *Human health, *Animal metabolism, *Animal pathology, *Animal physiology, Pathology, Mammals, *Toxicity, Chemical analysis, Laboratory tests, Industrial wastes, Hogs, Organic compounds, Organic wastes, Water pollution effects, Rodents.
Identifiers: Miniature swine, RDX, Swine, *Cyclotrimethylenetrinitramine, Tissue concentrations, Plasma, Urinary concentration, *Munitions.

Cyclotrimethylenetrinitramine (RDX) is an explosive extensively used by the military. It has caused convulsions in military field personnel ingesting it and in munition workers inhaling its dust during manufacture. This study was intended to determine the distribution, metabolism and excretion of RDX in laboratory animals and to estimate by inference the potential hazard to humands from RDX exposure. All of a group of 10 rats injected ip with 500 mg cyclotrimethylenetrinitramine (RDX)/kg had miltiple seizures and 8 died. The respective mean times to first seizure and to death were 23.8 min and 171.0 min, and the mean plasma (RDX) at seizure and death were 5.2 and 13.8 ug/ml, respectively. The (RDX) in the brain, heart, liver and kidney at death were, respectively 29.5, 25.0, 41.7 and 56.8 ug/g wet weight. After receiving 100 mg RDX/kg po, the plasma (RDX) was 2.1 ug/ml at 4 hours and 3.0 ug/ml at 24 hours, while the urnie (RDX) was 5.5 ug/ml at 4 hours and 6.9 ug/ml at 24 hours. Excretion of unmetabolized RDX in the first 6 days following 50 mg RDX/kg po was only 0.7 percent in the feces and 2.4 percent in the urine. Regardless of the route of administration or the dosage, (RDX) was greatest in kidney and most variable in liver. RDX did not accumulate in the brain. (Katz).
W77-10950

ENVIRONMENTAL QUALITY RESEARCH, FISH AND AUFWUCHS BIOASSAY, ANNUAL REPORT,
California Univ., Irvine.
S. Klein, and D. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 467, Price codes: A03 in paper copy, A01 in microfiche. Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, Report AMRL TR-76-64, Oct. 1976. 38 p, 9 tab, 12 fig, 4 ref.

Descriptors: *Toxicity, *Bioassay, Minnows, *Fuels, Warm-water fish, Gas chromatography, Laboratory techniques, *Oil, *Oil spills, Stress, Animal behavior, Water pollution effects, *Pollutant identification.
Identifiers: Golden shiners, *JP-4, *JP-8, Soft water, Hard water, Tap water, *Sublethal concentration, Static bioassay, Notemigonus.

This report contains the results of research efforts of a project concerned with defining the effects of potential environmental contamination resulting from the use of certain Air Force materials on fresh water fish. Materials being evaluated include JP-4 and JP-8. Techniques for exposing organisms to these substances are discussed and results of such exposures are presented. (Katz)
W77-10951

JP-4 AND JP-9 FUEL TOXICITY STUDIES USING FRESH WATER FISH AND AUFWUCHS, ANNUAL REPORT,
California Univ., Irvine.
S. Klein, R. Cooper, and D. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 594, Price codes: A04 in paper copy, A01 in microfiche. Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, Re-

port AMRL TR-76-50, June 1976. 60 p, 19 tab, 21 fig.

Descriptors: *Freshwater fish, *Periphyton, *Fuels, Gas chromatography, *Bioassays, Methodology, Water pollution effects, Minnow, *Oil, Oil spill, Laboratory tests, Laboratory techniques, Emulsions, *Rainbow trout, *Pollutant identification.
Identifiers: *JP-4, JP-9, Fish tissues, Golden shiners, Notemigonus, *Toxic response, Continuous flow bioassays, Jordanella.

This report contains the results of research efforts concerned with defining the effects of potential environmental contamination resulting from the use of certain Air Force materials on fresh water fish and aufwuchs. Materials evaluated include RJ-4, RJ-5, Methylcyclohexane, JP-9 and JP-4. Techniques for exposing organisms to those substances are discussed and the results of such exposures are presented. (Katz)
W77-10952

AUTOMATED MEASUREMENT OF RIVER PRODUCTIVITY FOR EUTROPHICATION PREDICTION,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5A.
W77-10953

CHLOROHYDROCARBONS IN MARQUETTE FISH HATCHERY LAKE TROUT (SALVELINUS NAMAVCUSH),
Northern Michigan Univ., Marquette. Dept. of Biology.
R. Parejko, and C. J. Wu.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 1, p 90-97, 1977. 10 tab, 4 ref. OWRT A-061-MICH(2).

Descriptors: *Lake trout, Lake Superior, Aquiculture, Fish hatchery, *Chlorinated hydrocarbon pesticides, *Heptachlor, *Fish diets, Fish physiology, Gas chromatography, *Arochlors, *DDT, *DDE, *DDD.
Identifiers: *Methoxychlor derivative.

A study was made to determine the concentrations of chlorinated hydrocarbon (CH) compounds in Lake trout living in the Lake Superior watershed but not in the lake itself. Lake trout in the Marquette Fish Hatchery consume and absorb CH compounds from their diet. Differences in kind and amount of CH compounds were observed and identified in the hatchery trout and the trout from Lake Superior. (Katz)
W77-10954

EQUILIBRIUM BETWEEN UPTAKE AND ELIMINATION OF DIELDRIN BY CHANNEL CATFISH, ICTALURUS PUNCTATUS,
Iowa State Univ., Ames.
L. R. Shannon.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 3, p 278-284, 1977. 1 fig, 1 tab. OWRT A-042 IA(4).

Descriptors: *Absorption, *Channel catfish, *Pesticides, *Insecticides, *Pesticide residues, *Dieldrin, *Path of pollutants, *Equilibrium, Laboratory tests, Chlorinated hydrocarbon pesticides, Agricultural chemicals, Public health, Seasonal, Commercial fish.
Identifiers: *Tissue analysis, *Bioaccumulation.

Channel catfish (Ictalurus punctatus) were exposed continuously to dieldrin for 70 days to determine if equilibrium between dieldrin uptake and elimination was reached by muscle tissue. Fish exposed to 13 parts per trillion (pptr) dieldrin reached equilibrium in 56 days. Fish exposed to 27 pptr dieldrin were near equilibrium after 56 days and fish exposed to 49 pptr dieldrin did not reach a balance between uptake and elimination after 70 days of exposure. Evidence of this study showed that balance between uptake and elimination was reached in less time at lower exposure levels than at higher levels. (Katz)
W77-10955

EFFECTS OF POLLUTANTS ON EMBRYOS AND LARVAE OF AMPHIBIAN SPECIES, SECOND ANNUAL REPORT,
California Univ., Irvine.
G. Greenhouse.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 560, Price codes: A02 in paper copy, A01 in microfiche. Wright-Patterson Air Force Base, Ohio, Report AMRL-TR-76-59, Nov. 1976, 14 p, 7 tab, 8 fig, 9 ref.

Descriptors: *Toxicity, *Laboratory tests, *Bioassay, *Toads, Water pollution effects, Juvenile growth stage, Methodology, Organic compounds, *Nitrogen compounds, Organic wastes, Amphibians.
Identifiers: Xenopus, *Hydrazine, Teratology, South African clawed toad, *N-phenyl- a-naphylamine, *Methylhydrazine, *Dimethylhydrazine.

This report for the period of 1 Sep 75 - 31 Mar 76 contains the results of research efforts concerned with defining the environmental effects of potential environment contamination resulting from the use of certain Air Force materials. The effects of exposure to N-phenyl- a-naphthylamine, hydrazine, methylhydrazine, and dimethylhydrazine on the development of Xenopus frogs are reported. (Katz)
W77-10956

HEPTACHLOR IN RELATION TO MAN AND THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.
For primary bibliographic entry see Field 5B.
W77-10957

AQUATIC FIELD SURVEYS AT RADFORD, HOLSTON, VOLUNTEER, AND MILAN ARMY AMMUNITION PLANTS, VOL. III - VOLUNTEER FINAL REPORT,
WAPORA, Inc., Washington, D.C.
B. L. Huff.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 193, Price codes: A07 in paper copy, A01 in microfiche. Report to Army Medical Research and Development Command, Washington, D.C. 135 p, December, 1975. 21 tab, 33 fig, 76 ref.

Descriptors: On-site investigation, *Tennessee, *Bacteria, Protozoa, *Phytoplankton, *Periphyton, *Zooplankton, *Benthos, *Freshwater fish, Water quality, Water pollution effects, Water pollution sources, Laboratory studies, Waste water(Pollutant), Water temperature, Sulfates, Zinc, *Chromium, *Nitrites.
Identifiers: *Volunteer Army Ammunition plant, Waconda Bay, Chickamauga Lake, *Munitions, *Ammunition plant, Macroinvertebrates, *Species diversity.

Laboratory and field studies were conducted at the Volunteer Army Ammunition Plant (VAAP) to determine the effects of munitions wastes on aquatic life in the receiving system (Waconda Bay, Chickamauga Lake). In addition to laboratory and field determinations of selected chemical and physical parameters the following aquatic groups were investigated: bacteria, protozoa, phytoplankton, periphyton, zooplankton, macroinvertebrates and fish. (Katz)
W77-10958

HAZARDOUS WASTES: A RISK-BENEFIT FRAMEWORK APPLIED TO CADMIUM AND ASBESTOS.
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 5G.
W77-10959

TOXICITY OF DDT FOOD AND WATER EXPOSURE TO FATHEAD MINNOWS,
Environmental Research Lab.-Duluth, Minn.
A. W. Jarvinen, M. J. Hoffman, and T. W. Thorslund.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 202, Price codes: A07 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-76-114, December, 1976. 67 p, 15 tab, 9 fig, 52 ref.

Descriptors: Bioassay, Minnows, *Freshwater fish, Laboratory tests, Methodology, *Clams, Pesticides, *Chlorinated hydrocarbon pesticides, Aquatic animals, *Toxicity, *Food chains, Insecticides, Gas chromatography, *DDT, Water pollution effects.
Identifiers: *Carbon 14, *Bioaccumulation, *Tissue residues, Concentration factors.

Fathead minnows (Pimpephales promelas) were exposed during a partial chronic toxicity test to two DDT concentrations in the water, one in the diet, and combinations of water and diet for 26 days through a reproductive period of their life cycle. Tissue-residue analyses were performed on test fish at present intervals throughout the exposure and also on embryos, larvae at hatch, and 30- and 60-day progeny. The contribution of DDT from each source was monitored with gas-chromatography and liquid-scintillation techniques. The diet was clams that had accumulated 140 DDT when exposed at a DDT water concentration similar to that in the high fish exposure. Higher total DDT tissue residues were accumulated from the water than from the diet. Residues contributed by dietary DDT were additive to those from the water. Mean concentration factors were 1.2 times from the diet and 100,000 times from the water. Mortality was higher in fish exposed to DDT in both water and diet than in fish exposed to only one or the other of these sources. DDT in the diet significantly reduced the probability of survival of the test fish (P=0.025). Estimated maximum acceptable toxicant concentrations for DDT are 0.6 ug/l for fish exposed to DDT in the water only and 0.4 ug/l for fish exposed to DDT in both water and diet. (Katz)
W77-10960

ION STIMULATION OF METABOLISM IN FISH ADAPTING TO GROWTH IN WARM WATER, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
V. D. Romanenko, S. P. Vesel'S'Kyi, and M. Yu. Yevtushenko.
Dopov Akad Nauk Ukr Rsr Ser B Heol Khim Biol Nauky 3, p 271-273, 1976.

Descriptors: *Metabolism, Fish, *Carp, *Thermal pollution, Ions, Manganese, Magnesium, Zinc, Growth rates, Powerplants, Reservoirs, Water pollution effects.
Identifiers: Carbon-14, USSR(Kiev).

The effects of Mg2+, Mn2+ and Zn2+ as applied to metabolic processes in the livers of carp grown in the reservoir-cooler of the Kiev heating and power plant (USSR) were studied. Under the effect of the Mg and manganese sulfate salts the growth rate of the fish increases and, simultaneously, aerobic glycolysis and the intensity of the incorporation from inorganic compounds into the proteins and lipids increases. The salts mentioned may be applied to the regulation of fish metabolism when the fish are grown in breeding chambers on artificial feed mixtures in reservoir-coolers of steam and atomic power stations.—Copyright 1977 Biological Abstracts, Inc.

W77-10971

DREDGED MATERIAL AS A NATURAL RESOURCE--CONCEPTS FOR LAND IMPROVEMENT AND RECLAMATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 4A.
W77-10983

ACCELERATION OF SEXUAL MATURATION OF THE RAINBOW TROUT SALMO GAIRDNERI RICH. UNDER THE EFFECT OF AN ELEVATED WATER TEMPERATURE, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khoziaistva, Rybnoe (USSR).
E. F. Titarev.
Vopr Ikhtiol 15(3), p 565-566, 1975.

Descriptors: *Rainbow trout, *Thermal pollution, Water pollution effects, Water temperature, Cooling water, *Sexual maturity, Growth rates, Electric powerplants, Ponds.

Experimental rearing of rainbow trout (S. gairdneri) in the cooling pond of an electric power plant showed that the elevated water temperature during the winter in the cooling pond in comparison with natural waters promoted accelerated growth and maturation of the trout. The 1st mature males were noted at an age of 19 mo. and females at 22 mo., i.e., 1-2 yr earlier than those in natural waters in the central belt of the USSR.--Copyright 1976, Biological Abstract, Inc.
W77-10987

STUDIES ON THE APPLICATION OF AMPICILLIN FOR PSEUDOTUBERCULOSIS OF CULTURED YELLOWTAILS: I. IN VITRO STUDIES ON SENSITIVITY, DEVELOPMENT OF DRUG-RESISTANCE AND REVERSION OF ACQUIRED DRUG-RESISTANCE CHARACTERISTICS, (IN JAPANESE),
Kochi Univ. (Japan). Dept. of Cultural Fisheries.
R. Kusuda, and K. Inoue.
Bull Jpn Soc Sci Fish 42(9), p 969-973, 1976.

Descriptors: Disease resistance, Inhibition, Fish diseases.
Identifiers: *Ampicillin, Chloramphenicol, Pasteurella-piscicida, Pseudotuberculosis, Sensitivity, *Yellowtails(Drug resistance), *Anti-bacterial drugs.

Studies are being made to apply ampicillin for pseudotuberculosis of cultured yellowtails. In vitro sensitivity and development of drug-resistance characteristics of P. piscicida were examined. Chloramphenicol was used for comparison. The minimum inhibitory concentration (MIC) of ampicillin to P. piscicida was 0.04-0.08 micro-g/ml and the MIC of chloramphenicol was 1.63 micro-g/ml. Antibacterial activity of ampicillin was 8-16 times greater than the activity of chloramphenicol. After 10 serial passages in vitro under the presence of drug, MIC values to ampicillin and to chloramphenicol were 4-8 times greater than the initial values. Reversion of acquired drug-resistance features to ampicillin was also studied. After 5 serial passages in vitro in BHI (brain heart infusion) agar under the absence of the drug, the acquired drug-resistance characteristics of P. piscicida disappeared, i.e., MIC changing from 12.32 micro-g/ml to 0.04-0.08 micro-g/ml. Ampicillin is apparently a useful antibacterial drug for pseudotuberculosis of cultured yellowtails.--Copyright 1977, Biological Abstracts, Inc.
W77-10992

SUCCESSION OF RED TIDE ORGANISMS IN OMURA BAY, WITH RELATION TO WATER POLLUTION, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
S. Iizuka.
Bull Plankton Soc Jpn 23(1), p 31-43, 1976.

Descriptors: *Red tide, Bays, Asia, Water pollution effects, Dissolved oxygen, Succession, Tides, Phosphates.
Identifiers: Ceratium-Furca, Dictyocha-fibula, Eutreptiella-sp, Exuviaella-sp, Gonyaulax-poligramma, Gymnodinium-nelsonii, *Gymnodinium-sp, Olisthodiscus, Prorocentrum-micans, Prorocentrum-triestinum, Skeletonema-costatum, *Japan(Omura Bay).

Omura Bay (Japan) is semiclosed, and was believed to be unpolluted until recently. A reassessment of past data shows that the dissolved O2 content in the upper layer had decreased by 1 ml/l during a period of 10-15 yr from the 1st half of the 1950's to the latter half of the 1960's, the value varying from 5-4 ml/l. Such depletion of dissolved O2 content may be related to the upward spreading of anoxic bottom water. Transparency depth has also decreased by about 2.5 m during the past 20 yr, the mean value varying from 9.6 m in the past to 6.9 m in the present, and the concentration of phosphate in the bay water has apparently increased during the same period. The 1st red tide after the war caused by Dictyocha fibula, a silicoflagellate, was recorded in 1947 and the discolored waters spread over the bay. The next red tide was caused by Gonyaulax poligramma in 1961, followed by extensive red tides of Gymnodinium type '65 which occurred frequently during the latter half of the 1960's as representative red tides in this bay. In the 1970's extensive red tides became weak and minor red tides of various organisms have occurred frequently in the branching parts of the bay.
W77-10997

DEVELOPMENT OF PLANKTON ORGANISMS OF AN EUTROPHIC RESERVOIR AND THEIR INTERACTION WITH A RADIOACTIVE ENVIRONMENT, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
K. K. Yankyavichyus, A. S. Antaninene, A. Yu. Baranauskene, V. Yu. Gribauskene, and T. S. Kiselite.
Liet Tsr Moksiu Akad Darb Ser B, 3, p 3-22, 1972.

Descriptors: *Eutrophication, *Radioisotopes, *Absorption, Reservoirs, Algae, Plankton, *Bacteria, *Zooplankton, Biomass, Decomposing organic matter, Pseudomonas.
Identifiers: Aphanizomenon-flos-aquae, Bacillus, Coelosphaerium-kuetzingianum, Gomphosphaeria-naegelianum, Micrococcus, Oocystis-lacustris, Pediastrum-boryanum, Planosarcina, Sarcina, Scenedesmus-quadricauda, *USSR(Lagoon of Kursiu Marios).

The study on potential capacity of planktonic organisms to accumulate a number of radionuclides was carried out under experimental conditions in a reservoir of an eutrophic type in the Lagoon of Kursiu Marios (USSR). In 1970 the hydrochemical conditions in the Lagoon area near Juodkrante were favorable. The following species of planktonic algae predominated: Aphanizomenon flos-aquae, Coelosphaerium kuetzingianum, Gomphosphaeria naegelianum, Oocystis lacustris, Pediastrum boryanum, Scenedesmus quadricauda. Maximum biomass of planktonic algae was observed in the last 10-day period of Aug. the minimum in the middle of July. In summer the lack of N in the water appeared to be a limiting factor for the development of some species. Bacterial counts in the water were 825-9576 thousand cells/ml, while that in the bottom was 10-100 times higher. Fourteen bacterial species of the genera Bacillus, Bacterium, Pseudomonas, Micrococcus, Sarcina and Planosarcina were identified. A considerable amount of protein mineralizing bacteria, aerobic and anaerobic cellular bacteria as well, were observed in the lagoon water and bottom, while bacteria assimilating mineral forms of N, denitrifying bacteria, aerobic and anerobic N fixers were less numerous. Significant fluctuations of proteinase, cellulase, amylase and pectinase were determined. In summer 1340-11575 mg of water organic substance/day is mineralized by bacteria. Thus, 100 to 873 mg/m3 of N and 6 to 55 mg/m3 of P is regenerated from decomposed organic matter. Maximum zooplankton biomass, occurred at the end of July and beginning of Aug. Water-soluble proteins fluctuated between 0.002-0.1 mg/l. Among free amino acids alpha-alanine, glutamine and asparagine were predominant. The most intensive accumulation of Sr90, Cs137, Ce144 and Ru106 took place during the 1 hour of its exposure to radioactive water. Ce144 showed particularly high accumulation coefficient. Unequal accumulation coefficients of radionuclides were observed throughtout the season.--Copyright 1974, Biological Abstracts, Inc.
W77-11020

TIME-STRESSED COASTAL ENVIRONMENTS: ASSESSMENT AND FUTURE ACTION.
Coastal Society, Arlington, Va.
For primary bibliographic entry see Field 5G.
W77-11022

RELATIVE SIGNIFICANCE OF CONTEMPORARY DREDGING IMPACTS IN SAN DIEGO BAY, AN HISTORICALLY STRESSED ENVIRONMENT,
Smith (David D.) and Associates, San Diego, Calif.
For primary bibliographic entry see Field 5G.
W77-11023

IMPACT OF DREDGING IN THE TAMPA BAY ESTUARY, 1976-1976,
Hillsborough Community Coll., Tampa, Fla.
R. R. Lewis, III.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 31-55, 17 fig, 1 tab, 30 ref.

Descriptors: *Dredging, *Estuarine environment, *Water pollution, *Wetlands, *Florida, Resources development, Environmental effects, Baseline studies, Bays.
Identifiers: *Outer Continental Shelf, *Tampa Bay(Fla).

Tampa Bay is an estuary located on the west coast of Florida. During the last 100 years four major types of dredging have impacted the bay: channel deepening, maintenance dredging, shell dredging, and dredging for landfill construction. These impacts range from the economic benefit provided by channel and port construction for what is now the eighth largest port in the nation to the environmental damage caused by dredging to create over 5,000 ha of landfill in the bay for residential, commercial, and dredged material disposal use. These landfills have resulted in the loss of 44% of the original marine wetlands bordering Tampa Bay. As a result of the loss of wetland habitat and continued pollution in Tampa Bay commercial harvests of marine finfish and shellfish have declined. Figures show the commercial landings and value of Florida Gulf Coast fisheries. Although definite conclusions cannot be drawn from these figures there are certain trends that are disturbing. The general increase in environmental awareness and the obvious increase in the cost of marine products and their declining numbers convinced commercial fishermen, sports fishermen, and consumer that something had to be done. The result has been increased opposition to the issuance of dredge and fill permits, particularly for projects where water access was not absolutely essential. (See also W77-11022) (Sinha-OEIS)
W77-11024

CONTAINMENT SPOILING IN CENTRAL LONG ISLAND SOUND: AN EXAMPLE OF SHORT-TERM BIOLOGICAL ENHANCEMENT,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5G.
W77-11025

DREDGING AND ITS IMPACTS ON UPPER CHESAPEAKE BAY: SOME OBSERVATIONS,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5G.
W77-11026

IMPACTS OF COASTAL DREDGING IN SAN PEDRO BAY, CALIFORNIA,
For primary bibliographic entry see Field 5G.
W77-11027

HYDROCARBON STRESS IN COASTAL WETLANDS,
Chevron Oil Co., New Orleans, La.
For primary bibliographic entry see Field 5G.
W77-11031

FIELD STUDIES ON MARINE LIFE INHABITING AREAS OF CHRONIC LOW LEVEL EXPOSURE TO PETROLEUM,
Chevron Research Co., Richmond, Calif.
E. W. Mertens.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of the Coastal Society, held New Orleans, LA, November 17-20, 1976. p 196-202, 16 ref.

Descriptors: *Aquatic life, *Oil pollution, *Environmental effects, Water pollution effects, Food chains, Coasts.
Identifiers: *Outer Continental Shelf, Low level exposure, Chronic effects, Oil seepage, Natural seeps.

Extensive field studies on the effects of chronic low level exposure of oil to marine life have been conducted at Santa Barbara; Lake Maracaibo, Venezuela; Bermuda; and Timbalier Bay, Louisiana, in the Gulf of Mexico. No Measurable effects have been observed on such indicators of the health of marine communities as population levels of various organisms; species diversity; and size, growth rate, or reproducibility of various organisms. Moreover, there is no evidence of adverse effects such as abnormal growths and biomagnification of petroleum fractions in the food chain. (See also W77-11022) (Sinha-OEIS)
W77-11033

OIL IN SOUTHERN CALIFORNIA MARSHES,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
D. Straughan.
In: Time-Stressed Coastal Environment: Assessment and Future Action, Proceedings of 2nd Annual Conference of the Coastal Society, held New Orleans, LA, November 17-20, 1976. p 204-220, 1 fig, 5 tab, 7 ref.

Descriptors: *Baseline studies, *Biological communities, Aquatic life, *Oil pollution, Resources development, *Water pollution effects, Wetlands, *California, *Marshes.
Identifiers: *Outer Continental Shelf, Tar.

Data are presented from surveys in 1974, 1975, and 1976, conducted at sites just inside the entrance to four southern California marshes. The studies were initiated to establish a baseline for the areas. Small amounts of tar were recorded on or adjacent to all survey sites. The distribution of species recorded on these surveys appears related to the normal abiotic variables operating in the survey areas and unrelated to the small recorded amounts of tar. (See also W77-11022) (Sinha-OEIS)
W77-11034

CHANGES IN MARSH ENVIRONMENTS THROUGH CANALIZATION,
Nicholls State Univ., Thibodaux, La. Dept. of Earth Science.
D. W. Davis.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 232-240, 19 ref.

Descriptors: *Resources development, *Channeling, *Environmental effects, *Wetlands, *Ecosystems, Louisiana, Water pollution sources, Coasts, Marshes, Salinity.
Identifiers: *Outer Continental Shelf, Coastal zone.

Louisiana's marsh-swamp complex is crisscrossed by an intricate system of artificial waterways. Some are wide and some narrow, but they have in common a straight course, or other characteristic that distinguishes them from natural features. These waterways are now significant elements in the progressive change in the physical appearance of the alluvial wetlands. A logical method of dealing with a distinct wetlands environment, the canal system nevertheless has modified drainage patterns, altered flora and fauna, changed salinity regimes and contributed to land loss. The available quantitative data are too incomplete to estimate the total effect canals have had on the environment. Field investigations show, and nearly all informants note, changes are occurring. While it is difficult to assess total change, some of which may have been detrimental, canal construction in Louisiana appears to be a constant variable in environmental modification. The canal patterns will endure even when the resources are exhausted. Their longivity will be a visible example of man's ability to change unknowingly the natural system. (See also W77-11022) (Sinha-OEIS)
W77-11036

THE GALVESTON BAY SYSTEM - A MULTI-STRESSED ENVIRONMENT,
Moody Coll. of Marine Sciences and Maritime Research, Galveston, Tex.
J. M. McCloy, and R. J. Scrudato.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 241-248, 1 fig, 15 ref.

Descriptors: *Resources development, *Water pollution sources, *Baseline studies, Environmental effects, *Texas, Coasts.
Identifiers: *Outer Continental Shelf, *Stressed environments, *Galveston Bay(Tex), Oil and gas industry, Petrochemical industry.

Central to the theme of environmental stresses to the Galveston Bay system is regional population growth; the significant increase from 2,226,074 in 1970 to a projected population of 4,765,017 by 1990 leaves little doubt that as a result of population pressure alone, the stresses will increase. Significant features of several geographic locations are discussed, moving northward from Galveston Island, disposal, leveeing, diking, and subsidence are discussed as representative of stressing agents to the bay complex. The major activity which encouraged this industrial and urban development is the proximity of oil and gas fields and associated refining activities; parts of the northern bay are densely covered with oil and gas drilling and production platforms. This area is the largest producer of petrochemical products in the United States and also has the greatest chemical pipeline system in the world. It must be noted that there are continued pressures being imposed by local proponents for expanding industrial and port activities, as well as residential development in the wetlands that will continue to impose serious and prolonged stresses. (See also W77-11022) (Sinha-OEIS)
W77-11037

PHYTOPLANKTON OF THE UPWELLING AREA OF NORTHWEST AFRICA: I. PIGMENTS AND PRODUCTION (CRUISE 'SAHARA II' OF THE RESEARCH VESSEL 'CORNIDE DE SAAVEDRA'), (IN SPANISH),
Instituto de Investigaciones Pesqueras, Barcelona (Spain).
R. Margalef.
Result Exped Cient Buque Oceanogr 'Cornide De Saavedra', 1, p 23-51, 1972.

Descriptors: *Phytoplankton, Chlorophyll, Africa, *Pigments, *Productivity, Light, Nitrogen, Phosphorus, Seasonal, Water pollution effects.
Identifiers: Carbon-14, Cornide, Sahara.

Pigments and 14C uptake were measured at 3 depths: 0m, 20m (or 10m), and 50m (or 20m in less transparent water) and in a number of stations, in the course of the months Aug. and Sept. 1971. Pigments of surface water were measured also along several transects between stations. 'Chlorophyll' concentration ranges from 0.05-18.2 mg m-3 with maximum values in the area W of Cabo Blanco, where discontinuous and more or less irregular patches could be recognized. The pattern of distribution changes rapidly. Although the relation between the pigment index D430/D665 and physiological and ecological properties of populations remains open to criticism and discussion, there are obvious regularities in its distribution, the index being lowest in the places of high productivity. Whole water samples -no elimination of zooplankton- of every one of the 3 samples depths were incubated on deck, at surface temperature, under 3 different light intensities (100%, 10%, 1%), giving 3 x 3 results for every station (table 1). Experiments were short -2 h-, C fixation in black bottles was subtracted from the average fixation in couples of clear bottles, and no corrections were applied for respiration or for excretion of organic solutes. A graphical method was used to integrate production per unit of surface and repeated incubations in 2 stations occupied during 24 h provided information to trace the pattern of diurnal change in production, on which factors for passing from hourly production to daily productions are based. The area of actual upwelling was restricted and bounded South by the latitude of Cabo Blanco. In it, production may exceed 1 g C m-2 day-1; in other seasons, it seems that the area of high production extends farther south. From the distribution of nutrients in the photic level, P rather than N seems to be limiting. The amount of C fixed in 1 hr per unit of chlorophyll gives evidence of the adaptation of the phytoplankton in the deeper layers to the efficient use of dim light.--Copyright 1974, Biological Abstracts, Inc.
W77-11045

A COLORIMETRIC METHOD FOR DETERMINATION OF SAXITOXIN,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5A.
W77-11047

ANALYSIS OF BRINE DISPOSAL IN THE GULF OF MEXICO. (3) CAPLINE SECTOR,
National Oceanic and Atmospheric Administration, Washington, D.C. Center for Experiment Design and Data Analysis.
For primary bibliographic entry see Field 5E.
W77-11049

PROGRESS REPORT. DEEP OCEAN MINING ENVIRONMENTAL STUDYg-PHASE I.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
NOAA Technical Memorandum ERL MESA-15, August 1976. 82 fig, 29 tab, 93 ref, 3 append.

Descriptors: *Mining, *Environmental effects, *Manganese, Aquatic life, *Baseline studies, *Resources development, Deep water, Biota, Water pollution effects.
Identifiers: *Outer Continental Shelf, Deep ocean mining, Nodules, *Deep Ocean Mining Environmental Studies(DOMES).

A preliminary analysis of the potential impacts on the marine environment which may result from the mining of deep ocean manganese nodules is presented. It is an interim step toward meeting the objectives of the DOMES Project and has been prepared using information available to the Project by mid-July 1976. DOMES will proceed in two phases which are keyed to the equipment development and testing schedule of the mining industry. Phase I is designed to identify potential environmental impacts to be expected from commercial mining prior to the deployment of prototype mining units. The basic objectives of Phase I are: (1) to obtain sufficient baseline data to determine the range of natural variability of selected environmental parameters in the mining region; (2) to identify major processes that control the distribution and abundance of marine organisms in the DOMES area; (3) to identify environmental parameters sensitive to deep ocean mining; (4) to start developing predictive models of the consequences of ocean mining on the marine environment; and (5) to permit the establishment of preliminary environmental guidelines for the mining of manganese nodules. This report gives a discussion of the direct effects of mining on the physical/chemical aspects of the marine environment and a discussion of the direct and indirect effects on the marine biota of the area. (NOAA)
W77-11053

REPORT OF A WORKSHOP ON THE IMPACT OF THERMAL POWER PLANT COOLING SYSTEMS ON AQUATIC ENVIRONMENTS, VOL. I. WORKING GROUP RESULTS.
Electric Power Research Inst., Palo Alto, Calif.
Report EPRI-SR-38, Proceedings of a workshop held at Asilomar, Pacific Grove, California, September 28-October 2, 1975. 123 p, 3 fig, 2 tab, append.

Descriptors: *Conferences, *Environmental effects, *Water pollution, *Thermal pollution, *Thermal stress, Discharge(Water), Thermal powerplants, Aquatic environment, Cooling water, Chemical wastes, Entrainment.
Identifiers: Impingement, Waste heat management.

The workshop was sponsored by EPRI in an effort to determine the current high-priority research needs which have broad application to defining aquatic power plant impacts. Vol. I of the proceedings is devoted to documenting the workshop proceedings and results. Two main results came from the workshop. First, a set of eleven distinct research recommendations was synthesized-each of which could comprise a major research program. These eleven topics, listed in order to priority, were: population, community, ecosystem effects of reduced survival or changes in distribution; chemical/physical studies; intake effects (near field); entrainment damage; ecosystem characterization; discharge effects; waste heat management; standardization of methods; information synthesis and evaluation; and information center. The second main result of the workshop was a compendium of research papers which are collected in Vol. II. (Chilton-ORNL)
W77-11123

WORKSHOP ON ENVIRONMENTAL RESEARCH FOR TRANSURANIC ELEMENTS.
Energy Research and Development Administration, Washington, D.C. Div. of Biomedical and Environmental Research.
Available from the National Technical Information Service, Springfield, VA 22161 as ERDA-76/134, Price codes: A04 in paper copy, A01 in microfiche. ERDA-76/134, Proceedings of the Workshop held at Battelle Seattle Research Center, Seattle, Washington, on November 12-14, 1975. 60 p.

Descriptors: *Conferences, *Research and development, Aquatic systems, Absorption, Diffusion, Soil, Sediments, Ecosystems, Food chains, *Trace elements.
Identifiers: *Transuranic elements.

This, the second workshop sponsored by the Division of Biomedical and Environmental Research on the subject, was organized to provide a forum for communication and coordination among the research scientist who have ongoing projects and to reveal needs and ideas for additional research. this workshop, in addition to land and freshwater research which was the focus of the first workshop, included marine sciences. A plenary session included a brief description by each scientist of the objectives and results of his research project to date. The remainder of the workshop consisted of group discussions in the areas of plant uptake, transport and diffusion in aquatic systems, soil and sediments, and ecosystems and food chains. This report is a description of the workshop and its results as observed by DBER staff and summarized in detail by the panel chairman. (Chilton-ORNL)
W77-11128

LAND AND WATER RESOURCES FOR ENVIRONMENTAL RESEARCH ON THE OAK RIDGE RESERVATION,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 6G.
W77-11130

RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIVISION ANNUAL REPORT, ECOLOGY, JANUARY-DECEMBER 1975.
Argonne National Lab., Ill.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL-75-60, Part III, Price codes: A06 in paper copy, A01 in microfiche. Report ANL-75-60, Part III, (1976). 105 p. W-31-109-Eng-38.

Descriptors: *Environmental effects, Plutonium, Aquatic environment, Biota, Radioecology, *Lake Michigan, Great Lakes.

The report includes 31 papers describing projects of the division. Of interest are the studies of plutonium and other transuranic elements in the Great Lakes and in the drainage basin of the Greater Miami River in Ohio. Emphasis has been placed upon attempts to understand the biogeochemical behavior of plutonium and other transuranic elements in the environment. A new program is described which examines the potential effects on aquatic ecosystems of pollutants related to nonnuclear energy conversion. Experiments designed to determine the hydrodynamic properties of waterborne particulates are included. A listing of publications by the staff of the section is given. (See W77-11133 thru W77-11150) (Chilton-ORNL)
W77-11132

FURTHER INVESTIGATIONS OF PLUTONIUM IN AQUATIC BIOTA OF THE GREAT MIAMI RIVER WATERSHED INCLUDING THE CANAL AND PONDS IN MIAMISBURG, OHIO,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
C. W. Wayman, G. E. Bartelt, and S. E. Groves.
In: Report ANL-75-60, Part III, (1976). p 23-27, 2 tab, 7 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Water pollution, Trophic levels, *Plutonium, Fish, Aquatic plants, Crayfish, Adsorption, Ohio.
Identifiers: Great Miami River watershed(Ohio).

The purpose of the study was to record plutonium activities in aquatic biota, to study trophic level relationships and to investigate the mode of plutonium uptake by organisms. Generally, aquatic plants were found to accumulate more plutonium than either crayfish or fish. Crayfish appeared to concentrate Pu238 to a greater extent than fish with the possible exception of shad. It was concluded that these investigations reiterate previous findings that plutonium is discriminated against at higher trophic levels. (See also W77-11132) (Chilton-ORNL)
W77-11133

DISPERSAL OF PLUTONIUM FROM AN EFFLUENT PULSE IN THE GREAT MIAMI RIVER,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
D. G. Sprugel, R. N. Muller, G. E. Bartelt, C. W. Wayman, and C. M. Bobula.
In: Report ANL-75-60, Part III, (1976). p 28-31, 2 fig, 2 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Water pollution, *Plutonium, Dispersal, Distribution, Rivers, Aquatic organisms, Algae, Adsorption, Ohio.
Identifiers: Effluent pulse, Cladophora, Great Miami River(Ohio).

An effluent release from Mound Laboratory was tagged with Rhodamine WT dye and its dispersal downstream was followed. It appeared that Pu238 was rapidly partitioned between the suspended sediment and dissolved phase in approximately equal proportions. This distribution was maintained downriver as the effluent pulse travelled as an identifiable water mass for a distance of at least 20 miles. The soluble plutonium was not removed from the water mass in the lower reaches of the river. Studies of the uptake of pulse-associated plutonium by aquatic organisms proved inconclusive. The alga, Cladophora, which is known to concentrate plutonium, did not exhibit rapid changes in uptake coincident with the passage of the pulse. (See also W77-11132) (Chilton-ORNLl)
W77-11134

PRELIMINARY INVESTIGATIONS OF THE CHEMICAL SPECIATION OF PLUTONIUM IN NATURAL WATERS OF THE NORTHEASTERN AND SOUTHEASTERN UNITED STATES,
Argonne National Lab., Illinois, Radiological and Environmental Research Div.
J. J. Alberts, M. A. Wahlgren, and D. M. Nelson.
In: Report ANL-75-60, Part III, (1976). p 32-35, 1 tab, 3 ref. W-31-109-Eng-38.

Descriptors: *Water pollution, *Plutonium, Particle size, Surface waters, Snow, Lakes, Southeast US, Northeast US.
Identifiers: Chemical speciation.

The study was directed to defining the gross submicron size and charge characteristics of plutonium which has been dispersed in the atmosphere, been deposited in surface waters of the northeast and southeast, and been scavenged by precipitation. Water samples were collected from Lake Michigan which representative of the epilimnion, thermocline and hypolimnion. Water samples were collected from Banks Lake (south Georgia) at the surface only because the lake is shallow and the waters wind-mixed. Snow samples were collected from the Argonne site. Comparison of Pu 239, 240 in the samples showed the concentration in Lake Michigan waters to be lower than in either snow or

surface waters from Banks Lake. Plutonium in Lake Michigan was found to be either of a particle size less than approximately 28 A diameter or in true solution. Samples from snow melt and Banks Lake contained a significant fraction of non-ultrafilterable plutonium (31.9 and 16,3% respectively). Charge distributions were also different for the various samples. (See also W77-11132) (Chilton-ORNL)
W77-11135

THE ASSOCIATION OF TRANSURANIC ELEMENTS WITH LACUSTRINE SEDIMENTS,
Argonne National Lab., Ill. Radiological and Environmental Research Division.
J. J. Alberts, M. A. Wahlgren, R. N. Muller, and K. Orlandi.
In: Report ANL-75-60, Part III, (1976). p 36-40, 2 tab, 6 ref. W-31-109-Eng-38.

Descriptors: *Water pollution, *Plutonium, Americium, *Lake Michigan, *Sediments, Distribution, Particle size.

The paper reports on Pu 239, 240 and Am 241 activities in several chemically defined phases of Lake Michigan sediment and sediment trap material and the distribution of Pu 239, 240 activity in various particle size ranges of Lake Michigan sediments. Results showed that, in Lake Michigan sediments, the transuranic elements Pu 239, 240 and Am 241 are associated with reducible hydrous oxides of iron and managanese and hence are inert to chemical mobilization as long as the sediments remain aerobic. A significant fraction of the sediment column. It was suggested that circumstances might exist in which clay-size particles could be transported with their attendant Pu 239, 240 to areas where the necessary chemical changes required to remobilize the attached isotopes chemically could occur. (See also W77-11132) (Chilton-ORNL)
W77-11136

EXPERIMENTAL APPARATUS AND ANALYSIS TECHNIQUE FOR STUDYING THE LOW REYNOLDS NUMBER HYDRODYNAMIC BEHAVIOR OF WATER-BORNE PARTICULATES,
Argonne National Lab., Ill., Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5A.
W77-11137

ACIDITY IN RAINFALL,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5A.
W77-11138

BIOLOGICAL UTILIZATION AND REGENERATION OF SILICON IN LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
H. L. Conway, and E. M. Yaguchi.
In: Report ANL-75-60, Part III, (1976). p 55-57, 2 fig, 1 tab. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Silicon, *Lake Michigan, Recycling, Diatoms.
Identifiers: Biological utilization.

Primary emphasis is devoted to data collected from a station 13 km offshore along a SW transect from Grand Haven, Michigan to the approximate center of the southern basin of Lake Michigan. During the period June to August, 1975, 80% of the total biologically active silicon had been utilized by the diatom community, with only 20% remaining as reactive silicon. It was concluded that, assuming the data to be representative of the entire lake, at least 80% of the total biologically active silicon is recycled each year in Lake Michigan and that most likely this value approaches 100%. (See also W77-11132) (Chilton-ORNL)
W77-11139

DISSOLUTION OF AMOPHOUS SILICON ON LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-11140

SEASONAL DEVELOPMENT OF PHYTOPLANKTON POPULATIONS IN OFFSHORE LAKE MICHIGAN IN 1975,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
J. I. Parker, H. L. Conway, and E. M. Yaguchi.
In: Report ANL-75-60, Part III, (1976). p 61-64, 2 fig, 2 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Seasonal, Distribution, Phytoplankton, Diatoms, Silicon, Light, *Lake Michigan.

Seasonal distributions of phytoplankton biomass, chlorophyll a, and primary productivity per unit of lake surface showed a bimodal seasonal distribution with maxima occurring in June and October. Diatoms contributed approximately 95% of the total biomass. Seasonal distribution of soluble reactive silicon and distom biomass showed a strong relationship. The development of a fall diatom bloom appeared to be regulated by the restoration of dissolved silicon to the level of the limiting concentration. It is suggested that the occurrence of unimodal diatom abundance patterns may be due to reduced incident radiation which might preclude the development of a fall bloom even though sufficient silicon is available. (See also W77-11132) (Chilton-ORNL)
W77-11141

VERTICAL DISTRIBUTION, COMPOSITION, AND ABUNDANCE OF CRUSTACEAN ZOOPLANKTON IN THE OFFSHORE WATERS OF LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
D. L. Mellinger.
In: Report ANL-75-60, Part III, (1976). p 65-67, 1 fig. W-31-109-Eng-38.

Descriptors: *Environmental effects, Seasonal, *Distribution, *Zooplankton, Populations, *Crustaceans, *Lake Michigan.

The vertical distribution of zooplankton in this tudy is described in terms of upper (0 to 20 m), middle (20 to 40 m), and lower (more than 40 m) layers. A similar amount of biomass/cubic m was found in each of the three layers when the water was homothermous (April-May). The winter vertical distribution and abundance in the northern basin were similar to those found in April in the southern basin. The biomass/cubic m of the upper layer increased dramatically with stratification in late June. During winter and spring, the herbivorous zooplankton component was composed entirely of calanoid copepods. By July, cladocerans represented 23% of the total herbivorous biomass in the upper layer. The mean percentage of cladoceran biomass (June-November) in the upper layer was 18%. The major portion of the annual production of the herbivorous crustacean biomass appeared to occur in the upper 20 m of the water column. (See also W77-11132) (Chilton-ORNL)
W77-11142

THE UTILIZATION OF DIATOMS AS A FOOD SOURCE BY CALANOID COPEPODS AND THE ABUNDANCE AND DISTRIBUTION OF ZOODETRITUS IN SOUTHEASTERN LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
J. G. Ferrane.
In: Report ANL-75-60, Part III, (1976). p 68-70, 1 fig. W-31-109-Eng-38.

Descriptors: *Ecology, *Food chains, *Diatoms, *Copepods, Populations, *Distribution, *Lake Michigan.

Examination of calanoid copepod fecal pellets showed that 21 species and subspecies of diatoms were utilized by the copepods. Fecal pellets were most abundant near the surface (0 - 20 m) throughout the sampling period from April to November. during September and October, pellets were also abundant at 40 - 50 m. In August the highest number of pellets/liter was found between 30 and 40 m. The usual pattern of vertical distribution is exemplified by a peak of abundance followed by a rapid decrease in numbers with depth reaching a minimum at approximately 40 to 50 m. (See also W77-11132) (Chilton-ORNL)
W77-11143

EFFECT OF ARSENIC AND CADMIUM ON THE GROWTH RATE AND NUTRIENT UTILIZATION RATES OF ASTERIONELLA FORMOSA,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
H. L. Conway, and E. M. Uaguchi.
In: Report ANL-75-60, Part III, (1976). p 74-77, 2 fig, 1 tab. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Water pollution, *Arsenic, *Cadmium, Diatoms, *Lake Michigan, Adsorption, *Growth rates, Sorption, Algae, Nutrients, Bioassay.
Identifiers: *Asterionella formosa.

Continuous culture techniques were used to assess biological effects of arsenic and cadmium concentration between 2 and 20 times ambient levels on the alga, Asterionella formosa. Experiments with cadmium showed corresponding increases in cadmium sorption with increase of cadmium concentrations, suggesting sorption of cadmium is a function of ambient concentration. Different results were obtained for arsenic. Over a range of 1 microg As/liter, the diatoms consistently sorbed similar levels of arsenic. The ability of the diatom to maintiain a constant arsenic level in or on the cells was examined by studying the sorption kinetic of arsenic at 10 microg As/liter on live cells, dead cells and frustules. It was concluded that there is both an active process regulating arsenic uptake in living cells and a process of surface adsorption. (See also W77-11132) (Chilton-ORNL)
W77-11144

THERMAL DISCHARGE RESIDENCE TIME LAKE MICHIGAN SALMONIDS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
G. P. Romberg, and W. Prepejchal.
In: Report ANL-75-60, Part III, (1976). p 78-80, 1 tab, 2 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Thermal pollution, *Water pollution, Thermal stress, *Lake Michigan, *Salmonids, Chinook salmon, Brown trout, Rainbow trout, Discharge(Water).
Identifiers: Exposure time, Residence time.

Lake Michigan salmon and trout were tagged with a thermoluminescent dosimeter (TLD) temperature tag to estimate their thermal exposure and residence time at a warm water discharge. During the 1974 studies, discharge temperatures were usually lower than during 1973 studies and mean percent residence times increased to approximately 30% for rainbow trout and chinook salmon and to 60% for brown trout. Corresponding temp

ture exposures decreased for all species but remained highest for brown trout. Lowest assumed nonresident discharge temperatures decreased from 19 to 20 C to 17 to 18 C, well below predicted avoidance temperatures. (See also W77-11132) (Chilton-ORNL)
W77-11145

PLUME RESIDENCE AND TOXIC MATERIAL ACCUMULATION,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
S. A. Spigarelli, and R. Holpuch.
n: Report ANL-75-60, Part III, (1976). p 81-83, 1 ab, 4 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Thermal stress, Discharge(Water), Toxins, Fish, Trout, Rainbow rout, Brown trout, Lipids.

Toxic contaminants were found to accumulate in dipose tissue and body concentrations have been orrelated with total lipid content in fish. Samples aken from TLD tagged and reference brown and ainbow trout were analyzed to detect possible hanges in lipid deposition resulting from recent lume residence. Plume resident fish had statistially higher percent fat contents than fish from unеated areas. Rainbow trout from unheated areas nd plume areas had 78% and 69% more fat than id related brown trout samples. Fat content of rout in this study ranged from 1 to 19%. Data from ne limited number of samples suggested that lume resident brown and rainbow trout have igher lipid contents than previously reported for ese species and that levels in plume resident fish qual or exceed levels reported for lake trout. (See lso W77-11132) (Chilton-ORNL)
/77-11146

UMMARY OF RECAPTURES OF FISH AGGED AT TWO POWER PLANTS ETWEEN 1972 AND 1974,
rgonne National Lab., Ill. Radiological and Environmental Research Div.
. M. Thommes, and G. P. Romberg.
: Report ANL-75-60, Part III, (1976). p 84-86, 1 b, 3 ref. W-31-109-Eng-38.

escriptors: *Environmental effects, *Thermal ollution, *Tagging, Fish, *Lake Michigan, owerplants, Discharge(Water), Salmonids, rout, Rainbow trout, Brown trout.

sh tagging studies were conducted at the Point each Nuclear Plant and at the Waukegan fossiled plant. Dominant species collected and gged at Point Beach were brown and rainbow out, while at Waukegan, coho salmon and brown out were prevalent. 1974 fish had significantly wer long-term recaptures than 1973 fish but the capture percentages for fish in both years were nilar for brown and rainbow trout. The influence thermal discharges on Lake Michigan salmonds as evidenced by the fact that 50.5% of the total recoveries were made at power plants. (See o W77-11132) (Chilton-ORNL)
7-11147

EMPERATURE SELECTION AND VOIDANCE BEHAVIOR OF SALMONIDS,
gonne National Lab., Ill. Radiological and Environmental Research Div.
Prepejchal, M. M. Thommes, S. A. Spigarelli, d G. P. Romberg.
Report ANL-75-60, Part III, (1976). p 87-89, 1 , 1 tab, 2 ref. W-31-109-Eng-38.

scriptors: *Environmental effects, *Thermal lution, Tagging, Fish, Salmonids, Trout, Rainw trout, Brown trout, Chinook salmon.
ntifiers: Temperature selection, Avoidance avior.

A radiotelemetry system was designed to monitor temperature orientation of fish in thermal discharge areas. Primary interest was in temperature selection and avoidance behavior within an area of approximately 1 mile of plumes. Data was indicative of the migratory tendencies of brown trout, rainbow trout, and chinook salmon. Further analysis of the data is planned. (See also W77-11132) (Chilton-ORNL)
W77-11148

BODY TEMPERATURE CHANGE IN LIVE AND DEAD GIZZARD SHAD, DOROSOMA CEPEDIANUM,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
T. L. Beitinger, M. M. Thommes, and S. A. Spigarelli.
In: Report ANL-75-60, Part III, (1976). p 90-91, 2 tab, 5 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Thermal pollution, Laboratory tests, Fish, Temperature, Monitoring.

22 gizzard shad, ranging in weight from 13.2 to 467.5 grams, were tested by monitoring the intestinal temperature as the shad were tansferred between two aerated water baths held at 9.2 plus or minus 0.13 C and 18.7 plus or minus 0.08 C. Data indicated that neither the direction of exposure nor the state of the test fish greatly influenced temperature change kinetics. Computations comparing half-time of live and dead shad indicated that conduction accounts for approximately 80% and convection for 20% of the total heat transport. (See also W77-11132) (Chilton-ORNL)
W77-11149

PHYTOPLANKTON AND NUTRIENTS NEAR THE ZION NUCLEAR PLANT DURING UPWELLING,
Argonne National Lab. Ill. Radiological and Environmental Research Division.
E. M. Yaguchi.
In: Report ANL-75-60, Part III, (1976). p 94-95, 2 tab. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Thermal pollution, Discharge(Water), *Phytoplankton, *Nutrients, Upwelling.

During upwelling conditions reactive silicate concentrations were found to be more than twice as great as during non-upwelling; phytoplankton diversity, chlorophyll a concentrations, and cell numbers per milliliter were greater. Productivity quotients were lower by nearly one-half during upwelling. (See also W77-11132) (Chilton-ORNL)
W77-11150

MIXED FUNCTION OXIDASES IN MARINE ORGANISMS IN RELATION TO PETROLEUM HYDROCARBON METABOLISM AND DETECTION,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
J. F. Payne.
Marine Pollution, Bulletin, Vol. 8(5), 1977, p 112-116. 3 tab, 30 ref.

Descriptors: *Water pollution effects, *Enzymes, *Oil, Oil spills, *Biochemistry, *Animal physiology, Animal metabolism, Marine fish, Oily water, Laboratory tests, *Methodology, Marine animals, Marine algae, Molluscs, Crustaceans, *Monitoring.
Identifiers: *Mixed function oxidases, *Marine environment, *Petroleum hydrocarbon metabolism, *Mixed function oxidases, *Aryl hydrocarbon hydroxylase, Aryl hydroxylase induction.

Aryl hydrocarbon hydroxylase (AHH) was not detectable in some marine organisms; enzyme activity may be related to phylogeny. The ability to respond to pollutant hydrocarbons by AHH induction is not a universal response for organisms possessing AHH. There was some substrate specificity in the mixed function oxidases (MFO) induced by petroleum in fish. Several MFO activities were examined but only AHH appeared as a useful enzyme monitor for petroleum. No invertebrate so far examined for MFO can be considered a useful monitoring species. (Katz)
W77-11241

EFFECTS OF DREDGING OPERATIONS ON ESTUARINE BENTHIC MACROFAUNA,
Swedish Water and Air Pollution Research Lab., Goteborg.
R. Rosenberg.
Marine Pollution Bulletin, Vol. 8, no. 5, 1977, p 102-104, 4 fig, 8 ref.

Descriptors: Metals, *Mercury, *Cadmium, *Zinc, *Copper, *Lead, *Nickel, Water pollution effects, *Sediments, *Dredging, Estuaries, Animal populations, Animal groupings, Marine animals, Fjords, Clams, Benthos.
Identifiers: *Sweden, Byfjord.

Dredging operations in a Swedish estuary reduced the number and diversity of benthic species. The larval recruitment in the vicinity of the dredged area was strongly affected. An overall increase in concentrations of Hg, Cd, Zn, Pb, and Ni were recorded in benthic fauna. One and a half years after termination of dredging, the benthic community structure was nearly restored and the high concentrations of heavy metals had decreased considerably. (Katz)
W77-11242

GENERAL TEST CONDITIONS AND PROCEDURES FOR CHLORINE TOXICITY TESTS WITH ESTUARINE AND MARINE MACROINVERTEBRATES AND FISH,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
For primary bibliographic entry see Field 5A.
W77-11243

BEHAVIORAL AVOIDANCE RESPONSES OF ESTUARINE FISHES TO CHLORINE,
Ichthyological Associates, Inc., Middletown, Del.
J. W. Meldrim, and J. A. Fava, Jr.
Chesapeake Science, vol. 18, no. 1, 1977, p 154-157. 6 tab, 3 ref.

Descriptors: *Chlorine, *Chlorination, *Toxicity, Laboratory tests, Methodology, Perches, Estuaries, Estuarine fisheries, Salinity, Dissolved oxygen, Hydrogen ion concentration, Statistical methods, Fish behavior, *Water pollution effects, Water temperature.
Identifiers: *White perch, *Atlantic silverside, Sublethal effects, Light level, Total residual oxidants.

A series of bioassays were conducted to determine the sublethal responses of estuarine fish to chlorine. The avoidance response of white perch and the Atlantic silverside was measured. The avoidance phenomena is complex and is influenced by environmental variables. (Katz)
W77-11244

BIOASSAY PROCEDURES FOR MARINE PHYTOPLANKTON WITH SPECIAL REFERENCE TO CHLORINE,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5A.
W77-11245

RESPONSES OF EARLY LIFE HISTORY STAGES OF THE STRIPED BASS, MORONE SAXATILIS TO CHLORINATION,
Environmental Research Lab., Johns Island, S.C. Bears Bluff Field Station.

D. P. Middaugh, J. A. Couch, and A. M. Crane.
Chesapeake Science, vol. 18(1), 1977, p 141-153. 4 tab, 10 fig, 28 ref.

Descriptors: *Chlorine, Bioassay, *Toxicity, *Mortality, Methodology, Laboratory tests, Laboratory equipment, Juvenile fish, *Striped Bass, Fish behavior, Animal pathology, Animal growth, Aquiculture, Fish physiology, *Embryonic growth stage, *Chlorination, Salinity, Statistics.
Identifiers: *Total residual chlorination, Histopathology, LC50, Gill damage.

The toxicity of total residual chlorination (TRC) to early life stages of the striped bass, Morone saxatilis, was determined using percent embryo hatchability, incipient LC50 bioassays, histopathology, and avoidance responses. Fifity-six percent of the control group (noTRC exposure) hatched. None of the embryos exposed to a measured TRC concentration of 0.21 mg/1 hatched. Only 3.5 percent of the embryos exposed to 0.07 mg/1 TRC and 23 percent of those exposed to 0.01 mg/1 TRC hatched. Incipient LC50 bioassays were used to determine the sensitivity of 2-, 12- and 30-day-old striped bass to concentrations of TRC in flowing water (1.0-3.0 ppt salinity at 18 + or - 1 C). The estimated incipient LC50 was 0.04 mg/1 TRC for 2-day-old prolarvae, 0.07 mg/1 for 12-day-old larvae and 0.04 mg/1 for 30-day-old juveniles. Histological examination of 30-day-old juveniles which survived exposure in the incipient LC50 bioassay indicated gill and pseudoranch damage for fish exposed to 0.21 to 2.36 mg/1 TRC. (Katz)
W77-11246

THE EFFECT OF PETROLEUM HYDROCARBONS ON REPRODUCTION OF AN ESTUARINE PLANKTONIC COPEPOD IN LABORATORY CULTURES,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
V. Berdugo, R. P. Harris, and S. C. O'Hara.
Marine Pollution Bulletin, vol. 8, no. 6, 1977, p 138-143. 1 fig, 4 tab, 12 ref.

Descriptors: *Oil, Oil spills, *Water pollution effects, *Copepods, Crustaceans, *Bioassay, Laboratory tests, Toxicity, Reproduction, Growth, Path of pollutants, Zooplankton, Methodology, Estuarine environment.
Identifiers: Eurytemora affinis, *Heating oil, *Naphthalene, *Sublethal biological effects, *Egg production, Methylnaphthalene, Dimethylnaphthalene.

The effect of short-term exposure to high concentration of water soluble fraction of aromatic heating oil on subsequent egg production by the estuarine copepod Eurytemora affinis has been studied in laboratory cultures to investigated possibly sublethal biological effects following exposure to hydrocarbon under an oil spill. Significant reduction in subsequent length of life, total number of eggs produced, mean brood size, and rate of egg production was observed. Exposure to napthalene alone at 1 mg1.-1 for 24 h produced a significant effect on total fecundity of the females. Ingestion rates were significantly lower when measured in the presence of water soluble fraction, and also naphthalene alone at mg1.-1 concentrations. Exposure to low-levels (10 and 50 micro-1.-1) of 14C-naphthalene alone over a period of ten days produced no significant effect on feeding or reproduction despite the high concentrations of hydrocarbon accumulated during this period. The results are discussed in relation to previous work on the fate of hydrocarbons in planktonic copepods, using 14C-naphthalene as a model compound. (Katz)
W77-11247

THE ECOLOGICAL EFFECTS OF PHYSICAL DAMAGE FROM MOTOR BOATS ON TURTLE GRASS BEDS IN SOUTHERN FLORIDA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
J. C. Zieman.
Aquatic Botany, vol. 2, 1976, p 127-139. 8 fig, 24 ref.

Descriptors: Florida, Environment, *Environmental effects, *Aquatic plants, Coasts, *Rhizomes, *Shallow water, Sediments, Hydrogen ion concentrations, Tidal streams, Tidal marshes, Tides.
Identifiers: *Turtle grass, Thalassia testudinum, *Motor boats, *Turtle grass beds, Southern Florida, Rhizome system.

Observation has shown that beds of turtle grass, Thalassia testudinum, although highly productive, do not recover rapidly following physical disturbance of the rhizome system. In shallow waters, the most common form of rhizome disturbance is from the propellers of motor boats. In turtle grass beds, which are otherwise thriving, tracks resulting from propellers have been observed to persist from 2 to 5 years. The proportion of fine sediment components is reduce in the sediments from the boat tracks, and the p H and EH are reduce in comparison to the surrounding grass bed. Damage of this type is most likely to occur in the shallow passes between islands and keys. These areas are also the slowest to recover due to the rapid tidal currents present in the shallow passes. (Katz)
W77-11248

METHOD FOR SAMPLING INVERTEBRATE DRIFT FROM A SMALL BOAT,
Ichthyological Associates, Inc., Pottstown, Pa.
For primary bibliographic entry see Field 5A.
W77-11249

EFFECTS OF HEAVY METALS ON SURVIVAL AND RESPIRATION RATE OF TUBIFICID WORMS: PART I-EFFECTS ON SURVIVAL,
ITEN-ENERGOINVEST, Dept. of Waste Water Treatment Research, Sarajevo (Yugoslavia).
I. Brkovic-Popovic, and M. Popovic.
Environmental Pollution, Vol. 13, 1977, p 65-72. 5 tab, 26 ref.

Descriptors: *Oligochaetes, Metals, *Cadmium, *Copper, *Mercury, *Zinc, *Chromium, *Nickel, Bioassay, Toxicity, Laboratory tests, Hardness(Water), Water pollution effects, Alkalinity, *Tubificids, Animal physiology.
Identifiers: *Dynamic bioassay, Respiration rate, *Median lethal concentrations.

Toxicity tests were performed with Tubifex tubifex in dynamic conditions. Median lethal concentrations (LC50) and the confidence limits were determined for cadmium, copper, mercury, zinc, chromium and nickel during exposure for 24 and 48 h in four diluents of different total hardness and alkalinity. The results of our experiments indicated that the toxicity effects of all heavy metals tested on the survival of T. tubifex depended considerably upon the hardness and alkalinity of the diluent used. The relationship between 48-h LC50 for the tested metals and alkalinity of water in a log-log system are defined as rectilinear functions. Hardness and alkalinity of dilution water have a much slighter effect upon the toxicity of mercury than upon other metals tested. (Katz)
W77-11250

STUDIES ON DETERMINATION OF ALKYL MERCURY IN FISH AND SHELLS BY THE STEAM DISTILLATION METHOD, (IN JAPANESE),
Yamaguchi Prefectural Research Inst. of Health (Japan).
For primary bibliographic entry see Field 5A.
W77-11251

EFFECTS OF HEAVY METALS ON DEVELOPMENT OF THE KILLIFISH, FUNDULUS HETEROCLITUS,
Rutgers - The State Univ., Newark, N.J. Dept. of Zoology and Physiology.
J. S. Weis, and F. Weis.
Journal of Fish Biology, Vol. 11, No. 1, 1977, p 49-54. 1 tab, 2 fig, 33 ref.

Descriptors: Mercury, *Metals, Water pollution effects, *Killifishes, *Fish eggs, Fish physiology, Fish reproduction, *Path of pollutants, Bioassay, Laboratory tests, Methodology, Cadmium, Pathology, *Heavy metals.
Identifiers: *Fish embryos, Inorganic mercury, Embryology, Fish development.

When F. heteroclitus embryos were exposed to inorganic mercury at concentrations of 0.03 or 0.1 mg/l at the early blastula stage, the percentage of successful axis formation was reduced and a significant proportion of embryos developed cyclopia or intermediate conditions leading to cyclopia. Treatment of the late blastula stage reduced the severity of the defects. Embryos which developed in lead at concentrations of 1 and 10 mg/l were normal in appearance until hatching, at which time they exhibited lordosis or were unable to uncurl from the position they had while still inside the chorion. No significant effects of cadmium at concentrations up to 10 mg/l were noted. (Katz)
W77-11252

HEPATOMAS IN MARINE FISH FROM AN URBAN ESTUARY,
California Univ., Davis. Dept. of Pathology.
B. McCain, K. V. Pierce, S. R. Wellings, and B. S. Miller.
Bulletin of Environmental Contamination and Toxicology, Vol. 18(1), 1977, p 1-2. 2 fig, 1 ref.

Descriptors: *Estuaries, *Fish diseases, On-site investigations, *Polychlorinated biphenyls, Marine fish, Estuarine environment, Estuarine fisheries, Laboratory analysis, Commercial fisheries, *Water pollution effects, *Animal pathology.
Identifiers: English sole, Parophrys vetulus, Starry flounder, Platichthys stellatus, *Fin erosion, Epidermal papillomas, Liver neoplasms, Hepatomas, Histopathology, *Urban estuary.

Hepatomas were found in starry flounder, Platichthys stellatus, from the Duwamish River Estuary in Seattle, Washington. 32% of flounder examined in this urban estuary were found to have hepatomas. (Katz)
W77-11253

TRACE METAL CONTENT OF PLANKTON AND ZOOPLANKTON COLLECTED FROM THE NEW YORK BIGHT AND LONG ISLAND SOUND,
National Marine Fisheries Service, Milford, Conn. Experimental Biological Investigations.
For primary bibliographic entry see Field 5A.
W77-11254

MICROBIOLOGICAL EFFECTS OF METAL IONS IN CHESAPEAKE BAY WATER AND SEDIMENT,
Maryland Univ., College Park. Dept. of Microbiology.
A. L. Mills, and R. R. Colwell.
Bulletin of Environmental Contamination and Toxicology, Vol. 18(1), 1977. p 99-103. 3 tab, 8 ref.

Descriptors: Microorganisms, *Chromium, *Cadmium, *Cobalt, *Lead, *Mercury, *Photosynthesis, Primary production, Bacteria, *Chesapeake Bay, Estuaries, Water pollution effects, Path of pollutants, Sediments, Laboratory tests.
Identifiers: *Metal ions, Dunliella, Chlorella, *Glucose oxidation, *Inhibition, Heterotrophic organisms.

The effects of chromium, cadmium, cobalt, lead, and mercury ions on Dunaliella and Chlorella photosynthesis was determined. High levels of metal ions can cause significant changes in the microbial ecology of Chesapeake Bay. (Katz)
W77-11255

CADMIUM AND OTHER HEAVY METALS IN SEA-SKATERS (GERRIDAE: HALOBATES, RHEUMATOBATES),
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W77-11256

ACIDIFICATION OF LAKES IN CANADA BY ACID PRECIPITATION AND THE RESULTING EFFECTS ON FISHES,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
R. J. Beamish.
Water, Air, and Soil Pollution, Vol. 6, (1976), p 501-514. 3 fig, 4 tab, 49 ref.

Descriptors: Water pollution, Water pollution sources, *Water pollution effects, *Air pollution effects, Acid, *Acidic water, Sulfur compounds, Mortalities, *Fish physiology, *Fish behavior, Fish reproduction, Fish sterilants, Stress, Heavy metals, Canada, Lakes.
Identifiers: *Lake acidification, *Sudbury, Ontario, *Acidic fallout, *Physiological response, Acid tolerance, Serum calcium, Sulfur oxides.

In the Sudbury region of Ontario, Canada, fallout of sulfur oxides has been shown to be responsible for damage to vegetation, lakes and fishes. The acidic fallout has been shown to effect a rate of acidification in many lakes that over several decades has resulted in the extinction of many species of fishes. Fish exhibit profound differences in acid tolerance but show some similarities in their physiological response to levels within the range of their individual susceptibilities. Prior to extinction most females of a particular species did not release their ova to be fertilized. The failure of females to spawn was coincident with an inability to maintain normal serum Ca levels. In some species growth was reduced despite an adequate supply of preferred food items. High concentrations of acid were considered to be the principal factor stressing the fish populations. Elevated concentrations of some heavy metals may add to the stress caused by high concentrations of acid. (Katz)
W77-11257

OPTIMAL CONTROL THEORY APPLIED TO A DYNAMIC AQUATIC ECOSYSTEM,
Ottawa Univ. (Ontario). Dept. of Electrical Engineering.
M. U. Ahmed, and N. D. Georganas.
J. Fish Res Board Can. Vol. 30, No. 4. 576-586, 1973. (Fr. summ.).

Descriptors: *Ecosystems, *Water pollution effects, Model studies, Aquatic environment.
Identifiers: Optimal control theory.

A dynamic model for an aquatic ecosystem consisting of a single species living in a polluted environment is presented. Considering the dynamics of growth of the species and increase in pollution, optimal control theory was applied to obtain species removal and pollution reduction rates at minimum cost.--Copyright 1973, Biological Abstracts, Inc.
W77-11258

UTILIZATION OF FISH FOR WATER QUALITY DETERMINATION. COMPARISON WITH THE BIOTIC INDEX METHOD. APPLICATION TO THE LAXIA (FRENCH RIVER IN THE LANDES BASQUE) AND THE GABAS (FRENCH RIVER IN THE LANDES DEPARTMENT), (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France). Laboratoire de Methodologie des Inventaires.
For primary bibliographic entry see Field 5A.
W77-11259

THE ASSOCIATION OF PHYTOFLAGELLATE BLOOMS IN LOWER NEW YORK BAY WITH HYPERTROPHICATION,
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Lab.
J. B. Mahoney, and J. J. A. McLaughlin.
Journal of Experimental Marine Biology and Ecology, vol. 28(1), 1977, p 53-65. 3 tab, 38 ref.

Descriptors: *New York, *Eutrophication, *Estuaries, *Nutrients, Domestic wastes, Sewage, *Water pollution effects, Water pollution sources, Laboratory tests, Bioassay, Carbon, Nitrogen, Phosphorus, Phosphorus compounds, Nitrogen compounds, Organic compounds, *Phytoplankton, *New Jersey.
Identifiers: *Phytoflagellate blooms, Lower New York Bay, *Hypertrophication.

Large quantities of nutrients, including organic substances, in treated and untreated wastes, are discharged into the New York estuary. The possible relationship between annual phytoflagellate blooms in Lower New York Bay and the urban hypertophication was investigated by means of tests of the utilization of a wide variety of organic C, N, and P compounds by the dominant phytoplanktonic organisms. Carbon compounds were tested at 50, 25, and 5 mg C/1; nitrogen compounds at 1.4, 0.7, and 0.14 mg N/1; and phosphorus compounds at 0.5, 0.25, and 0.1 mg P/1. The results from the lowest concentration are considered of greatest environmental relevance. At the low concentrations Massartia rotundata (Lohmann) Schiller used 11, Olisthodiscus luteus Carter 14, and Prorocentrum micans Ehrenberg 15 of 20 organic compounds; M. rotundata used 6, O. luteus 8, and P. micans 7 of 8 organic phosphorus compounds. (Katz)
W77-11261

ZOOPLANKTON AND DREDGING: RESEARCH PERSPECTIVES FROM A CRITICAL REVIEW,
Oregon State Univ., Corvallis. School of Oceanography.
B. K. Sullivan, and D. Hancock.
Water Resources Bulletin, vol. 13, no. 3, p 461-468, June 1977. 29 ref.

Descriptors: *Zooplankton, *Estuarine environment, *Environmental effects, *Populations, *Distribution, *Dredging, *Planning, *Reviews, Spatial distribution, Analytical techniques, *Seasonal, Sediments, Estuaries.
Identifiers: Research design.

Studies on the responses of zooplankton to dredging are summarized and discussed. Several factors influence the potential effects of dredging activity on zooplankton populations including the movement of zooplankton and the non-random horizontal dispensions of zooplankton. There is also no adequate means of estimating the size and composition of zooplankton populations with adequate reliability. Natural fluctuations in zooplankton populations are sufficiently large as to make field surveys impractical. Design criteria for studies intended for impact assessment require careful consideration of these factors. It is suggested that ocean dominated systems present different research requirements than those estuarine populations which have endemic zooplankton populations. (Katz)
W77-11262

TWO EUROPEAN OYSTER (OSTREA EDULIS) MORTALITIES ASSOCIATED WITH AN ABNORMAL HAEMOCYTIC CONDITION,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
D. J. Alderman, P. VanBanning, and A. Perez-Colomer.
Aquaculture, vol. 10, p 335-340, 1977. 2 fig, 1 tab, 12 ref.

Descriptors: *Water quality, *Mortality, *Oysters, *Environmental effects, *Commercial shellfish, *Cytological studies, *Animal physiology, Pathology, Mollusks, Invertebrates, Morbidity, Stress, Aquiculture, *Fish kill.
Identifiers: Ostrea edulis, Hemocytes.

Regularly occurring mortalities of the flat oyster, Ostrea edulis, on two sites, one in Galicia, Spain, and one in Yugoslavia, are reported. The oysters involved showed an apparent neoplastic condition of the haemocytes. No pathogen has been detected and the cause of the mortalities was attributed to a combination of water quality and physical stress factors. (Katz)
W77-11263

THE OCCURRENCE OF FIN ROT IN MULLET (MUGIL CEPHALUS) ASSOCIATED WITH CRUDE OIL CONTAMINATION OF AN ESTUARINE POND-ECOSYSTEM,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
C. D. Minchew, and J. D. Yarbrough.
Journal of Fish Biology, vol. 10, p 319-323, 1977. 1 tab, 1 plate, 4 ref.

Descriptors: *Fish diseases, *Bacteria, *Mullets, *Oil spills, Oil, *Water pollution effects, Estuaries, *Pathogenic bacteria, Pathology, Fish, Estuarine environment, Bioassay.
Identifiers: *Sublethal effects, *Mugil, *Fin rot, *Crude oil.

Empire Mix crude oil (4.0-5.0 ppm) was introduced into two estuarine pond-ecosystems equipped with tidal simulation and stocked with mullet, shrimp, and oysters. Six to eight days following the spill all mullet examined from the treated ponds had varying degrees of fin rot on one or more fins. The fin erosion involved primarily the caudal, pectoral, and pelvic fins with the caudal fin the most severely damaged. The damage to the fins varied from a slight discoloration with no visible fraying to complete erosion of all the fin elements. A gram negative rod tentatively identified as Vibrio sp. is considered the primary pathogen responsible for the fin erosion. The infection was primarily external as indicated by kidney cultures of the affected fish. The course of the infection was documented over a 56-day period following the oil spill. The high incidence of fin rot which occurred in the estuarine pond-ecosystems did not occur during numerous acute exposures of mullet to crude oil in the laboratory. (Katz)
W77-11264

STUDIES OF THE EFFECT OF THE ENVIRONMENT ON THE HEART RATE OF SHELLFISHES.--1. EFFECT OF TEMPERATURE, SALINITY AND HYPOXIA ON THE HEART RATE OF SCALLOPS, (IN JAPANESE),
Hokkaido Regional Fisheries Research Lab. (Japan).
T. Nakanishi.
Bulletin of Hokkaido Regional Fisheries Research Laboratory, No. 42, p 65-73, March 1977. 6 fig, 8 ref.

Descriptors: *Salinity, Animal physiology, *Environmental effects, *Dissolved oxygen, *Commercial shellfish, *Water temperature, *Mortality, Invertebrates, Mollusks, Laboratory tests, Oxygen sag, Monitoring, Shellfish farming.
Identifiers: Heart rate, *Scallops, Patinopecten.

Scallops (Patinopecten yessoensis) were maintained in aquaria at seven experimental temperatures ranging from a low temperature of -1.8C and increasing at 5C intervals. Heart rates increased from a low of 4 per minute at -1.8C as the temperature increased. Maximum heart rate was reached at 23C. All scallops died at 28C. Scallops were transferred to waters with reduced salinities and heart rates were measured for 24 hours. At 26C and 19.5 o/oo salinity, heart rates decreased to 3 beats per minute and then increased to normal rates after 1 hour and 9 hours respectively. At 13, 6.5, and 0 o/oo salinity, heart rates dropped to 2 to 3 beats per minute and death followed. Heart rates increased slightly at oxygen saturation less than 70% with a maximum rate seen at 25% oxygen saturation. Scallops survived oxygen saturations of 4%. (Katz)
W77-11265

THE EFFECTS OF VARIOUS COMPONENTS OF WATER POLLUTION ON THE BEHAVIOR OF SOME AQUATIC MACROPHYTES OF THE COASTAL RIVERS OF ISRAEL,
Tel-Aviv (Israel). Dept. of Botany.
M. Agami, M. Litav, and Y. Waisel.
Aquatic Botany, Vol. 2, 1976, p 203-213. 2 tab, 4 fig, 17 ref.

Descriptors: *Aquatic plants, *Water pollution effects, On-site-investigations, *Detergents, *Ammonia, Ammonium compounds, *Nitrates, *Phosphates, Rivers, Laboratory tests, Bioassays, *Nitrites, Anaerobic conditions.
Identifiers: *Aquatic macrophytes, *Hydrophytes, Israel, Coastal Rivers, Nymphaea, Ludwigia, Scirpus.

Seven aquatic macrophytes, with an exclusive distribution in clean sections of two coastal rivers in Israel, were transplanted into polluted sites in the same rivers. Five species died shortly afterwards, whereas two survived uninjured. Three 'clean water' species (Nymphaea caerulea, Ludwigia stolonifera and Scirpus litoralis) were treated with several water pollution factors. Detergents caused severe damage to all plants, whereas ammonium caused a temporary damage only in Nymphaea. Other factors like anaerobiosis and increased levels of nitrate and phosphate had no effect on the plants. It is assumed that the present content of detergents in most polluted sections of the two rivers constitutes the main limiting factor for many hydrophytes and hygrophytes which occur in the non-polluted sections. The possible use of certain aquatic macrophytes as indicators for varying levels of pollution is discussed. (Katz)
W77-11266

RELATIONSHIP BETWEEN WATER POLLUTION AND THE FLORA OF TWO COASTAL RIVERS OF ISRAEL,
Tel-Aviv Univ. (Israel). Dept. of Botany.
M. Litav, and M. Agami.
Aquatic Botany, Vol. 2, 1976, p 23-41. 6 tab, 8 fig, 10 ref.

Descriptors: *Aquatic plants, *Water pollution effects, On-site-investigations, Ammonia, *Ammonium compounds, Water quality, Chemical analyses, *Detergents, *Dissolved oxygen, Rivers, *Plant groupings, Plant populations, Sewage, *Sewage effluents, Sewage disposal, Nitrate, Phosphate.
Identifiers: *Israel(Alexander River), *Yarkon River, *Phytosociological investigation, Vegetation transect.

Changes in the vegetation of two coastal rivers in Israel were studied in relation to increasing pollution. Pollution levels were defined mainly in terms of ammonium content, presence of detergents and dissolved oxygen concentration at various depths and at various times of the day. It was found that species diversity was greatest in the clean-water sections of the rivers and decreased considerably with increasing pollution. No floating-leaved or submerged species were found in the polluted sections; these and some other species were exclusive to the clean-water sections. On the other hand, none of the hygrophyte species was exclusive to polluted sections. The distribution of several plant species across the rivers and the river banks was noted and it appears that although tolerant species can grow partly submerged in clean-water, they avoid direct contact with polluted water. (Katz)
W77-11267

A STUDY OF THE FISH COMMUNITY IN THE VICINITY OF A THERMAL DISCHARGE IN THE JAMES RIVER, VIRGINIA,
Richmond Univ., Va.
J. W. White, W. S. Woolcott, and W. L. Kirk.
Chesapeake Science, Vol. 18, No. 2, p 161-171, June 1977. 1 fig, 9 tab, 36 ref.

Descriptors: *Water temperature, *Thermal pollution, *Heated water, *Biological communities, *Fish populations, *Environmental gradient, *Freshwater fish, Bass, Shiners, Eels, On-site investigations, Powerplants, Size, Seasonal, Sampling, Environmental effects, Temperature.
Identifiers: *James River(Virginia), *Species diversity.

The size, species composition and structure of the fish community in a 9.6 km stretch of the James River, Virginia, were analyzed. Twenty collections were made by electrofishing during a year from both the north side of the river, which received a thermal discharge from an electric power plant (Change in temperature at outfall from 4 to 14C), and from the south side where temperatures were ambient. Parameters investigated were number of species, total number of individuals and the Shannon-Wiener and evenness indices of species diversity. Differences were found to exist in community structure among seasons within both the ambient and thermally influenced zones. In the ambient zone all parameters showed significant seasonal changes with values lower in the winter. At the outfall station significant seasonal change occurred for only the diversity and evenness indices with values lower in the summer. Average total abundance remained lower within all seasons at the outfall station than in the ambient zone. As temperatures declined downstream from the point of effluent discharge parameter values more closely approached those on the unheated side. (Katz)
W77-11269

EFFECT OF TEMPERATURE ON MATURATION OF A CYPRINID LOACH, (IN JAPANESE),
Nagano Prefecture Freshwater Fisheries Research Lab. (Japan).
R. Suzuki, and M. Yamaguchi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 4, p 367-373, 1977. 3 fig, 4 tab, 13 ref.

Descriptors: *Fish reproduction, *Environmental effects, *Aquiculture, *Water temperature, *Spawning, *Biorhythms, *Fish physiology, *Productivity, *Freshwater fish, Reproduction, Laboratory tests, Population, Seasonal.
Identifiers: Misgurnus anguillicaudatus, *Hormones, *Human chorionic gonadotropin, *Loach.

Female loach, Misgurnus anguillicaudatus, were reared for two months in aquaria at 15, 20, 25, and 30C. Highest gonadosomatic index ratios were found in groups kept at 25C and 30C, in both summer and winter experiments. Loaches at these two temperatures were injected with human chorionic gonadotropin, 10 IU/g body weight. At least 79% of injected fish spawned within 8 to 14 hours of injection. The average fertilization and hatching rates of eggs in the group kept at 25C were higher than in those kept at 30C. About 20% or less of the fish kept at the two lower temperatures spawned. Mature females collected from natural streams were reared in the laboratory at 25C. They spawned after injection with HCG, even in the autumn. Other adult females collected from water at 5.3C spawned successfully after 10 days at 25C and injection with HCG. The critical high temperature for egg maturation of this species is about 30C and the most suitable, about 25C. (Katz)
W77-11270

CHANGES IN THE MECHANICAL STRENGTH OF THE BONE AND IN THE COLLAGEN SOLUBILITY OF THE BONE AND THE SKIN OF CARP CAUSED BY BETA-AMINOPROPIONITRILE AND D-PENICILLAMINE,
Kyoto Univ. (Japan). Dept. of Fisheries.
R. Yoshinaka, M. Sato, and S. Ikeda.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 4, p 429-435, 1977. 1 tab, 6 fig, 22 ref.

Descriptors: *Fish physiology, *Carp, *Biochemistry, *Metabolism, *Pathology, *Antibiotics(Pesticides), Freshwater fish, Fish, Environmental effects, Aquiculture, Fish management.
Identifiers: Bone strength, Beta-aminopropionitrile, D-penicillamine, *Collagen, *Skeletal deformity.

Beta-Aminopropionitrile (Beta-APN) and D-penicillamine, when administered orally to carp, caused a marked decrease in the mechanical strength of the vertebral column and an increase in the amount of soluble collagen in the bone and skin. Intraperitoneal administration of these drugs to carp also caused a reduction in the mechanical strength of the bone. When Beta-APN and D-penicillamine were added to acid-soluble collagen derived from normal carp skin, D-penicillamine, in contrast to Beta-APN, prevented the formation of stable collagen fibrils in vitro. These results indicate that the skeletal deformation induced in carp by Beta-APN and D-penicillamine is due to the reduced mechanical strength of the bone resulting from a collagen maturation defect. (Katz)
W77-11271

TOXICITY AND UPTAKE OF KEPONE BY MARINE UNICELLULAR ALGAE,
Environmental Research Lab., Gulf Breeze, Fla.
G. E. Walsh, K. Ainsworth, and A. J. Wilson.
Chesapeake Science, Vol. 18, No. 2, p 222-225, 1977. 1 tab, 7 ref.

Descriptors: *Toxicity, *Absorption, *Marine algae, *Bioassay, *Pesticides, *Insecticides, *Lethal limit, *Pesticide residues, *Growth rate, Laboratory tests, Chlorinated hydrocarbon pesticides, Primary productivity, Aquatic plants.
Identifiers: *Kepone, *Chlorococcum, *Dunaliella, *Nitzschia, *Thalassiosira, Mirex.

Four species of marine unicellular algae were exposed to Kepone in laboratory bioassays. EC50 values after seven days' growth, in mg/liter (ppm), were: Chlorococcum sp., 0.35; Dunaliella tertiolecta, 0.58; Nitzschia sp., 0.60; Thalassiosira pseudonana, 0.60. When exposed to 100 micrograms/liter (ppb) Kepone for 24 hr, residues associated with the algae, in mg/kg (ppm) wet weight, were: Chlorococcum sp., 80; D. tertiolecta, 23; Nitzschia sp., 41; T. pseudonana, 52. (Katz)
W77-11272

CHANGES IN THE ACTIVITY OF EPIPHYTIC BACTERIA OF ELODEA CANADENSIS AND CHARA VULGARIS FOLLOWING TREATMENT WITH THE HERBICIDE, PARAQUAT,
University of Wales Inst. of Science and Technology, Cardiff.
J. C. Fry, and A. J. Ramsay.

imnology and Oceanography, Vol. 22, No. 3, p
6-562, 1977. 4 fig, 2 tab, 19 ref.

escriptors: *Bacteria, *Herbicides, Metabolism, Biochemistry, *Life history studies, Paraquat, *Aquatic bacteria, *Tracers, *Carbon dioisotopes, Pesticides, Kinetics, Methodology, piphytology, Environmental effects, Analytical chniques.
entifiers: Chara, Elodea, *Epiphytic bacteria, ineralization.

ne heterotrophic activity of the bacterial iphytes of Elodea canadensis and Chara vulgaris as studied by measuring the mineralization of C-glucose in situ. In a field experiment in which e plants were treated with the herbicide, raquat, there was an increase in both the max-um velocity of mineralization (Vmax) and +Sn (K=glucose concentration which gives half nax; Sn=natural concentration of substrate) of e epiphytic bacteria of Elodea and turnover time nained fairly constant. No appreciable change these parameters was noted in the epiphytic cteria of Chara, which was resistant to paraquat. e values for the mean Vmax per bacterium owed greater increases after herbicide treatment Elodea than for Chara. (Katz)
77-11273

TAKE AND LOSS OF DISSOLVED ZINC BY IE STICKLEBACK GASTEROSTEUS ACU-ATUS L.,
een Elizabeth Coll., London (England). Dept. Biology.
Matthiessen, and A. E. Brafield.
rnal of Fish Biology, Vol. 10, No. 3, p 399-410, 77. 1 tab, 8 fig, 27 ref.

scriptors: *Zinc, *Absorption, *Sticklebacks, etals, *Zinc radioisotopes, *Hardness(Water), nvironmental effects, Tracers, Laboratory ts, Calcium, Water quality, Size, Toxicity, Path pollutants.
ntifiers: Bioaccumulation.

take and loss by sticklebacks of both stable c and 65-Zn in hard and soft water were studied periods up to 400 h. In calcium-free water, the c uptake curve is approximately asymptotic r a period of 24 h, while in hard water internal levels dropped at 24 h. Over 5 h, fish in hard water absorb about 3 to 5 times more Zn than se in calcium-free water. There is positive ar correlation between log Zn uptake and log t weight of fish. Whole-body concentration fac-s (c.f.) at 16 h reach a maximum of 12.2 an=2.9), highest concentrations of Zn being nd in the gills (mean c.f.=5.1) and lowest con-trations in the gonads (mean c.f.=0.8). Over ger periods (400 h), internal stable zinc levels of exposed to 1 and 4 ppm Zn+2 remain little ner than controls (max. 28%). 65-Zn efflux in c-free water falls to zero after 5 h, more zinc %) being lost after uptake in tapwater than in cium-free water (56%). (Katz)
7-11274

E PERFORMANCE OF DIVERSITY INDEX DESCRIBING THE ZOO-BENTHOS OF TWO KES,
versity of East Anglia, Norwich (England). ool of Biological Sciences.
. Mason.
rnal of Applied Ecology, Vol. 14, 1977, p 313-2 tab, 13 ref.

criptors: Lakes, *Benthos, Invertebrates, trophication, On-site-investigations, Water ution effects, *Methodology, Analysis, alytical techniques, *Statistical methods, piration.
ntifiers: *Diversity index, *Zoobenthos, En-d, Benthic macro-invertebrates, *Culturally ophic, Biomass, *Mean annual diversity, Un-uted site, *Species diversity, Alderfen broad, er broad, Information-diversity index.

An information-diversity index was used to compare monthly samples over two years of benthic macro-invertebrates from two shallow lakes, one of which was culturally eutrophic. The analysis was performed on monthly estimates of numbers, biomass and respiration. Patterns in the biomass and respiration data were not very different from those derived from the numerical abundance of taxa. Mean annual diversity was lower at the culturally eutrophic site. However, in the June of both years the diversity index was lower at the unpolluted site due to a very high population of one species of chironomid. It was concluded that care is needed in relating species diversity to water quality when samples are taken infrequently. Species richness alone provided a more consistent difference between the two sites. (Katz)
W77-11275

MASS MORTALITIES OF ADULT SALMON, SALMO SALAR, IN THE R. WYE, 1976,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
M. P. Brooker, D. L. Morris, and R. J. Hemsworth.
Journal of Applied Ecology, Vol. 74, (1977), p 409-417. 4 tab, 4 fig, 15 ref.

Descriptors: *Fish kill, *Mortalities, *Atlantic salmon, Rivers, Water temperatures, Aquatic plants, *Dissolved oxygen, Water quality, On-site-investigations, Droughts, River flow, Anadromous fish.
Identifiers: England, *River Wye, *Mass mortalities, *Plant decay, Anoxia, Redweed, Dissolved oxygen, Deoxygenation.

The physical and biological and chemical conditions leading to a mass mortality of adult salmon (Salmo salar L.) in the lower reaches of the R. Wye are described. As a result of sunny and low flow conditions during late June 1976, water temperatures increased to a maximum of 27.6C and accelerated the decay of substantial plant stands, the growth of which had been enhanced by the prevailing conditions: this resulted in severe deoxygenation of the water. It is concluded that the low oxygen concentration in the water at this time was the principal factor in causing mass mortalities of fish and was probably accentuated by high water temperatures. (Katz)
W77-11276

CONTAMINATION OF THE BIRD LIFE OF THE CAMARGUE BY ORGANOCHLORINE RESIDUES (CONTAMINATION DE L'AVIFAUNE CAMARGUAISE PAR DES RESIDUS ORGANOCHLORES), (IN FRENCH),
Ontario Ministry of the Environment, Ottawa. Service Canadien de la Faune.
J. T. Mendola, R. W. Risebrough, and J. Blondel.
Environmental Pollution, Vol. 13, P 21-31, 1977. 1 tab, 41 ref.

Descriptors: *Water birds, *Pesticide residues, *Path of pollutants, *Chlorinated hydrocarbon pesticides, *Waterfowl, *Reproduction, *Bird eggs, *Gulls, DDT, Arochlors, Wildlife, Aquatic animals, Birds, Water pollution effects, Polychlorinated biphenyls, Dieldrin, Absorption.
Identifiers: National Reserve of the Camargue(France), *Organochlorine residues.

The National Reserve of the Camargue in the Delta of the Rhone is one of the largest nature reserves in Europe, providing a breeding habitat for many species of water birds. Potential sources of pollutant contamination include the waters of the Rhone and the adjacent Mediterranean, irrigation waters entering the Reserve from surrounding agricultural land and the increasing industrial activity immediately to the east. Nevertheless, levels of organochlorine compounds in eggs of several species of birds obtained these or related species in northern Europe and North America; adverse effects on the reproduction of fish-eating or raptorial birds of the area have not been found. (Katz)
W77-11277

UPTAKE OF COPPER AND LEAD BY A METAL TOLERANT ISOPOD, ASELLUS MERIDIANUS RAC.,
Cambridge Univ. (England). Dept. of Applied Biology.
B. E. Brown.
Freshwater Biology, Vol. 7, 1977, p 235-244. 5 tab, 4 fig, 27 ref.

Descriptors: *Metals, *Copper, *Lead, Crustaceans, Isopods, Diets, *Animal metabolism, Animal pathology, Animal physiology, *Path of pollutants, Water pollution effects, Laboratory tests, Methodology, Bioassay, Mortalities.
Identifiers: Hayle River, Gannel River, England, *Metal-tolerant isopod, *Asellus meridianus, Metal-enriched food, Copper-tolerant animals, Copper accumulation, Lead-tolerant animals, Lead accumulation, Copper storage forms, Copper uptake, Lead uptake, Hepatompancreas.

Asellus meridianus from sites on the rivers Hayle and Gannel accumulates both copper and lead from experimental solutions: tolerant animals also accumulate copper and lead from metal-enriched food. Copper-tolerant animals accumulated up to 6.8 ug mg-1 copper after feeding on a copper-enriched diet for 12 days whereas non-tolerant animals showed no evidence of copper accumulation from food and no survivors remained after 8 days. Lead-tolerant animals accumulated up to 28 ug mg-1 lead during a 14-day exposure to a lead diet; non-tolerant animals showed no accumulation of lead from food and no live animals remained after 10 days. A marked difference in the storage forms of copper is observed in the hepatopancreas of copper-tolerant isopods, as compared with non-tolerant animals, when samples are taken from natural populations. (Katz)
W77-11279

BENTHIC COMMUNITY STRUCTURE NEAR THE WOODS HOLE SEWAGE OUTFALL,
Southeastern Massachusetts Univ., North Dartmouth. Dept. of Biology.
J. A. Nichols.
Internationale Revue der Gesamten Hydrobiolgie, Vol. 62 (2), 1977, p 235-244. 2 tab, 3 fig, 22 ref.

Descriptors: Massachusetts, *Benthos, Invertebrates, *Animal groupings, Animal growth, *Sewage outfalls, Water pollution effects, *Nematodes, *Worms, Environmental effects, On-site-investigation, Marine animals, Organic matter, *Organic wastes.
Identifiers: *Woods Hole, *Outfall fauna, *Nematode-dominated community, Macrofaunal abundance, *Community structure, Environmental disturbance.

The benthic invertebrate fauna near the Woods Hole, Massachusetts sewage outfall and a nearby control area were sampled. Community structure in erms of numbers and taxa fluctuated seasonally at both control site and at the outfall. The outfall fauna was dominated by small nematode worms, and the year-round maintenance of a nematode-dominated community may be a mechanism for utilization of the unpredictable unnatural, excess organic material available around the outfall. Based on the small size of the invertebrates at the outfall compared to the other areas, it is suggested that the relationship between macrofaunal abundance and average individual size in an assemblage is a measurement of community structure which can be useful in assessing environmental disturbance. (Katz)
W77-11280

BENTHIC INVERTEBRATES AS INDICATORS OF ORGANIC POLLUTION IN THE WESTERN BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5A.

W77-11281

SOME EFFECTS ON THE ECOLOGY OF A LITTORAL ZONE RECEIVING THE WASTES ON AN OIL REFINERY (QUELQUES DONNEES SUR L'ECOLOGIE D'UNE ZONE MARINE LITTORALE RECEVANT LES REJETS D'UNE RAFFINERIE DE PETROLE),
Aix-Marseille-3 Univ. (France). Laboratoire de Microbiologie.
J. Le Petit, M.-H. N'Guyen, and S. Tagger.
Environmental Pollution, Vol. 13, p 41-56, 1977. 9 fig, 3 tab, 22 ref.

Descriptors: *Oil wastes, *Primary productivity, *Phytoplankton, *Marine bacteria, *Phosphates, *Nitrates, *Water temperature, *Aquatic population, *Environmental gradient, *Water pollution effects, *Microbial degradation, Biological communities, Bacteria, Chlorophyll, Oil industry, Nutrient removal, Water quality, Biodegradation.
Identifiers: *Mediterranean Sea.

The effects of a petroleum refinery overflow on the physical and chemical characteristics, phytoplankton production, and bacterial population in a marine environment were studied. The high temperature of the effluent creates thermal variation in the area, occasionally producing low oxygen concentrations. Variable but sometimes very high P-PO4 concentrations induce serious disturbances in the N-NO3/P-PO4 ratio. An N-NO3 reduction, probably of bacterial origin, further disturbs the balance. Chlorophyll concentrations measured close to the effluent area are approximately equal to those of offshore waters but the N-NO3/P-PO4 ratio indicate that the phytoplankton species may be different. Bacteria utilizing a gas-oil as the sole carbon source represent 10% of heterotrophic bacteria in the effluent area and 4% in an area not directly polluted by hydrocarbons. Physical and chemical conditions in the effluent area are not favorable to the phytoplankton population equilibrium, but seem to be so far hydrocarbon degradation by bacteria. (Katz)
W77-11282

PHYSIOLOGICAL RESPONSES OF ESTUARINE ORGANISMS TO CHLORINE,
Maryland Univ., Solomons. Chesapeake Biological Lab.
R. M. Block.
Chesapeake Science, Vol. 18(1), 1977, p 158-160.

Descriptors: *Chlorine, *Chlorination, *Animal behavior, Animal pathology, Animal physiology, Bioassay, *Toxicity, *Stress, Physiological ecology, Marine fish, Estuaries, Invertebrates, Oysters, Crabs, Salinity.
Identifiers: Physiological responses, Estuarine organisms, Chlorine produced stress, Time of exposure, Behavior patterns.

Chlorine produced stress to estuarine organisms may be indicated by physiological responses that are not reflected in mortality studies. The physiological parameters selected should relate to the functional physiology for a particular species. Time of exposure should be correlated with the behavior patterns for the test species. More research is required using multivariate design on the effects of chlorine on selected euryhaline species at various salinities. (Katz)
W77-11283

BEHAV L EFFECTS OF MERCURY ON GRASS S MP,
North Ca State Univ. at Raleigh. Dept. of Zoology.
G. T. Barthan s.
Marine Pollution Bulletin, Vol. 8, No. 4, p 87-90, 1977. 1 fig, 3 tab, 13 ref.

Descriptors: *Animal behavior, *Shrimp, *Mercury, *Water pollution effects, *Metals, *Toxicity, Heavy metals, Invertebrates, Crustaceans, Laboratory tests, Methodology, Water quality control.
Identifiers: *Sublethal effects, *Palaemonetes pugio, *Avoidance response.

Subacute exposure (0.05 ppm) to mercuric chloride significantly impairs the conditioned avoidance responses of grass shrimp Palaemonetes pugio, when tested in an aquatic avoidance apparatus. Control animals learn to avoid a shock after the onset of a light which followed a period of dark-adaptation. A third group of shrimp, which establish an avoidance curve similar to the controls, quickly lose its ability to avoid being shocked when exposed to mercury in the final days of the experiment. These experiments demonstrate the value of a simple behavioral index for establishing subacute toxicity standards for organisms in aquatic ecosystems. (Katz)
W77-11284

EFFECTS OF CRUDE OIL ON THE LOCOMOTORY ACTIVITY OF ARCTIC MARINE INVERTEBRATES,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
J. A. Percy, and T. C. Mullin.
Marine Pollution Bulletin, Vol. 8, No. 2, p 35-40, February 1977. 1 tab, 4 fig, 25 ref.

Descriptors: *Oil, *Water pollution effects, *Invertebrates, *Oil spills, *Amphipoda, *Movement, Laboratory tests, Arctic, Crustaceans, Aquatic animals, Toxicity.
Identifiers: Sublethal effects, *Onisimus, *Halitholus, *Crude oil, Locomotion, Locomotory activity, Coelenterate, Arctic invertebrates.

The effects of exposure to seawater dispersions of northern crude oils on the locomotory activity of two Arctic marine invertebrates, the amphipod Onisimus affinis and the coelenterate Halitholus cirratus have been examined. Low concentrations of the oils significantly impair activity in both species. Exposure to light dispersions of oil, containing 50 microliters oil per liter seawater for 24 hours reduced activity for both organisms by about 45%; exposure to a dispersion of 500 microliters per liter seawater resulted in activity depressions of 78 to 96% in Onisimus and 55% in Halitholus; exposure to 2000 microliters oil per liter seawater resulted in 98% and 100% reduction in activity, respectively. The manner in which oil interferes with locomotory activity is not known. (Katz)
W77-11285

THE EFFECT OF CHLORINE TOXICITY ON CERTAIN BLOOD PARAMETERS OF ADULT RAINBOW TROUT (SALMO GAIRDNERI),
Consumer Power Co., Jackson, Mich. Dept. of Environmental Services.
I. H. Zeitoun.
Environmental Biology of Fishes, Vol. 1, No. 2, p 189-195, 1977. 3 tab, 43 ref.

Descriptors: *Rainbow trout, *Bioassay, *Chlorine, *Fish physiology, *Mode of action, *Toxins, *Stress, Water pollution effects, Biochemistry, Pesticides, Trout, Laboratory tests, Environmental effects.
Identifiers: *Hematocrit, *Hemoglobin, Sublethal effects, Blood, Methemoglobin, *Hemolysis.

In order to assess the mode of chlorine action on rainbow trout (Salmo gaidneri), hematocrit percentage, and hemoglobin, methemoglobin, reduced glutathione, plasma protein, and plasma hemoglobin concentrations were determined in four tests in which duplicate groups were exposed to 3.86, 2.47, 2.75, and 1.09 mg/1 trace residual chlorine for 8, 19, 20, and 29 minutes, respectively. Blood from fish exposed to chlorine was darker and thicker than that of the control. Chlorine seemed to diffuse readily through the gills, oxidizing the hemoglobin to methemoglobin and disrupting the erythrocyte membranes, resulting in hemolysis. Stress polycythemia was also due to the substantial increase of the hematocrit value and hemoglobin concentration. Hemoconcentration led to a significant rise in the reduced glutathione and plasma protein concentrations. The hemoconcentration seemed to interfere with the blood circulation and hinder the delivery of oxygen to tissues. (Katz)
W77-11286

UPTAKE OF PLUTONIUM AND OTHER NUCLEAR WASTES BY PLANKTON,
Akademiya Nauk SSSR, Moscow. Institu Fizicheskoi Khimii.
V. V. Gromov.
Marine Science Communications, Vol. 2, No. and 4, p 227-247, 1976. 5 tab, 5 fig, 22 ref.

Descriptors: *Trace elements, *Path of pollutants *Plankton, *Nuclear wastes, *Radioactive waste *Radioisotopes, *Absorption, *Adsorptio *Kinetics, Reviews, Metals, Nuclear powerplant Water pollution sources, Phytoplankto Zooplankton, Cobalt, Iron.
Identifiers: *Plutonium, *Ruthenium, Technet um, Bioaccumulation.

The cycling of isotopes commonly discharged leaked into seawater as nuclear wastes discussed. Results of experiments partitioni such nuclides between organisms and seawate and the kinetics of uptake and release a discussed with particular reference to 239P 106Ru, and 99Tc by natural and single speci phytoplankton populations, and 137Cs by kri The physicochemical form of these elements frequently modified as a result of participation the biological cycles. It is suggested that su changes are in the direction of equilibrium in t environment. (Katz)
W77-11287

REPRODUCTIVE BIOLOGY OF RAINBO AND BROWN TROUT IN A GEOTHERMALL HEATED STREAM: THE FIREHOLE RIVER YELLOWSTONE NATIONAL PARK,
Montana State Univ., Bozeman. Dept. of Biolog
C. M. Kaya.
Transactions of the American Fisheries Socie Vol. 106, (4), 1977, p 354-361. 3 tab, 3 fig, 25 ref.

Descriptors: *Rainbow trout, *Brown trout, *F behavior, Fish physiology, Fish eggs, *F reproduction, Fish genetics, Fish populatio *Thermal pollution, Thermal springs, *Therm stress, Thermal wastes, *Geothermal studies.
Identifiers: Reproductive biology, Geotherma heated stream, Firehole River, Yellowstone N tional Park, Gonadal development, Reproduct success.

Geothermally heated waters discharged into Firehole River increase down-stream tempe tures by about 10.5C and affect the reproduct of the resident brown and rainbow trout. G and histological comparisons of gonadal devel ment and annual maturation cycles between t from an upstream, unheated station and a sta downstream in the warmest part of the river dicate that the two species respond differently the heating of the stream. Brown trout from unheated station reproduced well, with all ad examined having normally maturing gonads young of the year abundant in the area by e summer. However, those from the warm sta had poor reproductive success, with a low centage of adults having normally matu gonads, prespawning degeneration of ova in a females, and very few young of the year evide the area. Rainbow trout at the warm sta reproduced successfully and had changed them nual spawning time from the spring to the (Katz)

/77-11288

URVIVAL OF TWO SPECIES OF AMPHIPODS N AQUEOUS EXTRACTS OF PETROLEUM OILS,
exas Univ. at Austin, Port Aransas. Marine cience Inst.
. Y. Lee, M. F. Welch, and J. A. c. Nicol.
larine Pollution Bulletin, Vol. 8, No. 4, p 92-94, 977. 4 fig, 18 ref.

escriptors: *Toxicity, *Oil, *Amphipoda, Aqua[illegible] animals, *Bioassay, *Reproduction, Mortality, *Oily water, Crustaceans, Invertebrates, Laboratory tests, Oil wastes, Fuels.
dentifiers: *Crude oil, Survival, No. 2 fuel oil, outhern Louisiana crude.

queous extracts of two petroleum oils, No. 2 fuel il and Southern Louisiana crude, were tested on vo amphipods, Gammarus mucronatus and Amithoe valida, for survival. The oils were toxic at oncentrations of 0.8 ppm for fuel oil and 2.4 ppm or the Southern Louisiana crude. Mortalities increased with the concentration and length of expoure. Few or no young were produced at these and igher concentrations. Breeding adults rapidly ecreased in number. The amphipods were more ensitive to aqueous extracts of these oils than enthic polychaetes and shrimp, for which data re available. (Katz)
/77-11289

YDROLYTIC ACTIVATION AND DETOXICAION OF 2,4-DICHLORO-PHENOXYACETIC CID ESTERS IN MOSQUITOFISH,
lississippi Agricultural and Forestry Experiment tation, Mississippi State. Dept. of Entomology.
. Chambers, L. J. Dziuk, and J. Watkins.
esticide Biochemistry and Physiology, Vol. 7, p 97-300, 1977. 3 tab, 4 ref.

escriptors: *2,4-D, *Pesticides, *Biochemistry, Enzymes, *Inhibitors, *Toxicity, *Resistance, Fish physiology, *Adaptation, *Environmental ffects, Insecticides, Organic pesticides, hlorinated hydrocarbon pesticides, Water pollu-on effects.
dentifiers: *Mosquito fish, *DEF, *Sublethal ef-cts.

nsecticide-resistant mosquito fish (Gambusia affnis) were found to be slightly more tolerant of vo thiol esters of 2,4-dichlorophenoxyacetic acid ,4-D) than were fish of a susceptible population. EF (S,S,S,-tributyl phosphorotrithioate), at 0.1 pm for 24 hr, slightly decreased the toxicity of oth esters to both populations. Comparison of terase activities in gill and liver preparations owed that the resistant fish had lower levels of ver esterases than the susceptible fish, but results ill gill preparations were not consistent. With the hyl thiol ester, susceptible fish had the higher acvity, but with butyl thiol ester, resistant fish had e higher activity. DEF inhibited activities in both ssues of both populations, but inhibition was apreciably greater in the liver. Results suggest that ydrolysis in the liver activates 2,4-D esters, that ydrolysis in the gill is a detoxication rection, that e slight increase in tolerance in the insecticidesistant fish is primarily the result of decreased tivation, and that antagonism by DEF is the sult of a greater inhibition of activation than of toxication. (Katz)
/77-11290

HE ULTRASTRUCTURE OF THE CHORION F THE FATHEAD MINNOW, PIMEPHALES ROMELAS,
oyola Univ. of Chicago, Ill. Dept. of Biology.
. W. Manner, M. VanCura, and C. Muehleman.
ransactions of the American Fisheries Society, ol. 106, No. 1, 1977, p 110-114. 8 fig, 7 ref.

Descriptors: Freshwater fish, *Fish eggs, *Aquiculture, Fish farming, Methodology, *Microscopy, Laboratory tests, *Environmental effects, *Path of pollutants, Water pollution effects, Fish physiology, Aquiculture, *Fish reproduction.
Identifiers: Egg ultrastructure, *Chorion, Fathead minnow, Environmental agents, Light microscopy, Electron microscopy, Scanning electron microscopy, Embryogenesis, Environmental toxicity studies.

The teleost chorion serves as a natural barrier to environmental agents. In this investigation, the chrions of the fathead minnow, Pimephales promelas, were subjected to light microscopy, transmission electron microscopy, and scanning electron microscopy during different stages of embryogenesis. The chorion is composed of an outer layer of 22 lamellae, and inner, more electron-dense layer. During embryogenesis, there is a great increase in the thickness of the inner layer of the chorion, with a consequential decrease in the thickness of the outer 22 lamellae. The outside surface also changes during embrogenesis. It is suggested that the chorion be taken into consideration in environmental toxicity studies, and that the number of lamellae might be a way of classifying embryos. (Katz)
W77-11293

SEAWATER INHIBITION OF NITRITE TOXICITY TO CHINOOK SALMON,
California State Univ., Humboldt, Arcata. Dept. of Fisheries.
R. E. Crawford, and G. H. Allen.
Transactions of the American Fisheries Society, Vol. 106, No. 1, 1977, p 105-109. 2 fig, 22 ref.

Descriptors: *Chinook salmon, *Toxicity, *Nitrites, Seawater, *Bioassay, Freshwater, Juvenile fish, California, Sewage, Aquiculture, *Fish hatchery, *Mortality, Laboratory tests.
Identifiers: Relative toxicity, Hemoglobin, Methemoglobin, Percent methemoglobin, Calcium, Calcium free artificial seawater, Antagonistic ions, Humboldt bay, Nitrite toxicity, Toxicity reduction, Seawater inhibition.

The relative toxicity of nitrite to chinook salmon fingerlings (Oncorhynchus tshawytscha) in both freshwater (Ca++=32mg liter-1) and natural seawater (32.50/00Ca++=396mg liter-1) was measured by 48-h static bioassay. The percentage of hemoglobin oxidized to methemoglobin was also determined. In freshwater, the 48h median lethal nitrite concentration was 19 mg liter-1. In natural seawater, 1,070 mg liter-1 nitrite caused only 10% mortality in 48h. In freshwater with 27 mg NO2-liter-1, 44% methemoglobin occurred with 70% mortality. In natural saltwater with 815 mg NO2-liter-1, 74% methemoglobin occurred with 10% mortality. Adding calcium sulfate to the freshwater decreased the toxicity of nitrite but did not reduce methemoglobin. Nitrite in calcium-free artificial seawater (100 mg NO2- liter-1) was highly toxic but did not induce appreciable methemoglobinemia. Adding calcium to this medium decreased the acute toxicity of nitrite. (Katz)
W77-11294

RESPONSES OF A FRESHWATER SCULPIN (COTTUS COGNATUS GRACILIS) TO TEMPERATURE,
John Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
R. G. Otto, and J. O. Rice.
Transactions of the American Fisheries Society, Vol. 106, No. 1, 1977, p 89-94. 2 tab, 2 fig, 10 ref.

Descriptors: *Freshwater fish, *Fish behavior, Water temperature, *Thermal stress, Thermal water, Thermal pollution, *Fish physiology, Laboratory tests, Laboratory animals, Bioassays, Water pollution effects.
Identifiers: *Sculpins, Cottus cognatus, Temperature tolerance, Avoidance, Preference, Acclimation, Critical thermal maxima, Incipient upper lethal temperatures, Ultimate upper lethal temperature, *Avoidance temperature, Preferred temperature, Final preferendum.

Temperature tolerance, avoidance, and preference of a freshwater sculpin, Cottus cognatus gracilis, are described for fish acclimated to constant temperatures ranging from 5 to 20C. Critical thermal maxima varied from 23.5C for fish acclimated to 5C, to 29.4C for fish acclimated to 20C. Incipient upper lethal temperatures ranged from 18.5 to 23.5C. The ultimate upper lethal temperature was approximately 26.5C. Avoidance temperatures ranged from 15.2C at 5C to 21.5C at 15C. Preferred temperatures for 5C and 15C-acclimated fish were 9 and 12C respectively, and the final preferendum was about 10C. (Katz)
W77-11295

UPTAKE AND CLEARANCE OF PETROLEUM HYDROCARBON IN THE RINGED SEAL, PHOCA HISPIDA,
Ottawa Univ. (Ontario). Dept. of Biology.
F. R. Engelhardt, J. R. Geraci, and T. G. Smith.
Journal of the Fisheries Research Board of Canada, Vol 34, 1977, p 1143-1147. 1 tab, 2 fig, 26 ref.

Descriptors: *Oil, Oil spills, *Water pollution effects, *Mammals, Animal diseases, *Animal metabolism, Animal pathology, *Animal physiology, *Arctic, Arctic Ocean, Oil wastes, Oily water, On-site-investigations, Chemical analysis, Methodology, *Path of pollutants.
Identifiers: *Seals, Ringed seals, Hydrocarbon concentrations, Flourometry, Animal tissues, Blubber, Liver, Muscle.

Ringed seals, Phoca hispida, showed rapid absorption of hydrocarbons from Norman Wells crude oil into body tissues and fluids when exposed by both immersion and injestion. Relatively low but significant levels were found in tissue, blood, and plasma. Levels in bile and urine were high, indicating these to be routes of excretion. (Katz)
W77-11296

ACCUMULATION AND RETENTION OF DIETARY 14C-DDT BY ATLANTIC MENHADEN,
National Marine Fisheries Service, Beaufort, N.C.
S. M. Warlen, D. A. Wolfe, C. W. Lewis, and D. R. Colby.
Transactions of the American Fisheries Society, Vol. 106, No. 1, 1977, p 95-104. 3 tab, 3 fig, 17 ref.

Descriptors: DDT, Pesticides, *Insecticides, *Chlorinated hydrocarbon pesticides, *Commercial fish, Marine fish, Juvenile fish, *Fish diseases, Fish physiology, Fish sterilants, Water pollution effects, Path of pollutants, Biochemistry, *Diets, *Mathematical model.
Identifiers: *Menhaden, 14C-DDT, Dietary DDT, DDT uptake, Biological half-life, Growth rate, DDT accumulation, DDT retention, Atlantic menhaden.

The accumulation and retention of dietary 14C-DDT by young-of-the-year menhaden, and the effect of 14C-DDT exposure on growth of menhaden were studied. A simple mathematical model was developed to predict DDT flux in a natural menhaden population. Uptake of 14C-DDT was dose dependent and a function of exposure time. Prediction equations summarize the 14C-DDT uptake by menhaden for each of three exposure levels. Menhaden assimilated and retained 17 to 27 percent of the cumulative dosages of 14C-DDT. The biological half-life of 14C-DDT in menhaden was estimated to be 428, 64, and 137 days, respectively, for the low (0.58 ppb), medium (9.0 ppb), and high (93 ppb) dose groups. Exposure to dietary 14C-DDT at these concentrations did not produce

any effect on growth of menhaden nor did starvation significantly affect their retention of 14C-DDT. (Katz)
W77-11297

CHLORINE TOXICITY TO EGGS AND LARVAE OF FIVE CHESAPEAKE BAY FISHES,
Maryland Univ., Solomons. Chesapeake Biological Lab.
R. P. Morgan, II, and R. D. Prince.
Transactions of the American Fisheries Society, Vol. 106(4), 1977, p 380-385. 1 tab, 1 fig, 13 ref.

Descriptors: *Chesapeake Bay, Maryland, *Chlorine, *Toxicity, Bioassay, Laboratory tests, *Fish eggs, *Juvenile fish, *Striped bass, Perches, Herrings, Silversides, Larvae, Larval growth stages, Estuarine fishes, White perch.
Identifiers: Morone americana, Morone saxatilis, Blueback herring, Alosa aestivilis, Atlantic silversides, Menidia menidia, Age-related effects, Abnormal larvae.

Eggs and larvae of white perch (Morone americana), striped bass (Morone saxatilis), and blueback herring (Alosa aestivalis) and eggs of Atlantic silversides (Menidia menidia) and tidewater silversides (M. beryllina) were exposed to various residual chlorine levels for preestablished periods. Almost all LC50 values fell between 0.20 to 0.40 ppm of total residual chlorine for eggs, and between 0.20 to 0.32 ppm for larvae. Age-related effects in sensitivity to chlorine were observed. Abnormal larvae issued from blueback herring eggs exposed to low chlorine concentrations. (Katz)
W77-11299

NATURAL VARIABILITY IN DISTRIBUTION OF AN INTERTIDAL POPULATION OF MACOMA BALTHICA SUBJECT TO POTENTIAL OIL POLLUTION AT PORT VALDEZ, ALASKA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.
For primary bibliographic entry see Field 5B.
W77-11301

EFFECT OF LINDANE ON THE SURVIVAL TIME OF FRY OF MAKROPODUS OPERCULARIS,
Odessa State Univ. (USSR).
F. S. Zambriborshch, and B. Lay.
Hydrobiological Journal, 12(1), 1976, p 100-102. 2 tab, 9 ref. (Translation from Russian).

Descriptors: Pesticides, *Insecticides, *Chlorinated hydrocarbon pesticides, *Warmwater fish, Bioassay, *Toxicity, Laboratory tests, *Juvenile fish, Methodology, Statistical methods.
Identifiers: *Lindane, Gamma isomer, Makropodus opercularis, Southeastern Asia, Survival time, Statistical analysis.

The effect of low concentrations of lindane on the survival time of fry of Makropodus opercularis fingerlings was studied. The toxicity of lindane to fingerlings was observed at concentrations of 0.005 mg/liter of the gamma isomer. (Katz)
W77-11302

EXTRACTION OF IRON FROM WATER BY CHLORELLA VULGARIS AND SCENEDESMUS QUADRICAUDA,
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
V. M. Bagnyuk, T. L. Olynik, N. R. Lvovskaya, and L. O. Eynor.
Hydrobiological Journal, Vol. 12, (1), 1976, p 35-42. 3 tab, 5 fig, 21 ref. (Translation from Russian).

Descriptors: *Algae, *Iron, Metals, Water quality, Laboratory tests, Methodology, *Chlorella, *Scenedesmus, Chemical analysis, Plant growth, Plant physiology, Plant tissues, *Biochemistry, Hydrogen ion concentration, Waste treatment.
Identifiers: Iron ions, Redox potential, Iron concentration, Ferrous sulfate, Iron concentration dynamics.

Studies of interaction of iron ions of different concentrations with pure cultures of above algae showed that they quickly remove this element from water by direct cell uptake and by precipitating it as hydroxide. The latter process involves alteration of the redox potential and pH of the medium by these strains. Non-hemin forms of ion constitute 80 to 90% of iron concentrated in the algal cells. (Katz)
W77-11303

DEPRESSION OF PRIMARY PRODUCTIVITY BY AROCLOR 1232 IN AN INTERSPECIFIC LENTIC ALGAL ASSEMBLEDGE,
Wheaton Coll., Norton, Mass.
J. C. Kricher, and C. L. Bayer.
Bulletin of Environmental Contamination and Toxicology, Vol. 18(1), p 14-17, 1977. 2 tab, 1 fig, 5 ref.

Descriptors: *Aroclor, *Polychlorinated biphenyls, *Algae, *Primary productivity, Bioassays, Laboratory tests, Plant physiology, Plant populations, Methodology, *Scenedesmus, Stress
Identifiers: Aroclor 1232, Acetone, Lentic algae, Staurastrum, Pediastrum, Asterionella, Fragilaria.

In a laboratory test, Aroclor 1232 treated samples of algae displayed a lower rate of carbon fixation than the untreated control samples. Acetone treated control samples displayed a slightly reduced rate of carbon fixation compared with the controls. (Katz)
W77-11304

TOXICITY OF PYRETHOIDS TO JUVENILE ATLANTIC SALMON,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
V. Zitko, W. G. Carson, and C. D. Metcalfe.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 1, 1977, p 35-41. 4 tab, 1 fig, 9 ref.

Descriptors: Freshwater fish, Water pollution effects, *Bioassay, Methodology, Laboratory tests, *Fish toxins, Mortalities, Atlantic salmon, *Juvenile fish, Fish physiology, Animal pathology.
Identifiers: *Pyrethrin, *Pyrethroids, *Permethrin, *Allethrin, 3-Phenoxybenzyl alcohol, *Cyclopropane carboxylic acid, Lethality tests, Lethal thresholds, Partition coefficients.

Laboratory bioassays with juvenile Atlantic salmon indicated that permethrin is extremely toxic. It is more persistent than pyrethrins and allethrins. (Katz)
W77-11305

THE EFFECTS OF PESTICIDES, POLYCHLORINATED BIPHENYLS AND METALS ON THE GROWTH AND REPRODUCTION OF ACANTHAMOEBA CASTELLANII,
Augustana Coll., Sioux Falls, S. Dak. Dept. of Biology.
L. M. Prescott, M. K. Kubovec, and D. Tryggestad.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 1, 1977, p 29-31. 2 tab, 14 ref.

Descriptors: *Copper, *Zinc, *Lead, *Mercury, Metals, *Toxicity, Bioassay, Microorganisms, *Protozoa, Arochlor, *Polychlorinated biphenyls, *Aldrin, *Dieldrin, Pesticides, Insecticides, Carbamate pesticides, Herbicides, Animal growth, Reproduction, Chlorinated hydrocarbon pesticides.
Identifiers: Linuron, Stam F-34, IPC, Sevin, Atrazine, Simazine, Arochlor 1254, Copper sulfate, Zinc sulfate, Lead nitrate, *Acanthamoeba.

Laboratory tests on the tolerance of the soil and water benthic to pesticides, herbicides, polychlorinated biphenyls were conducted. The pesticides were dieldrin, aldrin, Atrazine, Simazine, linuron, Stam F-34, IPC. and Sevin. The metals were copper, ion, zinc ion, lead ions, and HgCl2. (Katz)
W77-11306

THE EFFECTS OF ESSO COREXIT 9527 ON THE FERTILIZING CAPACITY OF SPERMATOZOA,
Tromsoe Univ. (Norway). Inst. of Biology and Geology.
B. E. Hagstrom, and S. Lonning.
Marine Pollution Bulletin, Vol. 8, No. 5, p 136-138. 2 tab, 8 ref, June, 1977.

Descriptors: Oil, *Oil pollution, Oily water, *Water pollution effects, Bioassay, Toxicity, Laboratory tests, Waste disposal, Waste treatment, *Invertebrates, *Marine animals, *Benthos, Animal physiology, Freshwater fish, Dispersion.
Identifiers: Oil dispersant, *Esso Corexit 9527, *Sea urchin spermatozoa, Paracentrotus lividus, Zebra fish, Sea urchin eggs, Sea urchin sperm, Sea urchin embryos.

The water-soluble oil dispersant Esso Corexit 9527 has earlier been found to interfere, even in low concentrations, with fertilization and development. Further studies of the effect on sea urchin spermatozoa demonstrate that Corexit 9527 gives negative biological effects in concentrations down to 0.0003 ppm. (Katz)
W77-11307

EFFECTS OF CHLORINE ON THE COPEPOD ACARTIA TONSA,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. R. Heinle, and M. S. Beaven.
Chesapeake Science, Vol. 18, No. 1, 1977, p 140. 1 fig, 5 ref.

Descriptors: *Chlorine, *Chlorination, *Bioassay, Toxicity, Mortalities, *Zooplankton, *Copepods, Water pollution effects, Juvenile growth stage, Marine animals.
Identifiers: *Acartia tonsa, LC50.

Comparison of the available published and unpublished results for adults of Acartia tonsa suggest that the relationship between log LC 50 and log time to 50% mortality are linearly related despite considerable variation in methods. (Katz)
W77-11308

FORMALIN: ITS TOXICITY TO NONTARGET AQUATIC ORGANISMS, PERSISTENCE, AND COUNTERACTION,
Fish and Wildlife Service, La Crosse, Wis. Fish Control Lab.
T. D. Bills, L. L. Marking, and J. H. Chandler, Jr.
Investigations in Fish Control, No. 73, U.S. Dept. of the Interior, Wash. D.C., 1977, p 1-7. 8 tab, 1 ref.

Descriptors: *Freshwater fish, *Aquatic insects, Invertebrates, Aquatic life, Fish diseases, Aquiculture, Fish hatchery, Benthos, *Chinook salmon, Rainbow trout, *Atlantic salmon, *Lake trout, *Bullheads, *Channel catfish, Shrimp, Clams, Bioassay, Toxicity.
Identifiers: *Formalin, *Formaldehyde, Persistence.

The acute toxicity of formalin to selected fish and aquatic invertebrates was determined in standardized laboratory tests. Fish species exposed were chinook salmon, rainbow trout, Atlantic salmon, lake trout, black bullhead, channel catfish, green sunfish, bluegill, smallmouth bass, and largemouth bass. Invertebrates exposed were fresh water prawn, seed shrimp, Asiatic clam, snail, a

ackswimmer. Black bullhead and channel catfish ere the fish most sensitive to formalin (96-h C50's, 62.1 and 65.8 micro-l/1), and Atlantic sal- on and green sunfish were the most resistant (96- LC50 for each, 173 micro-l/1). The TILC50 ethal concentration producing 50% mortality in- ependent of time) for formalin against rainbow out was 72.0 micro-l/1. Seed shrimp were the ost sensitive invertebrates (96-h LC50, 1.05 icro-l/1), and backswimmers were the most re- stant (96-h LC50, 835 micro-l/1). The toxicity of rmalin was unchanged in solutions aged as long 3 weeks; the biological half-life could not be etermined. Formalin was not detoxified by oxida- on or reduction, and filtration through activated rbon did not significantly reduce toxicity. (Katz) 77-11309

HLORINE: ITS TOXICITY TO FISH AND ETOXIFICATION OF ANTIMYCIN,
ish and Wildlife Service, La Crosse, Wis. Fish ontrol Lab.
. L. Marking, and T. D. Bills.
vestigations in Fish Control, No. 74, U.S. Dept. the Interior, Wash. D.C., 1977. p 1-5. 4 tab, 1 g, 17 ref.

escriptors: *Chlorine, Chlorination, Freshwater sh, *Channel catfish, *Bullheads, *Toxicity, ortality, Laboratory tests, Hydrogen ion con- ntration, *Pesticides, Water temperature, aboratory animals, *Rainbow trout, *Salmon, Lake trout, *Carp, Sunfish, *Yellow perch, Fish ontrol agents, Suckers.
entifiers: *Detoxification, *Antimycin, 96-h C50's.

he 96-h LC50's for chlorine ranged from 0.156 g/l for channel catfish (Ictalurus punctatus) to 41 mg/l for black bullheads (I. melas) in stan- rdized laboratory tests. The toxicity of chlorine as influenced little by pH, temperature, or water rdness. Chlorine at 0.25 and 0.5 mg/l effectively toxified antimycin. The half-life of biological ac- vity for antimycin with chlorine ranged from 1.1 at 6.5 pH, to 1.5 h at pH 9.5. Chlorine readily toxified antimycin at pH 6.5, 7.5, and 8.5, but t at pH 9.5. (Katz)
77-11310

ALACHITE GREEN: ITS TOXICITY TO QUATIC ORGANISMS, PERSISTENCE AND EMOVAL WITH ACTIVATED CARBON,
sh and Wildlife Service, La Crosse, Wis. Fish ontrol Lab.
D. Bills, L. L. Marking, and J. H. Chandler.
vestigations in Fish Control, No. 75, U.S. Dept. the Interior, Wash. D.C., 1977, p 1-6. 5 tab, 15 .

scriptors: *Fish diseases, Fish hatcheries, Fish ming, *Agriculture, Toxicity, Bioassay, Mor- ity, Freshwater fish, *Chinook salmon, tlantic salmon, *Brown trout, *Rainbow trout, rook trout, *Channel catfish, *Bass, Sunfish, ails, Aquatic insects, Amphibians, Frogs, ads, Activated carbon.
ntifiers: *Malachite green, Lethal concentra- n, LC50.

e acute toxicity of malachite green was deter- ned in standardized laboratory tests for chinook mon, coho salmon, Atlantic salmon, brown ut, rainbow trout, brook trout, channel catfish, gemouth bass, smallmouth bass, bluegill, snails, atic clams, ostracods, freshwater prawns, lar- midges, naiads of mayflies, adult newts, larval pard frogs, and larval toads. Bluegills were the st sensitive (96-h LC50, 0.0305 mg/l), and coho mon the most resistant (0.383 mg/l). The C50 (lethal concentration producing 50% mor- ty independent of time) for rainbow trout was 98 mg/l. The responses of frog and toad larvae h LC50, 0.173 and 0.0680 mg/l) were similar to se of fish, whereas adult newts were more re- ant (1.03 mg/l). The invertebrates exposed were generally more resistant than the fish and amphibians; the 96-h LC50's ranged from 0.510 to 3.45 mg/l, except for the Asiatic clam, which was extremely resistant (122 mg/l), and the mayfly naiad, which was very sensitive (0.0790 mg/l). The toxicity of malachite green to fish was not affected by water hardness or pH, except bluegills, in which toxicity was about half as great at pH 6.5 as at pH 7.5 to 9.5, and was increased only slightly by increases in water temperature. (Katz)
W77-11311

TOXICITY OF FURANACE TO FISH, AQUATIC INVERTEBRATES, AND FROG EGGS AND LARVAE,
Fish and Wildlife Service, La Crosse, Wis. Fish Control Lab.
L. L. Marking, T. D. Bills, and J. H. Chandler, Jr.
Investigations in Fish Control, No. 76, U.S. Dept. of the Interior, Wash. D.C., 1977, p 1-6. 7 tab, 11 ref.

Descriptors: *Fish, *Frogs, Invertebrates, *Rainbow trout, *Channel catfish, *Green sunfish, Hydrogen ion concentration, *Bioassays, Toxicity, Mortality, *Fish diseases, Laboratory tests, Juvenile growth stages, Aquiculture.
Identifiers: *Furanace, Nitrofuran, *Frog eggs, *Frog larvae, LC50, *Leopard frog, *Green sunfish.

Furanace, a nitrofuran originally designated as furpirinol, nifurpirinol, is effective against certain bacterial infections in fish, especially myxobacteriosis. The toxicity of furanace to fish, frog eggs and larvae, and aquatic invertebrates was determined in standardized laboratory toxicity tests and in use pattern exposures. Additional tests were conducted in aged solutions of furanace to determine the persistence in water. Furanace was not toxic to any test species in use pattern exposures of 1 mg/l for 1 h daily for up to three treatments. In 96-h exposures, LC50's ranged from 0.820 to 3.00 mg/l for six species of fish and from 1.13 to 20 mg/l for six species of invertebrates, and was 0.770 mg/l for larvae of the leopard frog. Toxicity increased with elevated temperatures in tests with rainbow trout, channel catfish, and green sunfish. Increased water hardness and pH decreased toxicity to rainbow trout, but did not influence toxicity to channel catfish and green sunfish. (Katz)
W77-11312

EFFICACY OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM), 2', 5-DICHLORO-4'-NITROSALICYLANILIDE (BAYER 73), AND A 98:2 MIXTURE AS LAMPRICIDES IN LABORATORY STUDIES,
Fish and Wildlife Service, La Crosse, Wis. Fish Control Lab.
V. K. Dawson, K. B. Cumming, and P. A. Gilderhus.
Investigations in Fish Control, No. 77, U.S. Dept. of the Interior, Wash. D.C., 1977, p 1-11. 3 tab, 30 ref.

Descriptors: *Toxicity, Bioassay, Mortality, Laboratory effects, *Lampreys, Water temperature, Water quality, Water pollution effects, *Hydrogen ion concentrations, Hardness(Water), *Fish control agents, Fish management, Juvenile fish.
Identifiers: *TFM, *Bayer 73, *Lampricides, Free-swimming stages, *Sea lamprey, Petrozymon marinus, Burrowed sea lampreys, Nontarget organisms, *Molluscicides.

The lampricidal effects of 3-trifluoromethyl-4-nitrophenol (TFM), 2'5-dichloro-4'-nitrosalicylanilide (Bayer 73), and a 98:2 mixture of the two (TFM:2B) were tested against larvae of the sea lamprey (Petromyzon marinus) under controlled laboratory conditions. The lampricides were tested in water at temperatures of 7, 12, and 17 C; total hardnesses of 44, 170, and 300 mg/l as CaCO3; and pH's of 6.5, 7.5, and 8.5. Temperature had little influence on the toxicity of the lampricides, but the effect of Bayer 73 was slowed in cold water. Water hardness did not significantly influence the activity of the 98:2 mixture. The toxicities of TFM, Bayer 73, and TFM:2B were significantly reduced in water of high pH. Burrowed sea lamprey larvae were less vulnerable to TFM, Bayer 73, and TFM:2B than were free-swimming larvae. TFM and TFM:2B were selective for free-swimming lampreys over the nontarget organisms used for comparison, but the margin of safety for nontarget organisms over burrowed sea lampreys was narrow. (Katz)
W77-11313

TOXICITY OF THE MOLLUSCICIDE BAYER 73 AND RESIDUE DYNAMICS OF BAYER 2353 IN AQUATIC INVERTEBRATES,
Fish and Wildlife Service, Columbia, Mo. Fish-Pesticide Research Lab.
H. O. Sanders.
Investigations in Fish Control, No. 78, U.S. Dept. of the Interior, 1977, p 1-7. 5 tab, 30 ref.

Descriptors: *Toxicity, Bioassay, Mortality, *Pesticide, Laboratory tests, *Lampreys, *Aquatic insects, *Crustaceans, Daphnids, Shrimp, Crayfish, Benthos, Juvenile growth stage, Methodology.
Identifiers: *Molluscicide, *Bayer 73, *TFM, *Sea lamprey, Petrozymon marinus, Aquatic sowbugs, Scuds, Gammarus, Glass shrimp, Midge larvae, Residue dynamics.

The molluscicide Bayer 73, a chemical used as a synergist in conjunction with 3-trifluoromethyl-4-nitrophenol (TFM) to control the sea lamprey in tributaries of the Great Lakes, was tested against five species of crustaceans and two species of aquatic insects: daphnids, aquatic sowbugs, scuds, glass shrimp, crayfish, damselfly nymphs, and midge larvae. The acute toxicities ranged rom a 48-h EC50 (median effective concentration causing immobilization) of 0.2 mg/l for daphnids to a 48-h LC50 (concentration causing 50% mortality) of 25 mg/l for crayfish. In daphnids exposed continuously to Bayer 73, reproduction was not impaired at concentrations of 0.018 and 0.032 mg/l, but was significantly (P less than 0.01) reduced at concentrations of 0.056, 0.10, and 0.18 mg/l. Exposure to Bayer concentrations of 0.56, 1.0, and 1.8 mg/l significantly (P less than 0.01) reduced emergency of midges. All organisms exposed to Bayer 2353 (chlorosalicylic acid ring UL 14C) accumulated radioactive residues in 24h that ranged from 4 to 80 times (based on wet weight of whole organism) the water concentration of 1.2 plus or minus 0.2 microgram/l. Scuds and midge larvae eliminated 90% of the residues in 48h. (Katz)
W77-11314

ACCUMULATION, ELIMINATION, AND BIOTRANSFORMATION OF THE LAMPRICIDE 2',5-DICHLORO-4'-NITROSALICYLANILIDE BY CHIRONOMUS TENTANS,
Viterbo Coll., La Crosse, Wis. Dept. of Biology.
J. A. Kawatski, and A. E. Zittel.
Investigations in Fish Control, No. 79, U.S. Dept. of the Interior, 1977, p 1-8. 3 tab, 3 fig, 14 ref.

Descriptors: *Lampreys, *Aquatic insects, Bioassay, Biochemistry, *Animal physiology, Benthos, Pesticides, Water pollution effects, *Path of pollutants, Methodology, Laboratory tests, Radioactive techniques.
Identifiers: *Chironomus tentans, *Lampricide, Bayer 2353, *Accumulation, *Elimination, *Biotransformation, Sublethal concentration, 14C, Chironomids.

When exposed to sublethal concentrations of 14C-2',5-dichloro-4'-nitrosalicylanilide (Bayer 2353), either alone or in combination with 3-trifluoromethyl-4-nitrophenol (TFM), larvae of the midge Chironomus tentans accumulated 14C residue rapidly. Uptake was related directly to

amount of toxicant present in exposure water and to water hardness. Residues of 14C-Bayer 2353 did not attain a stable uptake equilibrium but were rapidly excreted, both during continuous exposure and during postexposure periods in toxicant free water. Chironomids biotransformed 14C-Bayer 2353 to 14C-chlorosalicylic acid and an unidentified 14C metabolite. (Katz)
W77-11315

TOXICOLOGY OF METALS - VOLUME I,
Permanent Commission and International Association of Occupational Health. Subcommittee on the Toxicology of Metals.
L. Friberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 991, Price codes: A12 in Paper copy A01 in microfiche. Environmental Protection Agency, Environmental Health Effects Research Series, Report EPA 600/1-76-018, March 1976. 269 p, 10 tab, 18 fig, 361 ref.

Descriptors: *Toxicity, Animal physiology, *Animal pathology, *Biochemistry, *Metals, *Cadmium, *Lead, *Mercury, *Water pollution effects, Water pollution sources, Absorption, Excretion, *Chromium, Selenium.
Identifiers: Homeostasis, *Toxic metals, *Dose-effects, Sodium chromate, Mercuric chloride, Potassium mercuric chloride, Methyl mercury.

This report consists of three main sections. The first (36p.) is the transcript of a panel discussion of a meeting of the Subcommittee on the Toxicology of Metals. It covers the general principles and mechanisms of absorption and excretion of all metals, but of heavy metals in particular. The second section, by a task group from the Subcommittee, consists of additional information on accumulation and retention of toxic metals, with special emphasis on absorption, excretion, and biological half-times, particularly of cadmium, lead, mercury. The third section (182p), a consensus report of a Subcommittee meeting, covers the dose-effects and dose-response relationships of toxic metals, specifically cadmium, lead, and mercury. The second and third sections contain information on critical organs, effects, and concentrations, as well as on models of retention and excretion and homeostatic mechanisms in general. (Katz)
W77-11316

PCBS IN THE UNITED STATES INDUSTRIAL USE AND ENVIRONMENTAL DISTRIBUTION, TASK I.
Vesar, Inc., Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-11317

EFFECTS OF CHLORINATED EFFLUENTS ON AQUATIC ECOSYSTEM IN THE LOWER JAMES RIVER,
Virginia State Water Control Board, Richmond.
M. A. Bellanca, and D. S. Bailey.
Journal Water Pollution Control Federation, Vol. 49, p 639-645, April 1977. 5 fig, 1 tab, 8 ref.

Descriptors: *Chlorine, *Fishkill, Mortality, *Virginia, *Chlorination, Oysters, Waste water treatment, *Toxicity, *Bioassay, Public health, Environmental effects, Freshwater fish, Water treatment, Disinfection, Water quality, Analytical techniques, On-site investigations, Commercial shellfish, Laboratory tests.
Identifiers: *James River(Va).

The effects of chlorinated wastewater effluents on aquatic life were studied after massive fish mortalities occurred in the lower James River during the spring of 1973. Through the utilization of field bioassays, live box experiments, and laboratory toxicity tests, it was determined that chlorine and chloramines were acutely toxic to a wide variety of estuarine animals. Toxicity symptoms noted for fish included the occurrence of severely dislocated and broken vertebrae. Studies were also conducted on the relationship of fecal coliform levels in the receiving stream and chlorination at wastewater treatment plants. It was found that chlorine dosage rates at the wastewater treatment plants could be reduced significantly without an adverse effect on bacterial levels in the estuarine system. (Katz)
W77-11318

KEPONE (TRADE NAME): CHRONIC EFFECTS ON EMBRYO, FRY, JUVENILE, AND ADULT SHEEPSHEAD MINNOWS (CYPRINODON VARIEGATUS),
Environmental Research Lab., Gulf Breeze, Fla.
D. J. Hansen, L. R. Goodman, and A. J. Wilson, Jr.
Chesapeake Science, Vol. 2, p 227-232, 1977. 2 tab, 4 fig, 17 ref.

Descriptors: *Insecticides, *Absorption, *Lethal limit, *Toxicity, *Minnows, Bioassay, *Juvenile fish, *Fry, *Embryonic growth stage, Pathology, Reproduction, *Mortality, Laboratory tests, Juvenile growth stage, Fish diseases, Fish behavior, Pesticides, Estuarine fisheries.
Identifiers: Bioaccumulation, Sublethal effects, *Kepone.

Adult sheepshead minnows exposed to Kepone for 28 days showed 95% survival when exposed to 0.05 microgram/liter, 100% survival at 0.16 microgram/liter, 20% survival at 1.9 microgram/l, and 0% survival at Kepone concentrations above 7.8 microgram/l. Concentration factors for adult fish ranged from 3,100 to 7,000 with an average of 5,200. Symptoms of poisoning included scoliosis, darkening of the posterior one-third of the body, hemorrhaging, edema, fin-rot, and cessation of feeding. Embryos from adult-fish which survived exposure to 1.9 microgram/l Kepone frequently developed abnormally and died when incubated in untreated water. Kepone in water was not as lethal to progeny as to adults: 36-day LC50 for juveniles was 6.7 micrograms/l; 28-day LC50 for adults was 1.3 microgram /l. Growth was reduced in juvenile fish exposed to 0.08 microgram/l of Kepone. Concentration factors in juvenile sheepshead minnows averaged 7,200 and increased from 3,600 to 20,000 as exposure concentrations decreased. (Katz)
W77-11319

ACUTE TOXICITY OF KEPONE TO FOUR ESTUARINE ANIMALS,
Environmental Research Lab., Gulf Breeze, Fla.
S. C. Schimmel, and A. J. Wilson, Jr.
Chesapeake Science, Vol 18, No 2, p 224-227, 1977. 2 tab, 8 ref.

Descriptors: *Absorption, *Insecticides, *Lethal limit, *Toxicity, Bioassay, *Estuaries, *Minnows, *Crabs, *Shrimp, *Mortality, *Fish, Laboratory tests, Invertebrates, Pesticides, Estuarine environment.
Identifiers: *Kepone, *Spot, *James River Estuary(Va), Bioconcentration.

Recent contamination of the James River estuary, Virginia, with Kepone prompted acute flow-through bioassays to determine the 96-hour toxicity of the insecticide to four estuarine species native to that ecosystem. The species and their 96-hour LC50 values were: grass shrimp (Palaemonetes pugio), 121 micrograms/liter; blue crab (Callinectes sapidus), greater than 210 microgram/liter; sheepshead minnow (Cyprinodon variegatus), 69.5 microgram/liter; and spot (Leiostomus xanthurus) 6.6 microgram/liter. Surviving animals were analyzed for Kepone. Average bio-concentration factors were: grass shrimp, 698; blue crab 8.1; sheepshead minnow 1,548; and spot, 1,221. (Katz)
W77-11320

ACUTE TOXICITY OF THE ACTELLIC BIO-CIDE TO FISH, (IN BOHEMIAN),
Vyzkummy Ustav Rybarsky a Hydrobiologicky, Vodnany (Czechoslovakia).
J. Huda, and Z. Svobodova.
Bulletin VURH Vodnany (Published by Fisheries Research Institute, Vodnany, Czechoslovakia) Vol 12(4) 1976, p 24-28, 4 tab, 1 fig, 2 ref.

Descriptors: *Pesticides, *Toxicity, *Bioassay, *Carp, *Rainbow trout, *Organophosphorou compounds, *Organophosphorous pesticides, Laboratory tests, Water pollution effects, Pathology, Fish behavior.
Identifiers: Guppies, Actellic, Priimphospmethyl, Acute toxicity tests.

The acute toxicity of the organophosphori preparation Actellic to fish (50% pirimipho methyl) was determined by the Acute Tocivit Test on Fish. In a time period of 48 hours, th LC50 of Actellic is 0.005 ml/1 for carp, 0.001 ml for rainbow trout, and 0.004 ml/1 for Poecil reticulata. The following values were establishe as minimum lethal concentrations (LC5) in the 4 hour period: 0.001 ml/1 for carp, 0.0005 ml/1 f rainbow trout, and 0.002 ml/1 for Poecilia retic lata. Acetellic is a chemical showing a high toxici to fish. The clinical and patho-anatomic picture intoxication was described with a characteris darkening of fish body surface in the stage of t beginning of non-coordinated movement. (Katz)
W77-11321

IDENTIFICATION OF AMMONIA AS TH TOXIC PRINCIPLE OF RED TIDE IN NO TILUCA MILARIS, (IN JAPANESE),
Kagawa Univ., Takamatsu (Japan). Faculty Agriculture.
For primary bibliographic entry see Field 5A.
W77-11323

THE PAPILLOMATOSIS OF THE EUROPE EEL (ANGUILLA ANGUILLA L.): ANALYS OF SEASONAL FLUCTUATIONS IN T TUMOR INCIDENCE,
Hamburg Univ. (West Germany). Institut f Hydrobiologie und Fischereiwissenschaft.
G. Peters.
Archiv fur Fischereiwissenschaft, Vol 27(3), 19 p 251-263, 1 tab, 8 fig, 8 ref.

Descriptors: *Fish diseases, *Eels, *Water te perature, Seasonal, On-site investigatio Laboratory tests, *Fish behavior, *Fish physio gy, Thermal water, Laboratory animals, Est ries, Epidemiology, Pathology.
Identifiers: European eels, Anguilla, *Tumo *Papillomatosis, Lower Elbe River.

The eels of the Lower Elbe River show a high cidence of epidermal papillomas mostly loca about the mouth area. In spring and autumn c paratively few fish are afflicted. Their tumors small In summer the rate of incidence reache maximum with a high average tumor size. E the color and morphology of the tumors v seasonally. This disease afflicts most strongly 15-25 cm in length. The size of papillomas in larger eels is very variable. Under experime conditions the growth of the tumors show definite temperature dependency: at 8 C gro stagnates or the tumors even shrink; at 15 and growth is rapid. When the eels are kept in g tanks at high temperatures, there is a ma decrease in the total volume of the papillo within a few weeks. (Katz)
W77-11324

STATEMENT ON APPROACHES TO T STUDY OF POLLUTION IN BENTHIC MA ENVIRONMENT, (IN ITALIAN),
Naples Zoological Station (Italy).
E. Fresi, L. Mazzella, and F. Cinelli.
Memorie di Biologica Marina e di Oceanogra n.s. Vol 6(4) 1976. p 135-140, 10 ref.

escriptors: *Water pollution effects, Methodology, *On-site investigation, Animal roupings, Animal population, Environmental ef-cts, *Statistical methods, *Statistical models, Bioindicators, Monitoring, Benthos, Marine nimals.
dentifiers: *Benthic marine environment, ynecological approach, Biocoenoses.

ommonest approaches to the study of the effects pollution in benthic marine environment are mpared. The synecological approach seems to preferred, as the biocoenoses, resulting from tions and interactions of all environmental rameters in a given time, contain the necessary formation to discriminate the effects of the pol-tion in a historical perspective. A research ethod ('pure gradients' method) is proposed, by nich, with the support of modern statistics and ectronic data elaboration, one can discriminate impact of the pollution and possibly create ological standards that may result in useful onitoring for pollution itself. (Katz)
7-11325

MMARY OF EXPERIMENTAL RESULTS: ONTROLLED ECOSYSTEM POLLUTION EX-RIMENTS,
idaway Inst. of Oceanography, Savannah, Ga.
W. Menzel.
lletin o Marine Science, 27(1), p 142-145, 1977. ref.

scriptors: On-site investigation, *Methodology, ioassays, *Zooplankton, *Phytoplankton, Pri-ry productivity, Water chemistry, *Copper, letals, *Oil, Oil pollution, *Water pollution, xicity, Mortality, Algae, Diatoms, Stress.

e first effects of pollutants in controlled system pollution environments appear to be versal. There is a short term response of bac-al populations which may be measured by nges in heterotrophic potential, oils and metals t impact phytoplankton by causing a rapid cline in most centrate diatoms. The sensitivity zooplankton to metals leading to mortality is a ct function of the size of the organism. The to which copper was removed from solution directly related to the level of primary produc-. (Katz)
7-11326

UTE TOXICITY OF WATER-BORNE METHYLNITROSAMINE (DMN) TO FUNDU-S HETEROCLITUS (L.),
vironmental Research Lab., Narragansett, R.I.
A. Ferraro, R. E. Wolke, and P. P. Yevich.
rnal of Fish Biology, Vol 10(3), p 203-209, 7. 2 tab, 17 ref, 6 plates.

criptors: Killifish, *Marine fish, *Toxicity, assay, Sea water, *Nitrogen compounds, imal pathology, Animal physiology, Fish dis-, Laboratory tests, Laboratory animals, lic health, Salinity.
ntifiers: Fundulus, *Carcinogens, nethylnitrosamine, Gross lesions, Gastroin-nal mucosa, DMN-induced pathology, opathological changes.

te (120h) toxicity of the water-borne car-gen, dimethylnitrosamine (DMN) to adult dulus heteroclitus (L.) at 20C and 20 plus or us 2% salinity in natural seawater was deter-ed. The LC-50 values were 8300 mg/l at 24 h, mg/l at 48 h, 4700 mg/l at 72 h, 3300 mg/l at 96 d 2700 mg/l at 120 h. Gross lesions consisted of oneal and cephalic ecchymoses. Microscopic ns included necrosis and sloughing of the gas-testinal mucosa, haemorrhage and necrosis of iver, and necrosis of taste buds, with severity ncidence being a function of DMN concentra-. Acute pathological effects of DMN on Fun-s heteroclitus conformed closely to those re-ed in other species exposed to this compound by respiratory, oral or parenteral route. DMN concentrations used in this experiment greatly exceeded those expected to be found under natural conditions, and this report is intended both to improve our understanding of DMN-induced pathology in marine fishes and to provide further evidence of the consistency of acute lesions induced by DMN, regardless of test organism or mode of exposure. (Katz)
W77-11327

EFFECT OF A PULP AND PAPER MILL EFFLUENT ON THE PRODUCTIVITY OF PERIPHYTON AND PHYTOPLANKTON,
Canada Centre for Inland Waters, Burlington (Ontario).
J. E. Moore, and R. J. Love.
Journal of the Fisheries Research Board of Canada, Vol 34, 1977. p 856-862, 4 tab, 4 fig, 10 ref.

Descriptors: Laboratory tests, Bioassay, Methodology, *Periphyton algae, *Phytoplankton, *Pulp wastes, *Pulp and paper industry, Industrial wastes, *Photosynthesis, Toxicity, Hydrogen ion concentration, Water pollution effects, *Productivity, Carbon cycle, *Lake Superior, Canada.
Identifiers: Cryptomonas, *Nipigon Bay(Ont), *Kraft mill effluents, *Dehydroabietic acid, *Oleic acid, *Quaiacol, Terpineol, Carbon uptake.

The short-term effect of a kraft mill effluent on the productivity of periphyton and phytoplankton in Nipigon Bay was examined. Addition of raw effluent at concentrations of 10-2 and higher consistently reduced photosynthesis of both periphyton and phytoplankton. Significant reductions were occasionally observed at effluent concentrations as low as 10-4. At high effluent concentrations pH change produced a major portion of the depression. Laboratory experiments with four compounds identified from the effluent showed dehydroabietic acid to be slightly toxic. (Katz)
W77-11328

RELATION BETWEEN NIPIGON BAY BENTHIC MACROINVERTEBRATES AND SELECTED ASPECTS OF THEIR HABITAT,
Ontario Ministry of the Environment, Thunder Bay.
J. VanderWal.
Journal of the Fisheries Research Board of Canada, Vol 34, 1977. p 824-829, 2 tab, 6 fig, 16 ref.

Descriptors: On-site investigation, *Pulp and paper industry, *Pulp wastes, Industrial effluents, Water pollution effects, Benthos, *Invertebrates, Animal populations, Biological communities, Carbon, *Sulphur, *Oligochaetes, Zooplankton, *Lake Superior, Canada.
Identifiers: *Nipigon Bay(Ont), *Organic carbon, *Pontoporeia.

In areas of Nipigon Bay unaffected by pulp and paper mill effluent, the benthic macroinvertebrate community was characterized by low standing stocks and high diversity. The coefficient of community and percentage similarity of community defined two major environments in Nipigon Bay, generally related to distance from the mill outfall. Near the pulp and paper mill outfall, further zonation of the benthic macroinvertebrate community was apparent. Inhibition and ultimate extinction of oligochaete populations appeared related to increasing levels of organic carbon and total sulphur, both associated with proximity to the outfall. Since a 10-yr period following abatement measures has not resulted in major responses by the macroinvertebrate community, recovery is expected to be slow. (Katz)
W77-11329

PESTICIDE LEVELS IN SERA OF MORIBUND CHANNEL CATFISH FROM A CONTINUOUS WINTER MORTALITY,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
J. A. Plumb, and R. W. Richburg.
Transactions of the American Fisheries Society Vol 106(2), p 185-188, 1977. 1 tab, 15 ref.

Descriptors: *Channel catfish, Freshwater fish, *Bullheads, *Endrin, *Chlorinated hydrocarbon pesticides, *Mortality, On-site investigations, Chemical analysis, Fishkill, *DDT, Fish diseases, Alabama.
Identifiers: *Toxaphene.

A continuous mortality of channel catfish (Ictalurus punctatus) and brown bullhead (I. nebulosus) in Alabama was investigated between September 1975 and March 1976. Sera of moribund catfish averaged 0.29 to 1.80 ug/g of endrin in 1.71 to 1.76 ug/g of toxaphene during three sampling periods. After cessation of mortality in March 1976, the sera of healthy catfish from affected ponds had less than 0.02 ug/g of endrin or 0.10 ug/g of toxaphene. Sera from two healthy populations of channel catfish taken from other waters during the study period had no detectable endrin or toxaphene. DDT and its derivatives were present in low concentrations in sera from moribund and control fish. (Katz)
W77-11330

THE EFFECTS OF POWER PEAKING ON THE SURVIVAL OF JUVENILE FISH AT LOW COLUMBIA AND SNAKE RIVER DAMS,
Washington Univ., Seattle. Coll. of Fisheries.
M. C. Bell, Z. E. Parkhurst, R. G. Porter, and M. Stevens.
U.S. Corps of Engineers, North Pacific Division (Contract No.) DACW 57-75-C-0173), April 1976. 35 p, 2 tab, 52 exhibits, 77 ref, append.

Descriptors: *Salmon, Hydroelectric power, Reservoirs, Hydroelectric plants, *Columbia River, *Dams, Fish migration, Juvenile fish, Power head, *Anadromous fish, Water temperature, Rainbow trout.
Identifiers: *Snake River, Lower Columbia River, *Power peaking.

Additional water storage on the Columbia and Snake Rivers will probably extend to the lower water temperature period and will reduce downstream travel time. Both underloading and underloading of hydroelectric units should be avoided during the critical passage times of the downstream migrants. The rate of change in the reservoirs is probably more important in survival of migrating hatchery fish than wild stocks as there is an indication that hatchery fish are more susceptible to stranding. During the critical period of release of hatchery fish, stabilization of the various levels of reservoirs would be desirable. (Katz)
W77-11331

ACUTE TEMPERATURE AND LOW DISSOLVED OXYGEN TOLERANCES OF BRACHYURAN CRAB (CANCER IRRORATUS) LARVAE,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
S. L. Vargo, and A. N. Sastry.
Marine Biology, Vol 40, p 165-177, 1977. 2 tab, 3 fig, 28 ref.

Descriptors: *Crabs, *Dissolved oxygen, *Water temperature, *Larval growth stage, Environmental effects, Larvae, *Lethal limit, Animal physiology, Crustaceans, Invertebrates, Water quality, Temperature, Resistance, Benthic fauna.

Tolerance limits to acute temperature, and temperature and low dissolved oxygen stresses were determined for 5 zoeal stages and megalops of

Cancer irroratus. The acute temperature limits for a 120 min exposure were all approximately 29.0C, with little interstage variation, while those for 240 min exposure ranged from 27.3 to 28.5C. More interstage variation was shown when temperature and low dissolved oxygen stress were combined, with low oxygen tolerance decreasing as temperature increased. The first, second, and fourth zoeal stages display similar patterns of response. The third and fifth stages show a similar response, but are different from the former stages. The megalops is relatively insensitive to changes in oxygen concentration with temperature. The larval stages did not show a progressive increase in tolerance to temperature or low dissolved oxygen with development. Tolerance to these factors may be related to size, stage of development and activity level. The larval stages have capacities to tolerate a wider range of these factors than they require in the natural environment. (Katz)
W77-11332

ACUTE TOXICITY OF OIL DISPERSANTS TO MARINE FISH LARVAE,
Aberdeen Univ. (Scotland). Dept. of Natural History.
K. W. Wilson.
Marine Biology, Vol 40, p 65-74, 1977. 2 tab, 8 fig, 33 ref.

Descriptors: *Larval growth stage, *Marine fish, Fish physiology, *Oil wastes, *Toxicity, Mortality, *Lethal limit, *Herrings, Water quality, *Salinity, *Water temperature, Mode of action, Oil spills, Path of pollutants.
Identifiers: Pilchard, Plaice, Sole, Haddock, *Oil dispersants

The acute toxicities of several oil dispersants to the larvae of haddock, herring, lemon sole, pilchard, plaice, and sole were examined, the type and aromatic content of the solvent being the main factors influencing the toxicity. Newer ('second generation') dispersants had much lower toxicities. Ageing of dispersant solutions led to a decrease in toxicity, which could be related to loss of aromatic compounds from solution. Temperature and salinity had only slight influence on toxicity For all disersants, differences of susceptibility between species were less than differences at different ages within a species. The larvae of all species showed a similar susceptibility when newly hatched, and susceptibility increased throughout the yolk-sac stage. The transition period from yolk reserves to an external food supply was most critical, for once larvae had established feeding, resistance increased until metamorphosis. THe dispersants appeared to act largely as physical toxins causing, initially at least, a reversible narcosis. The implications of the results are discussed in relation to the use of dispersants at sea. (Katz)
W77-11333

THE RED TIDES OF MALTA,
Harriet Costello School, Basingstoke (England).
H. Fudge.
Marine Biology, Vol 39, p 381-386, 1977. 2 tab, 5 fig, 7 ref.

Descriptors: *Red tide, *Eutrophication, Water quality, Public health, Environmental effects, *Water temperature, *Seasonal, *Marine algae, *Dinoflagellates, Water pollution sources, Diatom, Salinity, Phytoplankton, Domestic wastes.
Identifiers: *Malta.

A 5 year survey of Marsamxetto Harbour, Malta, was carried out to investigate some factors contributing to 'red tides' and to identify the causative organisms. 'Red tides' occurred usually in May but, less predictably, also during June - August. Causative organisms included the diatom Chaetoceros sp., and the dinoflagellate genera Prorocentrum, Peridinium, Ptychodiscus, Gonyaulax, Ceratium, and Cochlodinium. Early summer red tides occurred at a time of increasing insolation, and water temperature, prevailing onshore winds and salinities in the range o 34.4 to 36.6%. A consistent feature was a quick rise in sea temperature of more than 2C during the week preceding red water. Red tides later in the year coincided with higher temperatures and salinities and calm weather. (Katz)
W77-11334

COPPER GRANULES IN THE BARNACLE BALANUS BALANOIDES,
Natural Environment Research Council, Bangor (Wales). Marine Invertebrate Biology Unit.
G. Walker.
Marine Biology, Vol 39, p 343-349, 1977. 2 fig, 2 tab, 13 ref.

Descriptors: Animal physiology, *Heavy metals, *Water pollution effects, *Zinc, *Copper, *Metals, Analytical techniques, Biology, Invertebrates, Crustaceans, Electron microscopy, Chemical analysis, X-ray analysis.
Identifiers: Bioaccumulation, Parenchyma, *Barnacles.

Balanus balanoides collected from an area with high heavy-metal run-off contained two different types of granules within parenchyma cells of the prosoma. X-ray microprobe analysis shows one to be the familiar 'zinc' granule made up of concentric layers and giving major peaks for phosphorous and zinc, and the other to be homogeneous and giving peaks for sulphur and copper. This latter granule is designated the 'copper' granule. Various tests on 'copper' granules in sections and in a granule-rich pellet have shown that the copper is probably complexed with organic matter. The tests also demonstrated the relatively insoluble nature of these granules. Although 'zinc' and 'copper' granules were present together in the prosoma, atomic absorption analyses of whole bodies (prosoma and thorax) have shown the level of zinc (50.28 microgram/mg dry weight) to be much higher than that of copper (3.75 microgram/mg dry weight). (Katz)
W77-11335

ZINC-65 SPECIFIC ACTIVITIES IN THE MIGRATORY PACIFIC HAKE MERLUCCIUS PRODUCTS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W77-11336

LATHYRITIC CHANGES IN CARP CAUSED BY BETA-AMINOPROPIONITRILE AND D-PENICILLAMINE,
Kyoto Univ. (Japan). Dept. of Fisheries.
M. Sato, R. Yoshinaka, and S. Ikeda.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 43, No 3, p 349-355, 1977. 3 fig, 3 tab, 24 ref.

Descriptors: *Fish diseases, *Fish pathology, *Aquiculture, *Carp, *Bioassay, *Growth rates, *Mortality, *Mode of action, *Metabolism, Pathology, Analytical techniques, Laboratory tests, Fish farming, Aquiculture.
Identifiers: Lathyrism, Skeletal deformation, Penicillamine, Aminopropiomitrile.

Carp were fed diets containing either 0.3% beta-aminopropionitrile (beta-APN) or 0.3% D-penicillamine. On the 67th day of the feeding, skeletal deformity was identified in 25% of fish given beta-APN and 32% of those given D-penicillamine. X-ray examination of the abnormal fish showed severe spinal curvature at the region of the 12th to 16th vertebrae, separation and fracture of the vertebral column, deformation of the ribs, and fracture of the rib in its basal part. In addition, fish given these drugs exhibited hemorrhage in the fins, the skin, and the viscera, and fragility of the connective tissues. Carp, when injected intraperitoneally, with these drugs, also showed similar toxic symptoms. These experimental results indicated that beta-APN and D-penicillamine caused lathyritic changes in carp similar to those seen in rats and chicken. (Katz)
W77-11337

SURVIVAL OF COREGONUS PELED LARVAE IN DIFFERENT SALINITIES,
Siberian Research Inst. of the Fish Industry, Sverdlovsk (USSR). Ural Div.
N. E. Nesterenko.
Journal of Ichthyology, Vol 16(3), 1976. p 473-47
3 tab, 11 ref.

Descriptors: Freshwater fish, *Juvenile fish, *Larvae, Bioassay, *Salinity, *Aquiculture, Water quality, Methodology, Toxicity, Fish farming, Fish management.
Identifiers: *Pelyad, *Coregonus, USSR.

The results of experiments on the survival of 1, and 14 day old larvae of Coregonus peled in 2-12 salinity are given. It was established that a salinity of more than 8% is lethal to all larvae, independent of age. At a salinity of less than 8% larvae 24 hours old have the highest rate of survival. Practical recommendations are given on the use of saline waters for the rearing of pelyad. (Katz)
W77-11338

THE EFFECT OF SALINITY ON THE EARLY DEVELOPMENT STANZAS OF THE WALLEYE (LUCIOPERCA LUCIOPERCA),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
Ye Kh Zhmurova, and N. V. Somkina.
Journal of Ichthyology, Vol 16(3), 1976. p 511-51
2 tab, 7 ref.

Descriptors: Freshwater fish, *Walleye, *Juvenile fish, Bioassay, *Salinity, Fish hatches, *Aquiculture, *Water quality, *Fish physiology, Amino acids, Proteins, Lipids, Toxicity.
Identifiers: *Lucioperca, Early development, *Don River(USSR).

The rate of the daily weight increase of walleye was at the same level as in the control or higher in all variants of the experiment (salinity between 3.5 and 11%). The highest growth rate was observed in fingerlings kept in water at a salinity of 6%. The mean daily percentage mortality of the fish at salinities between 3.5 and 11% is lower in fresh water. At an age of 30 days (development stage E, mean weight 90 mg), juvenile walleye are most able to tolerate salinities between 3.5 and 10%. The best physiological and biochemical indicators were recorded in fingerlings kept in water at a salinity of 6%. This salinity is the optimum for walleye of this age. (Katz)
W77-11339

BLOOD PO2, PCO2, AND PH CHANGES IN BROOK TROUT (SALVELINUS FONTINALIS) EXPOSED TO SUBLETHAL LEVELS OF ACIDITY,
Pennsylvania State Univ., University Park. Dept. of Biology.
J. L. Dively, J. E. Mudge, W. H. Neff, and A. Anthony.
Comparative Biochemistry and Physiology, 57A, (1977), p 347-351, 1 tab, 6 fig, 20 ref.

Descriptors: *Brook trout, Freshwater fish, *Acidity, *Acid waters, Acids, *Toxicity, Seasonal, Fish diseases, *Fish behavior, *Animal physiology, *Animal pathology, Bioassay, Mortality, Lethal limit.
Identifiers: Sub-lethal effects, Hematology, Hematocrit, Rate of ventilation, *Hypoxemia, *Blood acidosis, Acid toxication, Alkalosis, Ocular indulation.

cute exposure of winter and summer collected rook trout, Salvelinus Fontinalis, to near toxic evel of acidity caused an elevation of PCO2, he- natocrit, and rate of ventilation. Other than a ansient drop in PO2 in June exposed fish, neither ypoxemia nor blood acidosis was evidenced. ummer exposed trout which showed severe ehavioral responses to acid toxication actually hibited a moderate alkalosis. (Katz)
77-11340

HE EFFECTS OF SEASON AND ACUTE SUB-ETHAL EXPOSURE ON SURVIVAL TIMES F BROOK TROUT AT LOW PH,
ennsylvania State Univ., University Park. Dept. Biology.
L. Falk, and W. A. Dunson.
ater Research Vol 11, 1977. p 13-15, 1 tab, 1 fig, ref.

escriptors: Freshwater fish, *Hydrogen ion con- ntration, *Toxicity, Bioassay, Mortality, boratory test, Fish behavior, *Seasonal, Stress, enetics, *Acidic water, Acid mine water, cidity, *Brook trout.
entifiers: Sub-lethal pH, Heritable differences, ored strains.

ook trout were exposed to sub-lethal pH's of 5.0 d 5.8 (H_2SO_4) for 24 h or less and the effect on rvival times at pH's 3.15 or 3.5 measured. nounced behavioral signs of distress occurred these sub-lethal pH's but usually disappeared hin 1 h of the initial exposure. No change in re- tance times due to the pre-treatment was ob- ved. A marked seasonal decline in survival es was obtained between December and ruary. Heritable differences in acid tolerance some inbred strains of brook trout were large. tz)
7-11341

NAMICS OF SOME TRACE ELEMENTS IN GANS AND TISSUES OF THE RUDD,
spiiskii Nauchno-Issledovatelskii Institut Ryb- o Khozyaistva, Astrakhan (USSR).
primary bibliographic entry see Field 5B.
7-11342

MATOLOGICAL CHANGES IN FIN- RLING CHANNEL CATFISH EXPOSED TO LACHITE GREEN,
urn Univ., Ala. Dept. of Fisheries and Allied acultures.
. Grizzle.
Progressive Fish Culturist, Vol 39, No 2, p 90- April 1977. 2 tab, 8 ref.

criptors: *Channel catfish, *Pesticides, ngicides, Aquiculture, *Fish parasites, Pest rol, Fish physiology, *Cytological studies, Ju- le fish, Laboratory tests, Analytical niques.
tifiers: *Malachite green, Sublethal effects, atological changes, Erythrocytes, Leuko- s.

erling channel catfish (Ictalurus punctatus) exposed to 0.1 mg/l malachite green in 40- aquariums (fasted fish) and 500-liter troughs fish). In both tests, neutrophilia at 1 and 3 after treatment was the most drastic he- logical change found. Other significant ges (P less than 0.05) in the test with fed fish increases in erythrocyte counts, hemoglobin ntrations, and hemoblast percentages 3 days treatment; erythrocytosis after 7 days; he- crit increase after 14 days; and leukopenia 21 days. No signficant differences were 28 days after exposure. (Katz)
11343

MICAL COMPOSITION AND EFFECTS OF ER EXTRACTS OF PETROLEUM ON EGGS OF THE SAND DOLLAR MELITTA QUINQUIESPERFORATA,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
J. A. C. Nicol, W. H. Donahue, R. T. Wang, and K. Winters.
Marine Biology, Vol 40, (1977). p 309-316. 5 tab, 3 fig, 16 ref.

Descriptors: *Oil pollution, *Oil spills, Bioassay, Toxicity, Mortality, Marine animals, *Benthos, Laboratory tests, Eggs, Larvae, *Larval growth stage, Water pollution effects.
Identifiers: *Echinoderms, *Sand dollars, Melitta, Sand dollar eggs, Sand dollar sperm, Kuwait crude oil, *No. 2 fuel oil, Water soluble extracts, Aromatic compounds.

Sperm and eggs of sand dollars, Melitta quinquiesperforata (Leska), were subjected to two petroleum oils, and effects determined. The oils chosen were Kuwait crude and No. 2 fuel oil, supplied by the American Petroleum Institute. Water-soluble extracts (WSF) from oil-sea water mixes were prepared and the major aromatic components in the WSF of the fuel oil were identified. WSF and No. 2 fuel oil depressed respiration, mobility of sperm, interfered with fertilization and cleavage, and retarded larval development. The effects were detectable at dilutions of 4% and less (about 0.6 ppm of WSF). Kuwait crude was much less toxic. There was no effect on water permeability of the egg membrane. Results are compared with similar studies on other marine organisms. (Katz)
W77-11345

RESPONSES OF ARCTIC MARINE BENTHIC CRUSTACEANS TO SEDIMENTS CONTAMINATED WITH CRUDE OIL,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
J. A. Percy.
Environmental Pollution, Vol 13 (1977). p 1-10, 5 tab, 17 ref.

Descriptors: *Arctic, *Oil spills, Sediments, *Benthos, *Crustaceans, Bioassay, Laboratory tests, Amphipods, *Animal behavior, Isopods, Weathering, Water pollution effects, Environmental effects, Oil pollution.
Identifiers: *Crude oils, Onisimus, Corophium, Mesidotea, Oil-polluted bottom sediments.

The responses of several arctic marine benthic crustaceans to sediments experimentally contaminated with crude oils have been examined. The amphipod Onisimus affinis overwhelmingly selected clean rather than oil-contaminated sediments. The response was most pronounced at low oil concentrations and the ability to discriminate was abolished at the highest concentrations tested. Weathering of the oiled sediment for 1 week reduced the avoidance response. Another amphipod and two isopod species tested did not discriminate consistently between oiled and clean sediments. Potential ecological consequences of these behavioral responses are discussed. (Katz)
W77-11346

LABORATORY TECHNIQUE FOR OBTAINING FATHEAD MINNOW EGGS FOR USE IN TOXICITY EXPERIMENTS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
J. E. Till.
The Progressive Fish Culturist Vol 39(1), p 24-27, 1977. 1 tab, 1 fig, 6 ref.

Descriptors: Methodology, Aquiculture, Minnow, *Bioassay, *Fish eggs, Laboratory animals, Laboratory equipment, Laboratory test, Fish hatchery, *Fish farming, *Toxicity, *Juvenile growth stage, Larval growth stage.
Identifiers: *Fathead minnow, *Fertilized eggs, Nesting sites, Abnormal larvae, Larval survival.

A laboratory technique for collecting freshly fertilized eggs of the fathead minnow (Pimephales promelas) has been developed for use in toxicity testing of radioactive materials or other environmental pollutants. The fathead minnow egg was selected as a test organism because the period of embryogenesis is relatively short, the number of eggs per spawning is sufficiently large to provide a test group and a conrol group, and the size of the parent fish is compatible with laboratory facilities. Under a controlled laboratory environment, eggs are available all year. Nesting sites were contructed by cutting plastic pipe in half and coverng the inside of the pipe with 1-mm thick translucent polyethylene. The polyethylene with the eggs attached was removed from the shelter and cut into two pieces, each piece containing approximately the same number of eggs. One piece of polyethylene was floated in the test solution, and the other in spring water as a control. Hatching occurs in 168 h at 24C. Toxicity of the test solution may be scored on the percentage of eggs hatching, the number of abnormal larvae produced, and larval survival. (Katz)
W77-11347

PROPORTIONS OF A YELLOW PERCH POPULATION SURFACING AFTER A ROTENONE TREATMENT,
Washington Univ., Seattle. Coll. of Fisheries.
N. W. Bartoo.
The Progressive Fish Culturist, Vol 39(1), 1977. 5 ref.

Descriptors: *Fishkill, *Yellow perch, Toxicity, On-site investigation, Lakes, Fish management, Freshwater fish, *Rotenone, *Fish toxins, Fish populations, Water temperature, Fish behavior.

A complete kill of yellow perch was probably obtained in a lake treated with rotenone. About 17.5% of the perch population surfaced within 96 hours after rotenone treatment. Eighty-seven percent of the fish that surfaced did so the 24 hours after treatment. (Katz)
W77-11348

FILTERING RATE PERFORMANCE OF DAPHNIA RETROCURVA IN PULP MILL EFFLUENT,
Canada Centre for Inland Waters, Burlington (Ontario).
J. M. Cooley.
Journal of the Fisheries Research Board of Canada, Vol 34, p 863-868, 1977. 2 tab, 5 fig, 5 ref.

Descriptors: *Zooplankton, *Daphnia, *Water pollution effects, Stress, Animal behavior, Methodology, Bioassay, Laboratory tests, *Pulp wastes, Pulp and paper industry, *Fish food organisms, Industrial wastes, *Feeding rates, Phytoplankton, *Scenedesmus, Lake Superior, *Crustaceans.
Identifiers: Filtering rates, Radioactive scenedesmus.

Laboratory experiments were carried out with radioactive Scenedesmus to determine the effect on filtering rate of Daphnia retrocurva of exposure to different dilutions of raw pulp mill effluent in lake water. Filtering rate decreased progressively as the exposure time in 5 and 10% effluent increased. Most animals seemed able to recover from brief exposures, but with increased time spent in effluent, larger proportions of the animals did not filter when the food was presented. (Katz)
W77-11349

EXTENT OF EFFLUENT INFLUENCE ON LAKE WATER DETERMINED BY BACTERIAL POPULATION DISTRIBUTIONS,
Ontario Ministry of the Environment, Rexdale. Lab Service Branch.
For primary bibliographic entry see Field 5B.
W77-11350

MORPHOLOGICAL ADAPTATIONS TO THERMAL STRESS IN A MARINE FISH, FUNDULUS HETEROCLITUS,
State Univ. of New York at Stony Brook. Dept. of Ecology and Evolution.
J. B. Mitton, and R. K. Koehn.
Biological Bulletin, Vol. 151, p 548-559, 1976. 4 fig, 5 tab, 22 ref.

Descriptors: Stress, *Thermal stress, Thermal water, *Thermal pollution, Thermal power plants, *Marine fish, On-site investigation, *Environmental effects, *Water pollution effects, Industrial water, Marine fish, *Adaptation.
Identifiers: Morphological adaptation, Fundulus heteroclitus, *Long Island Sound.

Populations of Fundulus heteroclitus (Cyprinodontidae), a coastal marine fish, were studied in control and artificially heated environments on the north shore of Long Island to determine patterns of variation in morphology and the extent to which this variation reflected adaptation to environmental characteristics. Fishes living in water artificially heated by a power plant exhibited marked divergence from control populations in head morphology, and convergence with a population sampled at more southern latitudes. Hence, these differences were interpreted as adaptations to warm environments. Greater morphological variation is detected at the heated locality than at control localities, and this may be partially due to a breakdown in developmental homeostasis, and partially due to selection favoring phenotypes that are rare in this environment. (Katz)
W77-11351

EFFECTS OF ENVIRONMENTAL FACTORS ON RADIOCADMIUM UPTAKE BY FOUR SPECIES OF MARINE BIVALVES,
Environmental Research Lab., Narragansett, R.I.
E. Jackim, G. Morrison, and R. Steele.
Marine Biology, Vol. 40 (1977). p 303-308, 4 tab, 3 fig, 9 ref.

Descriptors: *Metals, *Cadmium, Mollusks, Clams, Salinity, *Zinc, Water temperature, Sediments, *Mussels, Sea water, Bioassay, *Laboratory tests, Water pollution effects, *Path of pollutants, Environmental effects.
Identifiers: Radiocadmium, Marine bivalves, Static bioassay.

Temperature, salinity, bottom-sediment type, and zinc concentration all influenced Cd uptake by 4 marine bivalves (Mya arenaria, Mytilus edulis, Mulina lateralis and Nucula proxima) in short-term static assay systems using 109-Cd as a tracer. The water contained either 5 or 20 microgram/l Cd and tracer. Distribution and kinetics of the metal were monitored in the water column and organisms. The results demonstrate that Cd uptake rates differed widely among the organisms tested. An increase in temperature increased Cd uptake rate by all test organisms. A decrease in salinity increased Cd uptake by all organisms tested. The presence of bottom sediment depresses Cd accumulation in some benthic animals. Zinc in concentrations of 0.5 microgram/l substantially decreased Cd uptake by Mytilus edulis and Mulina lateralis. It is suggested that all important species and environmental variables be considered when studying heavy-metal uptake by marine organisms or when establishing water-quality criteria. (Katz)
W77-11352

COMPARATIVE COLD RESISTANCE OF THREE COLUMBIA RIVER ORGANISMS,
Battelle-Pacific Northwest Labs., Richland, Wash.
C. H. Becker, R. G. Genoway, and M. J. Schneider.
Transactions of the American Fisheries Society, Vol. 106(2), p 178-184, 1977. 1 tab, 1 fig, 21 ref.

Descriptors: *Sunfish, *Rainbow trout, *Crayfish, Methodology, Bioassay, Laboratory tests, Water temperature, *Cold resistance, Fish behavior, *Columbia River, Freshwater fish, Crustaceans, *Thermal stress.
Identifiers: Pumpkinseed sunfish, Lepomis, Pacifastacus, *Cold shock, Loss of equilibrium.

Resistance to abrupt and gradual cold shock was determined in bioassays with pumpkinseed (Lepomis gibbosus), rainbow trout (Salmo gairdneri) and a northwestern crayfish (Pacifastacus leniusculus) acclimated to higher temperatures at 5 C increments. Test criteria were median tolerance limits (TLm) for 96-h exposures after abrupt cold shock, and 50% loss of equilibrium (LE50) for decline rates of 18, 15, 10, 5 and 1 C/h during gradual cold shock. Cold resistance depended on original acclimation temperature (AT) and varied among species under both test conditions in the order: pumpkinseed < rainbow trout < crayfish. The lower TLm limit for pumpkinseed was 12.3 C at 30 C AT, 9.6 C at 25 C AT, 4.5 C at 20 C AT, and 2.7 C at 15 C AT. Rainbow trout at 20, 15 and 10 C AT survived abrupt exposures to cold down to 3.3, 1.4 and 0.5 C, respectively. Crayfish at 25, 20 and 15 C AT survived exposures down to 2.5, 0.4 and 0.0 C, respectively. TLm values were slightly above LE50 values for both fish species but well below for crayfish. Partial adaptation significantly lowered LE values at decline rates below 18 C/h for pumpkinseed, and to a lesser extent for the other two species, thus extending the lower margin of cold resistance. (Katz)
W77-11353

EFFECTS OF DIETARY FENITROTHION ON GROWTH AND HIERARCHICAL POSITION OF BROOK TROUT,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
The Progressive Fish Culturist 39(1), p 3-9, 1977. 3 fig, 6 tab, 13 ref.

Descriptors: *Organophosphorous compounds, *Organophosphorous pesticides, Brook trout, Fish behavior, Bioassay, *Fish food organisms, *Growth rates, Methodology, Aquiculture, Fish physiology, Fish diets.
Identifiers: *Fenitrothion.

At a dietary level of 10 mg/kg of wet food (=11.5 mg/kg dry food) the organophosphorothionate insecticide, fenitrothion, does not affect growth or dominance patterns of brook trout (Salvelinus fontinalis) at dry ration levels up to 4.45% of body dry weight per day. The method devised for this study allows the individual ration per fish per day to be determined for small groups of up to 20 fish per tank. The method is useful in fish toxicology, where effects of exposure to dietary contaminants must be determined; for testing individual growth and food conversion efficiency; and in determining behavioral dominance patterns. (Katz)
W77-11354

ORGANIC CONTAMINANT RESIDUES IN FISHES FROM NIPIGON BAY, LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
K. L. E. Kaiser.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 850-855, 1977. 1 tab, 2 fig, 18 ref.

Descriptors: Water pollution effects, *Pulp wastes, Pulp and paper industry, Industrial wastes, *Lake Superior, Freshwater fish, Suckers, *Polychlorinated biphenyls, *DDE, *Chemical analysis, Chromatography, Freshwater fish, Perches, Canada.
Identifiers: *Organic contaminants, *Tetrachlorobenzene, *Trichlorobenzene, Longnose sucker, *Dehydroabietic acid, *Hexachlorobenzene, *Nipigon Bay(Ont).

Three species of fish, caught at various distances from a kraft pulp and paper mill effluent discharge in Nipigon Bay, were analyzed for organic contaminants. Fishes from all sites contained residues of polychlorinated biphenyls and DDE. Most samples were also contaminated with hexachlorobenzene and several samples contained phthalic acid esters. From sampling sites close to the mill discharge, dehydroabietic acid was observed in one extract of each of the three fish species investigated. Two isomers of tetrachlorobenzene and one trichlorobenzene isomer were identified in a longnose sucker (Catostomus catostomus) extract from the vicinity of the mill outfall. (Katz)
W77-11355

TRANSFER OF THE CHLORINATED HYDROCARBON PCB IN A LABORATORY MARINE FOOD CHAIN,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5B.
W77-11356

ASSESSMENT OF THE ACUTE TOXICITY, GROWTH IMPAIRMENT, AND FLESH TAINTING POTENTIAL OF A BLEACHED KRAFT MILL EFFLUENT ON RAINBOW TROUT (SALMO GAIRDNERI),
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
D. M. Whittle, and K. W. Flood.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 869-878, 1977. 7 tab, 1 fig, 2 ref.

Descriptors: *Lake Superior, *Rainbow trout, Water pollution effects, *Pulp wastes, Pulp and paper industry, *Industrial wastes, Freshwater fish, *Bioassay, Toxicity, Methodology, Biochemistry, Chemical analysis, Juvenile fish.
Identifiers: *Acute toxicity, Flesh tainting, Flavor impairment.

Static and continuous flow bioassays utilizing rainbow trout (Salmo gairdneri) were conducted on a northern Ontario bleached kraft mill effluent to assess the range of acute toxicity and related sublethal effects. The acute toxicity of the total mill effluent, as determined by static bioassay procedures, ranged from a 96-h LC50 value of 1 to 49.0% vol/vol. The results of these bioassays depended on testing methodology and effluent treatment systems employed by the mill when samples were collected. Continuous flow bioassays conducted on the effluent produced 96-h LC50 values of 21.8 and 24.8% vol/vol. Growth rate of juvenile rainbow trout (1-2 g) held under continuous flow conditions for 18 days was significantly reduced at 6% vol/vol effluent concentration ($P<0.05$). Flavor of yearling rainbow (equivalent to 200 g) exposed to 3% effluent for 48 h was significantly impaired ($P<0.05$). This effluent concentration, the lowest level impairing flavor, represents approximately 0.12 of the 96-h LC50 derived from continuous flow bioassays. No significant flavor impairment was detected in fish exposed for 144 h to a 2% effluent concentration. Flavor impairment at a 3% vol/vol effluent concentration, the most sensitive sublethal response measured in this study, may also be the most critical response when assessing the economic impact of a kraft mill discharge to a freshwater ecosystem. (Katz)
W77-11357

DENSITY, DISTRIBUTION AND MOVEMENTS OF NIPIGON BAY FISHES IN RELATION TO PULP AND PAPER MILL EFFLUENT,
Fisheries and Marine Service, Ottawa (Ontario). Great Lakes Biolimnology Lab.
J. R. M. Kelso.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 879-885, 1977. 12 tab, 4 fig, ref.

Descriptors: Freshwater fish, *Pulp wastes, *Pulp and paper industry, *Industrial wastes, Water pollution effects, Suckers, Pikes, Yellow perch, Smelts, Fish populations, *Fish behavior, Fish migration, *Benthic fauna, Canada, *Lake Superior.
Identifiers: White fish, *Species dominance, *Avoidance reaction, *Nipigon Bay(Ont), Alewife, Northern pike, Pelagic fish.

Density of pelagic fish in accessible portions of Nipigon Bay was lower offshore, less than 100 fish/10,000 m3, and greater nearshore, less than 1800 fish/10,000 m3. Conditions at Red Rock caused intense aggregation there and caused species dominance to shift to sucker at the mill discharge from yellow perch elsewhere. Plume shape and direction did not alter the localized pattern of distribution. Two typical responses to plume concentrations were found using suckers fitted with ultrasonic transmitters. Fish released in high discharge concentrations (>15% dilution by volume) become disoriented for as much as several hours, then appeared to search for 'background' conditions. Fish released in low discharge concentrations (<15%) immediately initiated an avoidance reaction. Although individuals tended to avoid areas of altered water quality, the community aggregated at Red Rock in response to, perhaps, increased production of benthic macroinvertebrates. However, telemetry indicated that residence time was short in the area of altered water quality. (Katz)
W77-11358

EFFECTS OF HEAVY METALS ON SURVIVAL AND RESPIRATION RATE OF TUBIFICID WORMS: PART II - EFFECTS ON RESPIRATION RATE,
ITEN-ENERGOINVEST, Dept. of Waste Water Treatment Research, Sarajevo (Yugoslavia).
S. Brkovic-Popovic, and M. Popovic.
Environmental Pollution, Vol. 13, p 93-98, 1977. 3 fig, 5 ref.

Descriptors: *Heavy metals, Bioassay, Cadmium, Copper, Mercury, Zinc, Chromium, Nickel, Oligochaetes, *Toxicity, Oxygen, Oxygen requirements, Laboratory tests, *Tubificids, Water pollution effects, Animal physiology, Respiration.

An investigation of the relationship between the concentration of some heavy metals (Cd, Cu, Hg, Pb, Cr and Ni) and respiration rate of tubificid worms is described. The results showed that the direction of the change, caused by various metals, does not have to be the same and depends upon the range of tested concentrations. In six hour experiments cadmium, mercury and copper, at concentrations which are lethal during 24 and 48 h exposure, have a visible depressive effect on the respiration rate. Copper has a depressive effect on the respiration rate of tubificid worms at very low concentrations that are lower than the acute lethal range. Zinc, nickel and chromium at concentrations which are lethal during short exposures, considerably increase the respiration rate of tubificids above the control values. In the range of concentrations under 48-h LC50 the respiration rate does not differ significantly from the control. (Katz)
W77-11359

STUDIES ON THE YELLOW SPOT DISEASE IN PORPHYRA TENERA - III. AQUATIC FACTORS INFLUENCING THE DEVELOPMENT OF THE YELLOW SPOT DISEASE, (IN JAPANESE),
Fukuoka-chi Prefecture Fisheries Experimental Station (Japan).
Y. Taniguchi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 43, No 3, p 259-263, 1977. 5 tab, 5 ref.

Descriptors: *Spots, *Epiphytology, *Nitrates, Salinity, Water quality, *Marine algae, *Plant diseases, Environmental effects, Plant pathology, Diseases, Pathology, Sea water, Laboratory tests, Hydrogen ion concentration.
Identifiers: *Porphyra, *Yellow spot disease.

Yellow spot disease developed in Porphyra conchocelis that were inoculated with the frationated pathogen when sterilized water drawn from a culture container in which the disease was prevalent was used as culture water in the experiment. When the inoculated conchocelis were kept in fresh seawater, they did not suffer from the disease at all. The COD and nitrate concentration was higher in the sterilized culture water than in the fresh seawater. The appearance of symptoms on inoculated conchocelis was affected by the nitrate concentration and the amount of culture fluid which was added. The appearance of the symptoms was restrained at 100 micrograms at./liter nitrate or blade extract of 1.25 g/liter, and spread quickly at nitrate higher than 500 microgram at./liter or blade extracts of 2.5 g/liter. The appearance of the symptom on inoculated conchocelis was restrained only at pH higher than 7. (Katz)
W77-11360

THE EFFECTS OF LEAD ON ALGAE, IV. EFFECTS OF PB ON RESPIRATION AND PHOTOSYNTHESIS OF PHAEODACTYLUM TRICORNUTUM (BACILLARIOPHYCEAE),
Scripps Institution of Oceanography, La Jolla, Calif.
M. L. Woolery, and R. A. Lewin.
Water, Air and Soil Pollution, Vol 6(1), 1976. p 25-32. 8 fig, 9 ref.

Descriptors: *Lead, *Metals, Water pollution effects, *Photosynthesis, *Respiration, *Algae, Phytoplankton, Bioassay, *Algal poisoning, Laboratory tests, Laboratory equipment, Methodology, Phytotoxicity, Biochemistry, Sea water, *Phaeophyta.
Identifiers: *Phaeodactylum tricornutum.

Lead inhibits respiration and photosynthesis in Phaeodactylum. In cells treated for 24h with PbCl2 10mg/l R-1, photosynthesis is completely suppressed, while respiration is reduced to 25%. A lower concentration, 1 mg/l l-1, permits photosynthesis at 75% of the control rate, respiration being virtually unaffected. The vital activities of cells treated for 48h or 72h are progressively more inhibited: concentrations of pbCl2 as low as 0.1 mg/l l-1 reduce photosyntheis and respiration by 25 to 50%. (Katz)
W77-11361

ON THE INFLUENCE OF SEWAGE POLLUTION ON INSHORE BENTHIC COMMUNITIES IN THE SOUTH OF KIEL BAY. PART 2. QUANTITATIVE STUDIES ON COMMUNITY STRUCTURE,
Biologische Anstalt Helgoland (West Germany).
K. Anger.
Helgolander wissenschaftliche Meeresuntersuchengen, Vol 27, p 408-438, 1975. 20 fig, 9 tab, 13 ref.

Descriptors: *Environmental effects, *Stress, *Biological communities, *Environmental gradient, *Biomass, *Bioindicators, *Water pollution effects, *Benthic fauna, *Sewage effluents, *Mollusks, *Crustaceans, Water quality, Biomass, Invertebrates, Ecological distribution, Self-purification, Sewage sludge, Entrophication.
Identifiers: *Species density, *Baltic sea.

The sandy bottom of a shallow inshore region in the South of Kiel Bay (Baltic Sea) was studied for the influence of organic sewage pollution on the macrobenthic community structure. Three associations charcterize the bottom: Capitella capitata and Oligochaeta at 50-100 m from the sewage outlet; Pygospio elegans at 200 to about 700 m; and Bathyporia sarsi at greater than 700 m. The influence of the biological substrate structure becomes more apparent in less affected areas. The inshore benthic macrofauna aids in the self purification of the ecosystem by transforming particulate organic matter to available fish food. Abundance and biomass are multiplied due to sewage sedimentation. Highly diverse systems such as mussel beds resist factors which directly influence the composition of the community. The ecological buffer consists of many specialized competitors and predators. Faunal composition, evenness, species richness, population density, and biomass of the communities are suitable parameters for the early recognition of environmental stress. (See also W76-01944) (Katz)
W77-11362

THE EFFECT OF CATCHMENT GEOCHEMISTRY AND GEOMORPHOLOGY ON THE PRODUCTIVITY OF A TROPICAL AFRICAN MONTANE LAKE (LITTLE CONNEMARA DAM NO. 3, RHODESIA),
Rhodesia Univ., Salisbury. Hydrobiology Research Unit.
W. K. Nduku, and R. D. Robarts.
Freshwater Biology, Vol. 7, No. 1, February 1977, p 19-30. 8 fig, 5 tab, 18 ref.

Descriptors: *Trophic level, *Septic tanks, *Underground streams, *Underseepage, Porosity, *Rock properties, Dams, Water pollution sources, Domestic wastes, Nutrients, Sewage treatment, Plant growth regulators.
Identifiers: *Dolerite, *Little Connemara Dam(Rhodesia).

The discrepancy between the high nutrient content of the bottom muds and the oligotrophic status of the water column in Little Connemara Dam (No. 3) in Rhodesia (East Africa) is shown to be caused by nutrients flushed into the lake from septic tanks by way of underground streams. Little Connemara Dam, consisting of three catchments, lies in a thick sill of medium-grained dark dolerite. The dolerite is strongly jointed and affords considerable movement to water, weathering easily under high rainfall. A number of homes are built in the small catchment, along with summer holiday cottages. All of these have septic sewage treatment systems which, although located more than the minimum legal distance from the water, send out nutrients which enter the water by way of the porous dolerite. As the dolerite weathers, large amounts of iron and manganese, but little calcium or carbonate, are released. The iron and manganese are complexed with PO4-P in the water column, allowing only small concentrations for use by algae. Nitrogen enters the lake mainly as a particulate but is not significantly converted to soluble combined forms of nitrogen at the low pH values (6.2-6.7) found in lake. Bioassay experiments have indicated that combined forms of nitrogen limited phytoplankton growth. (Harris-Wisconsin).
W77-11414

ZOOPLANKTON AND PHYTOPLANKTON STUDIES IN THE WATERTON LAKES, ALBERTA, CANADA,
R. S. Anderson, and R. B. Green.
Verh. Internat. Limnol., Vol 19, October 1975, p 571-579. 6 fig, 1 tab, 8 ref.

Descriptors: *Phytoplankton, *Zooplankton, *Oligotrophy, Biomass, Plankton, Lakes, Mixing, Water quality, Sewage effluents, Lake morphometry.
Identifiers: *Waterton Lakes National Park, Alberta(Canada), Glacier National Park, Montana.

Although increases in plankton biomass have been noted for parts of the unique lake system in the Waterton Lakes National Park in Alberta, Canada (forming part of the Waterton-Glacier International Peace Park), it is unlikely that enrichment has produced any significant permanent changes

to the lake up to now; moreover, discontinuation of enrichment from domestic sewage in the near future will be in time to preserve the oligotrophic character of the lakes. To provide data for these assessments, phytoplankton and zooplankton samples were collected in various recent years as parts of ongoing studies. Of 107 algal species and clearly identifiable subspecies found in summer phytoplankton sampling, only 14 have reached or exceeded densities of 100 cells/ml. Water temperatures in the main lakes have remained fairly constant and unlikely to have caused changes in plankton numbers. Moreover, increases in algal cell counts cannot be attributed to decreased grazing, because other sampling shows there has been a general increase in total numbers of zooplankters each year since 1969, except in one part of the lake where counts have been erratic. It is thought that wind-induced mixing to a depth of 15-25 meters explains the absence of greater numbers of phytoplankton species at the more nutrient-rich end of the long and narrowlake system. (Harris-Wisconsin).
W77-11415

THE ARGILLOTROPHIC LAKE SYSTEM,
Alberta Univ., Edmonton. Dept. of Zoology.
G. R. Daborn.
Verh. Internat. Verein. Limnol., Vol 19, October 1975, p 580-588. 4 fig, 2 tab, 9 ref.

Descriptors: *Lakes, *Semiarid climates, Ponds, Eutrophication, Turbidity, Secchi disks, Shallow water, Phytoplankton, Zooplankton, Wind velocity, Phosphorus, Nitrogen, Suspended solids, Daphnia, Copepods, Diptera, Canada.
Identifiers: *Argillotrophic lakes, *Fleeinghorse Lake, Alberta(Canada), Phyllopods.

Account is given of phyllopod life cycles and energy relations based on a four-year study of Fleeinghorse Lake in southeast Alberta (Canada), emphasizing the similarity of this lake to other argillotrophic lakes in geographically distant localities and sharing its characteristics: persistent and extreme turbidity, shallowness, absence of phytoplankton and a zooplankton association of very low diversity. The high turbidity of these lakes, which are mostly either temporarily or perenially astatic, is usually caused by wind activity and results in Secchi disc readings as low as 4-5 millimeters. These lakes are usually alkaline, with relatively high levels of dissolved phosphorus and nitrogen: i.e., they are essentially eutrophic. But the fauna of such lakes are trophically dependent on the suspended particularate matter. This faunal association is particularly characterized by three abundant crustaceans: a large species of Daphnia and two diaptomid copepods—one much larger than the other. The bottom fauna is sparse, represented solely by a few chironmod larvae, and insects such as Notonectidae and Corixidae are a relatively minor component. In such lakes in Canada and South Africa, the zooplankton may be seasonally augmented by anostracan and conchostracan phylopods, which at times are the most important members of the community. (Harris-Wisconsin)
W77-11416

SEASONAL CHANGES OF PLANKTONIC CRUSTACEA IN TWO NEWFOUNDLAND LAKES,
C. C. Davis.
Verh. Internat. Verein. Limnol., Vol 19, October 1975, 739-744. 2 fig, 3 ref. National Research Council (Canada) A-5074.

Descriptors: *Crustaceans, *Trophic level, *Seasonal, Phytoplankton, Zooplankton, Copepods, Eutrophication, Lakes, Water pollution sources.
Identifiers: *Hogans Pond, Newfoundland(Canada), *Bauline Long Pond, Newfoundland(Canada), Microcrustaceans.

Earlier studies of phytoplankton and zooplankton in Hogans Pond and Bauline Long Pond in Newfoundland suggested that the former was more eutrophic than the latter, but because the studies had been undertaken in separate years it was uncertain whether the differences observed in the plankton were a reflection of real lacustrine differences or merely differences between the years. It was therefore decided to reexamine both lakes simultaneously, sampling at three depths every two weeks with a 10-liter plankton trap equipped with a 55 micron mesh net. Aside from a slump in microcrustacean numbers late in the season in Hogans Pond, the conclusion reached in the earlier study that it is more eutrophic than Bauline Long Pond is supported by: (1) the consistency with which total microcrustacean numbers in Hogans Pond exceeded those in Bauline Long Pond during the earlier months; (2) the consistency of greater size in Hogans Pond copepods; and (3) the larger number of eggs produced per female Cyclops scutifer in Hogans Pond and of Diaptomus minutus and Daphnia catawba during most months. The greater spring egg production in Bauline Long Pond by Diaptomus and Daphnia suggests that during spring either the amount or the kind of food available was more suitable in Bauline Long Pond than in Hogans Pond for these species. On the other hand, the larger size attained by Daphnia in Bauline Long Pond to some degree contradicts the above conclusion. (Harris-Wisconsin)
W77-11417

GROWTH INHIBITION CAUSED BY TURBULENCE IN THE TOXIC MARINE DINOFLAGELLATE GONYAULAX EXCAVATA,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
A. W. White.
Journal of the Fisheries Research Board of Canada, Vol 33, No 11, November 1976, p 2598-2602. 2 fig, 16 ref.

Descriptors: *Red tide, *Dinoflagellates, *Turbulence, *Poisonous plants, *Laboratory tests, Toxicity, Shellfish farming, Fishkill.
Identifiers: *Gonyaulax excavata(Braarud) Balech.

Effects caused by laboratory shaking of Gonyaulax excavata cultures suggests that small-scale oceanic turbulence of sufficient intensity may inhibit growth of individual dinoflagellate cells, possibly affecting potential red tide populations by inhibiting growth of individual populations. The distribution of Gonyaulax excavata, the toxic dinoflagellate responsible for paralytic shellfish poisoning in eastern Canada and New England, may be related to the presence of land-derived organic substances in coastal waters. Laboratory tests involving rotary shakers with a 1.9-cm circular orbit were used on cultures of the dinoflagellate, at shaking speeds of 100, 110, 125, 130 and 140 rpm. At shaking speeds of 125 rpm and greater, cells died rapidly and disintegrated. At 110 rpm and slower there was inhibition of growth compared to control sample cultures, and the amount of inhibition depended on the degree of agitation. In addition, intermittent shaking, even for as little as 30 minutes perday, caused inhibition. (Harris-Wisconsin)
W77-11418

THE OCCURRENCE AND BEHAVIOUR OF ADULT CHAOBORUS AND PROCLADIUS (DIPTERA: NEMATOCERA) FROM LAKE GEORGE, UGANDA,
Ghana Univ., Legon. Dept. of Zoology.
L. M. McGowan.
Zoological Journal of the Linnean Society, Vol 57, No 4, November 1975, p 321-334. 7 fig, 4 tab, 20 ref.

Descriptors: *Frequency, *Aquatic insects, *Tropical regions, *Monthly, Biorhythms, Seasonal, Diurnal, Zooplankton, Larvae, Ecosystems, Productivity, Africa, Lakes.
Identifiers: *Lake George(Uganda), *Lunar periodicity, Nematocera, Chaoborus anomalus Edwards, Chaoborus(Sayomyia) ceratopogones, Procladius(Procladius) brevipetiol atu Goetghebuer.

Among adult nematocera collected in shallow trophical Lake George in Ruwenzori Nationa Park in Uganda, two species of Chaoborus an one of Procladius showed a lunar periodicity of oc currence. All three were most abundant in the firs quarter of the lunar month and least abundant i the third quarter. These three dominant Lak George species—Chaoborus (Neochaoborus anomalus Edwards, C. (Sayomyia) ceratopogone and Procladius (Procladius) brevipetiolatu Goetghebuer—are among the Nematocera whic frequently form vast swarms over other Ea African lakes though not at Lake George. In co trast to earlier studies of periodicity and occu rence of chaoborids and chironomids in the Ea African area, in which collection by light traps w later criticized, the present study utilized a suctio trap of the enclosed cone type, positioned awa from lights about 200 m from the lake. The resul showed Chaoborus but not Procladius tended t vary seasonally in occurrence. Observations o sex ratios, longevity, swarming and oviposition Chaoborus at Lake George and also at neart Lake Edward are also given. In Lake George, t larvae of both the Chaoborus species predators the lacustrine zooplankton which undergoes slig seasonal variation in abundance. Procladius larv are mainly detritus feeders. (Harris-Wisconsin)
W77-11419

MARINE CLADOCERA (CRUSTACEA) IN TH EUTROPHICATED AND POLLUTED SARON GULF (GREECE),
Athens Univ. (Greece). Zoological Lab. and Mus um.
V. Kiortsis, and M. Moraitou-Apostolopulou.
Israel Journal of Zoology, Vol 24, No 1-2, 1975 71-74, 1 tab, 5 ref.

Descriptors: *Zooplankton, *Water pollution e fects, *Crustaceans, Eutrophication, Spatial d tribution, Industrial wastes, Sewage effluen Neritic.
Identifiers: *Saronic Gulf(Greece), Aegean S Evadne spinifera Muller, E tergestina Clauss, nordmani Loven, Podon intermedius Lilljeborg polyphemoides Leuckart, Penilia avirostris Dan

Six species of planktonic cladocerans were det mined and seasonally measured in the Saro Gulf of the Aegean Sea, characterized by a h degree of pollution in the northern part where main sewage outfall from the Athens-Piraeus a is located and where large quantities of indust wastes and hydrocarbon products from the Elef industrial zone enter the marine environment. S face zooplankton were collected during n cruises between August 1969 and June 1973, order to obtain an overall picture of the zoopla tonic community in relation to oceanograp parameters and the degree of pollution in the which varies from north to south. Eva spinifera Muller is the commonest and most ab dant cladoceran of the Saronic Gulf. This therm philic species reaches a maximum with the hig water temperatures, strongly decreases in wi and disappears from samples when the water t perature reaches its annual minimum. Evadne gestina Clauss, also thermophilic, has a hig temperature range then E. spinifera. Also fo were Evadne nordmani Loven, Podon intermed Lillijeborg. P. polyphemoides Levekart Penilia avirostris Dana. E. nordmani had not b previously found in the Aegean Sea. The Pe species, a neritic form prefering lower salinitie explained by large amounts of suspended det and dissolved organic matter and by the relati shallow character of the gulf. (Harris-Wisconsi W77-11420

TEMPERATURE LIMITATION OF METHANOGENESIS IN AQUATIC SEDIMENTS,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
. G. Zeikus, and M. R. Winfrey.
Applied and Environmental Microbiology, Vol 31, No 1, January 1976. p 99-107. 5 fig, 4 tab, 29 ref. NSSF GB41925.

Descriptors: *Methane, *Methane bacteria, Sediments, Decomposing organic matter, Temperature, Anaerobic conditions, Microbial degradation, Oxygenation.
Identifiers: *Lake Mendota(Wisc), Methanogenesis, Microbial methane formation.

Microbial methane formation in Lake Mendota (southern Wisconsin) is greatly influenced by temperature, according to an investigation of the microbial ecology of methanogenesis in the lake. The results support other findings that bacterial decomposition processes in aquatic sediments are temperature-limited. Sediments were taken at depths of 5, 10, and 18 m. Methanogenesis varied with respect to sediment site and depth, sampling date, in situ temperatures and number of methanogens. Increased numbers of methanogenic bacteria and rates of methanogenesis correlated with increased sediment temperature during seasonal change, with the greatest methanogenic activity observed for 18-m sediments throughout the sampling year. As compared with shallower sediments, 18-m was removed from oxygenation effects and contained higher amounts of ammonia, carbonate and methanogenic bacteria, and the population density of methanogens fluctuated less during seasonal change. It is thought that in any future comparative studies that aim to establish the rates of anaerobic carbon decomposition or to define in situ carbon precursors and mirobial interactions associated with methanogenesis must employ sediments nearly identical with respect to sample site and depth, to date of collection and processing, and to in vitro experimental conditions including anaeobiosis and length and temperature of incubation. (Harris-Wisconsin)
W77-11422

FACTORS INFLUENCING NATURAL WATER QUALITY AND CHANGES RESULTING FROM LAND-USE PRACTICES,
New Mexico Univ., Albuquerque. Dept. of Biology.
S. White.
Water, Air, and Soil Pollution, Vol 6, No 1, August 1976, p 53-69. 4 fig, 2 tab, 21 ref. New Mexico Env. Institute. No 3110-301.

Descriptors: *Land use, *Small watersheds, Water quality, *Road construction, Sedimentary rocks, Basalts, Surface waters, Agricultural runoff, Grazing, New Mexico.
Identifiers: *Mount Taylor(N Mex).

The main factor which was found to determine the natural water quality of surface water and precipitation samples collection on the northern slopes of Mount Taylor in west-central New Mexico was contact with the different geologic formations in the study area, a factor further influenced by land use practices in the area. Contact with the basaltic flows in the area resulted in water of good quality and low dissolved solids. Contact with the ore-solute rich sedimentary formations and tuff material below the basaltic flows resulted in water of lesser quality because of the greater amount of dissolved and suspended solids. Of the various land use practices, construction of access roads for mining exploration in the steep sedimentary slopes beneath the mesa had the greatest effect on exposing the water to the sediments and tuffs. Cutting of roads exposed deeper soil horizons of rock accumulation and the solute-rich sedimentary material. Runoff from the areas of intensive road construction in the sedimentary material contained up to 47 200 mg-l particulate solids and increased dissolved solids substantially. Mining exploration and access road construction in basaltic areas, however, generally resulted in only a slight increase in dissolved and particulate solids. Local grazing and irrigation for orchards had no significant effect on water quality. (Harris-Wisconsin)
W77-11425

INSECT FAUNA OF SOME VIRGINIA THERMAL STREAMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Entomology.
W. H. Robinson, and E. C. Turner, Jr.
Proceedings of the Entomological Society of Washington, Vol 77, No 3, September 1975, p 391-398, 1 tab, 18 ref. OWRT A-042 VA(2).

Descriptors: Aquatic life, *Insects, *Thermal springs, Warm springs, Streams, Diptera, Distribution, *Virginia, *Water temperature.

The water temperature of the springs and streams flowing from the spring pools in this study was 34-35C. Insect orders represented were the Coleoptera, Diptera, Hemiptera, and Odonata. In terms of numbers, the dominant family of the stream community was Chironomidae. Few, if any, of the animals associated with Warm Springs Pools could be considered as thermal fauna. For the most part, the are taxa with a widespread distribution and could be found in normal cold-water streams. (Chilton-ORNL)
W77-11476

UTILIZATION OF SEDIMENTARY AMMONIA BY POTAMOGETON NODOSUS AND SCIRPUS,
B. S. Cole, and D. W. Toetz.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 2765-2772, 1975. 3 fig, 5 tab, 15 ref. OWRT A-023-OKLA(5).

Descriptors: *Root systems, *Ammonia, *Aquatic plants, *Translocation, Absorption, Bulrushes, *Bottom sediments, Nitrogen, Oklahoma.
Identifiers: Potamogeton nodosus, Scirpus.

In efforts to resolve limnological controversy as to the role of roots in the nutrition of hydrophytes, a laboratory demonstration attempted to show that the uptake to ammonia and acropetal translocation of nitrogen by Potamogeton nodosus and Scirpus occurs in nature. Another goal was to determine the rate of labeled nitrogen movement from the roots and rhizomes to the stems and leaves under controlled conditions. Enrichment with N15 occurred at all substrate concentrations for P. nodosus and during each incubation interval. Only three root-rhizome tissues were not enriched. Generally, enrichment was more frequent in all tissues of plants incubated for 5 or 10 days at higher concentrations. Stem or leaf tissues were enriched in at least one of the three replicated for each treatment, except those incubated for two days at the lowest substrate level. In most, but not all, instances where leaves were enriched, stems were also enriched. The specific uptake rate was undetermined as the response was not hyperbolic and the Michaelis-Menten expression could not describe the uptake kinetics. It was conclusively demonstrated that P. nodosus can take up ammonia through its roots and rhizomes and translocate the N15 label to stems and leaves but it may be handicapped in utilizing ammonia in the sediments at in situ concentrations and sediment inorganic nitrogen may only be an auxiliary source. (Auen-Wisconsin)
W77-11479

ALGAL PRIMARY PRODUCTION IN THE ZONE OF SUBMERGED VEGETATION OF A EUTROPHIC LAKE,
A. Kowalczewski.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p 1305-1308, 1975. 3 fig, 1 tab, 1 ref.

Descriptors: *Primary productivity, *Littoral, *Periphyton, *Algae, Submerged plants, Foreign countries, *Eutrophication, Water pollution effects.
Identifiers: *Mikolajskie Lake(Poland).

The periphyton primary production was measured on two groups of submerged vegetation, each differing in structure and biomass per square meter, in the littoral zone of Mikolajskie Lake in northern Poland. The chlorophyll content of the periphyton averaged 80 microgram/100 sq cm of plant surface, representing 0.02% of dry mass. Gross primary production averaged 2.2 mg oxygen/100 sq cm of plant surface/24 hr, with maximal values in spring. Production was also observed under ice cover. Respiration, averaging 2.8 mg oxygen/100 sq cm/24 h, exceeded production during nine months of the year, indicating that this periphyton community is autotrophic for about three months per year. Photosynthetic activity averaged 42 mg oxygen/mg chl/24 h. Yearly gross periphyton production was estimated as 363 g oxygen/sq m. Plankton in this zone was characterized by its chlorophyll and phaeopigment contents, gross primary productionk respiration, and the P/R ratio. While plankton differed from periphyton mainly by lower chlorophyll content per sq m of the littoral and much higher photosynthetic activity, results were similar in annual gross primary production of the two communities. The periphyton contained a considerable fraction of calcium carbonate in its dry weight. The results showed that the plankton photosynthetic activity was about five times higher than that of the periphtyon. (Auen-Wisconsin)
W77-11480

NITROGEN FIXATION (ACETYLENE REDUCTION) IN A SALT MARSH AMENDED WITH SEWAGE SLUDGE AND ORGANIC CARBON AND NITROGEN COMPOUNDS,
Skidaway Inst. of Oceanography, Savannah, Ga.
R. B. Hanson.
Applied and Environmental Microbiology, Vol 33, No 4, p 846-852, April, 1977. 2 fig, 5 tab, 36 ref.

Descriptors: *Nitrogen fixation, *Salt marshes, *Marsh plants, Metabolism, Nutrients, Organic carbon, Nitrogen compounds, Algae, Sludge disposal, Waste water treatment.
Identifiers: Spartina alterniflora, Glucose, Ammonium nitrate.

Results of a 12-month study on nitrogen fixation in a sewage sludge-amended Spartina alterniflora salt marsh were reported. Four 100-meter plots were used, two of these treated with sludge to the equivalent of 4 grams of nitrogen per square meter. The effects of nutrient amendment were also studied on similar plots, divided into 10 treatment areas. Half of these areas were clipped of S. alterniflora and enclosed in lawn edging to prevent lateral root movement. Clipped and unclipped plots were injected with glucose, ammonium nitrate, a combination of the two, rhodamine WD, and distilled water as a control. The acetylene reduction method was used to measure nitrogen fixation. No significant difference was found between the sludge-amended plots and the controls. Apparently sludge enhanced rhizosphere nitrogen fixation in the soil through stimulation of Spartina production. Other processes, however, such as denitrificaton, may be inhibited by sludge treatment. In the clipped and unclipped plots, nitrogen fixation was significantly lower in the clipped plots due to the lack of carbon input via the roots. Nitrogen fixation in the ammonium nitrate-enriched unclipped plot was increased, indicating that increased Spartina production from nitrogen addition out-weighed the inhibitory effect of inorganic nitrogen on nitrogen fixation. Glucose addition inhibited nitrogen fixation in the soil, perhaps due to its stimulation of microbial activity. (Collins-FIRL)
W77-11481

A PROCEDURE FOR THE ROUTINE BIOLOGICAL EVALUATION OF URBAN RUNOFF IN SMALL RIVERS,
Massachusetts Univ., Waltham. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5A.
W77-11484

5D. Waste Treatment Processes

DYNAMIC MODELS AND COMPUTER SIMULATION OF WASTEWATER TREATMENT SYSTEMS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
J. F. Andrews.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 457-466, 1975. 5 fig, 10 ref.

Descriptors: *Waste water treatment, *Behavior, *Simulation analysis, *Activated sludge, *Anaerobic digestion, Computers, Control, Failures, Mathematical models, Systems analysis.
Identifiers: Biological processes, Dynamic models.

Dynamic models and computer simulations are tools of substantial value for describing the behavior of wastewater treatment systems. Specific examples of dynamic models and computer simulations are presented for two biological processes used in wastewater treatment. The anaerobic digestion process is potentially unstable and simulation is of value in exploring process stability and control strategies for the prevention of process failure. Simulations of the step feed activated sludge process indicate that variation of the point(s) at which wastewater is added along the length of the aeration basin offers a valuable control action when poorly settling sludge is encountered. (See also W77-10806) (Bell-Cornell)
W77-10814

SIMULATION AIDED MODELING OF THE DYNAMIC BEHAVIOR FOR SOME ELEMENTS OF A SURFACE WATER TREATMENT PLANT,
Philips Forschungslaboratorium G.m.b.H., Hamburg (West Germany).
For primary bibliographic entry see Field 5F.
W77-10815

SIMULATION AND OPTIMISATION OF A BIOLOGICAL WATER TREATMENT PLANT,
Eidgenoessische Technische Hochschule, Zurich (Switzerland); and Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
P. E. Erni.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 477-481, 1975. 8 ref.

Descriptors: *Simulation analysis, *Optimization, *Water quality control, *Treatment facilities, *Sewage treatment, Activated sludge, Biological treatment, Control, Regulation, Measurement, Efficiencies, Equations, Mathematical models, Operations research.
Identifiers: Parameter identification.

Several basic conditions for the adaptive control of an activated sludge unit have been established. A new mathematical model is described which is similar to that of Monod, but in constrast does not produce conflicting results when used for simulation with low yield coefficients. Laboratory experiments have been carried out to obtain data for the verification of the model and the identification of its parameters. Due to reciprocal dependency among the constants, only 3 of the 4 constants have been identified. For the optimization, only a closed loop regulation of the activated sludge unit could be considered, due to the expected fluctuations in the input variables. This work has shown that an adaptive control of a sewage treatment plant is possible and leads to an improvement of the efficiency of such a plant. However, before a practical realization is possible, the problem of the fast and automated determination of the biological variables must be solved. This can be obtained either through improvement of measuring equipment or through the estimation of biological variables through other parameters which are more readily determined. Only then can one reasonably examine the economic feasibility of an adaptively controlled plant. (See also W77-10806) (Bell-Cornell)
W77-10816

OPTIMIZING A PRESSURIZED PIPE-LINE NETWORK USING A NEW METHOD,
Dwars, Heederik and Verhiey Ltd., Amersfoort (Netherlands).
J. Wiggers, and O. Groen.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., 1975. 5 fig, 5 ref, append.

Descriptors: *Water pollution control, *Networks, *Sewers, *Economic efficiency, Optimization, Costs, Pumping, Pipelines, Waste water treatment, Integer programming, Water storage, Equations, Mathematical models, Systems analysis.
Identifiers: *Sewer systems, *Holland, Cost minimization, Nonlinear programming.

Centralized treatment of waste water has proved to be economically advantageous. Unfortunately, when the ultimate plans for waste water pollution control were drawn up in the Netherlands, no systems analysis was applied. So that funds made available to the Netherlands can be used to best advantage, there is still the possibility of using systems analysis to examine parts of the system to achieve optimal solutions. A method is presented for driving the least cost route for a pressure line network on the island of Walcheren in the Netherlands. The system contains: the sewer system (collection of waste water); sewage pumping stations and pressure lines (transport); sewage treatment plant; and the effluent pumping station and the pressure main (disposal). Each separate sewer system is regarded both as a source and as a sink. The economic value is discounted by means of the method of present value. Total costs are dependent only on the route chosen and the diameters. Search for the cheapest route can be carried out quickly and efficiently using an iterative process in which the total discharge is distributed over the total network step by step, a technique well known in traffic and transportation studies. The cheapest route to the central treatment plant is determined using a tree-builder algorithm. Although the method uses more computer runs than are required in other approaches, it produces the more optimal solution. (See also W77-10806) (Bell-Cornell)
W77-10829

OPTIMAL STORAGE CONTROL IN A COMBINED SEWER SYSTEM,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
B. H. Bradford.
Journal of the Water Resources Planning and Management Division, Vol 103, No WR1, p 1-15, May 1977. 8 fig, 3 tab, 7 ref. OWRT C-6174(5218)40(1).

Descriptors: *Combined sewers, *Water pollution control, *Automation, *Detention reservoirs, *Linear programming, Optimization, Drainage, Computers, Control, Algorithms, Management, Constraints, Water storage, Waste water(Pollution), Methodology, Simulation analysis, Equations, Mathematical models, Systems analysis.
Identifiers: *Multilevel control, Minimization, Real time operations.

A control algorithm for automated operational management of detention storage in a combined sewer system is applied to a version of the proposed San Francisco Master Plan for Wastewater Management. The paper builds on a previous publication which described general hierarchical strategies and presented the methodologies of decomposition and aggregation. Herein, these two methodologies are applied to solve the large-scale mathematical programming problem by a multilevel series of smaller subproblems. The aggregation method is presented and computational results from simulated real time operation of the proposed San Francisco system are given. The system is modeled with control objectives and physical system constraints expressed as a large-scale linear programming problem. The algorithm transforms the large-scale control problem into the series of smaller subproblems that are amenable to computer solution in real time. Results of several examples are presented which indicate that optimal or nearly optimal solutions can be found in real time and that the resulting system performance is significantly better than that which could be achieved with unregulated detention storage. Control objectives are minimization of overflows and street flooding and maximization of the flow to the sewage treatment plant by utilization of the system detention storage. (Bell-Cornell)
W77-10846

REDUCING COKE PLANT EFFLUENT,
Carnegie-Mellon Univ., Pittsburgh, Pa. Environmental Studies Inst.
R. W. Dunlap, and F. C. McMichael.
Environmental Science and Technology, Vol. 10, No. 7, July 1976, p 654-657, 1 tab, 5 fig, 6 ref.

Descriptors: *Pollution abatement, *Water pollution treatment, Environmental effects, *Environmental control, *Industrial wastes, Analytical techniques, *Ammonia, *Phenols, *Waste water treatment.
Identifiers: *Treatment technology, *Coke plant wastes, Mass balance, *Cyanide.

A method is discussed for selecting treatment technologies for coke plant effluents, especially ammonia, cyanide, and phenols, so that land, air and water impacts are minimized. The environmental impact of each wastewater stream is characterized by construction of an overall mass balance for emission to the air, water, and land. The mass balance is drawn around the principal parts of the plant, including the processes that generate electricity and process steam for the treatment system. An inventory was compiled of all principal pollutants emitted for each control strategy. Emission estimates for each pollutant were made. An aggregate summation was made of the different residuals and their effects in order to select the best overall strategy. The reduction of emissions of ammonia, cyanide, and phenol to the water involves the generation and discharge of many other pollutants and treatment residuals to the air and land. To obtain a more unified perspective on the mass emissions, all of the emissions are converted to a dimensionless index that sums their individual effects. The index is used to assess the net improvement or degradation of the environment for a chosen strategy relative to the no control case. (Nessa-NC)
W77-10922

COST-EFFECTIVE COMPARISON OF LAND APPLICATION AND ADVANCED WASTE-WATER TREATMENT,
Environmental Protection Agency, Washington, D. C. Office of Water Program Operations.
C. E. Pound, R. W. Crites, and R. G. Smith.
Report EPA-430/9-75-016, November 1975. Technical Report. 25 p, 4 fig, 13 tab, 4 ref.

Descriptors: *Waste water treatment, Aeration, Sewage treatment, *Activated sludge, Costs, Cost effectiveness, *Cost analysis, *Cost comparisons, Irrigation, Water conveyance, Biological treatment, Sludge treatment, Waste disposal, Tertiary treatment.
Identifiers: *Land application system(LAS), Advanced wastewater treatment(AWT), Infiltration-percolation.

The sensitivity of land application system (LAS) costs to variations in major design factors are analyzed and compared with the costs for conventional advanced wastewater treatment (AWT). Important costs factors are the relative importance of costs for preapplication treatment, conveyance, storage, application, and land. It is assumed that preapplication treatment would consists of biological oxidation using aerated lagoons. Land application systems are equally effective with wastewater which has been given primary or secondary treatment. Four cost curves were developed comparing, in various factor cost situations, 4 AWT systems, irrigation, infiltration-percolation, activated sludge and aerated lagoon. Some implications were: LAS exhibit less economy of scale than do AWTs; under stated conditions the infiltration-percolation system is the cheapest LAS; the condition variables are extremely important in LAS, with cost variation of 300% for an irrigation system; total costs of LAS is very sensitive to conveyance distance at low flow capacity but becomes less sensitive as flow capacity increases; the lower the flow capacity of the LAS, the higher the cost of land that can be absorbed by LAS while remaining competitive with AWT; the federal government assumes more of the LAS cost than of the AWT costs--70% versus 35% respectively in a 1 mgd irrigation system. (Gentry-NC)
W77-10928

ROUGH CREEK LIMESTONE BARRIER INSTALLATION AND EVALUATION,
Erica Engineering Associates, Inc., Huntingdon, PA.

For primary bibliographic entry see Field 5G.
W77-10943

PROCESS FOR THE TREATMENT OF ACIDIC WASTE LIQUID CONTAINING DISSOLVED SALTS,
Laxide Group Ltd., Villingham (England). (Assignee).
A. Twist, and P. Spurgeon.
U.S. Patent No. 4,006,080, 4 p, 4 ref; Official Gazette of the United States Patent Office, Vol 955, No 1, p 207, February 1, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water quality control, Separation techniques, Acidic wastes, Metals, Acidic water, Hydrogen ion concentration.
Identifiers: Steel industry, Sulfuric acid, Titanium dioxide industry.

Waste aqueous sulphuric acid solutions containing particularly, iron sulphates where the iron content is substantially in the ferrous state, are produced in large quantities by the steel industry ('pickling liquor') and by the titanium dioxide industry in the operation of the so-called 'sulfate' process. It is desirable that such aqueous sulphuric acid solutions should be treated to reduce their acidity and to remove at least the greater part of the dissolved salts in the form of a solid which can be disposed of, for example as land fill and/or as a starting material or component for other processes. The process for the treatment comprises the following steps: adjusting the pH value of the solution by the addition of a calcium compound to precipitate selectively calcium sulphate; separating the precipitated calcium sulphate and calcining it to form calcium sulphide and/or calcium oxide; adjusting the pH of the mother liquor from the second step to a value in the range 7 to 9 by the addition of a calcium-containing compound to precipitate solid metal compounds; and then separating and/or calcining the precipitated solids. (Sinha-OEIS)
W77-11003

METHOD FOR PREVENTING GELATION OF THERMOSETTING RESINS IN WASTE WATER,
Sumitomo Durez Co. Ltd., Tokyo (Japan). (Assignee).
N. Nakamura, and Y. Saeki.
U.S. Patent No. 4,006,081, 4 p, 6 ref; Official Gazette of the United States Patent Office, Vol 955, No 1, p 207, February 1, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, *Water pollution sources, Water quality control, Resins, Adhesives, Gels.

A method for preventing gelation in waste water which contain glues or varnishes of resorcinol resins or phenol modified resorcinal resins is disclosed. Resorcinol resins have the advantage of curing at ambient or lower temperatures by adding formaldehyde donors. Therefore, they have a wide range of practical uses when used as adhesives or varnishes. However, this advantage which makes the cure proceed at ambient temperature when applied as adhesives reacts adversely, on the other hand, to the wastes resulting from washing the mixers, spreaders and other tools and machines used, thereby transforming them into a watery, gelatinous, agar-agar state within a several day period. Waste water from washing the equipment used for mixing and applying those glues are deep reddish brown and show a high chemical oxygen demand and biochemical oxygen demand. Therefore, it is necessary to make such washing wastes harmless by chemical or chemical engineering treatments. The invention was discovered and applied to practical use successfully by preventing the formation of an agar-agar state gel containing water by adding and mixing urea into washings as a treatment. (Sinha-OEIS)
W77-11004

LIQUID TREATING APPARATUS,
O. Q. Matteson.
U.S. Patent No. 4,006,085, 10 p, 6 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 955, no 1, p 208, February 1, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution control, Water quality control, Aeration, Settling basins.

In a liquid treating apparatus the inlet of a settling chamber communicates with the outlet of an aeration chamber. Retaining members in the aeration chamber which divide it into two or more compartments are of sufficient porosity to permit the liquid to flow through at the required rate while retaining materials of a selected configuration or size. A permeable restraining member in the settling chamber separates the inlet from the outlet and is of a mesh to permit liquid flow in a diffused manner. The restraining member extends above the high liquid level and terminates adjacent to the bottom of the settling chamber. An imperforate partition at the inlet end of the settling chamber carries a porous deflector which extends upward and inward to restrain downward movement of liquid passing over the upper end of the partition. Sludge return conduits and suction-skimmer conduits transfer liquid and solids back from the settling chamber to the aeration chamber. Splash plates extend forward of the discharge end of such conduits and cause effluent to be spread into a thin sheet onto the surface of the liquid in the aeration chamber (Sinha-OEIS)
W77-11006

PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER FROM AQUEOUS WASTES,
Hanover Research Corp., East Hanover, N.J. (Assignee).
C. Greenfield, R. E. Casparian, and A. J. Bonanno.
U.S. Patent No. 4,007,094, 8 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 955, no 2, p 574, February 8, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water treatment, *Water pollution treatment, *Evaporation, Brackish water, Saline water, Separation techniques, Scaling, Equipment, Desalination.

The apparatus and process of this invention comprise a systematic arrangement of equipment and a series of steps for recovering clean water from aqueous wastes by evaporation while avoiding fouling and scaling as well as corrosion of evaporator tubes. The apparatus and process obviate antiscaling compounds and separate, switchable nests of evaporator tubes. In addition, the necessity for special alloys in the evaporation equipment is avoided. The process consists of the following steps: (1) adding an oil to the aqueous wastes and forming a mixture of oil and wastes; (2) concentrating the mixture of oil and aqueous wastes by heat evaporation in the course of which the mixture comes in contact with the evaporating surface of the evaporator to yield water vapor and concentrated wastes containing oil; and (3) condensing the water vapor. (Sinha-OEIS)
W77-11011

PROCESS FOR THE PURIFICATION OF WASTE WATERS WITH ACTIVATED CARBON,
Bergbau-Forschung G.m.b.H., Essen (West Germany). (Assignee).
G. Gappa, H. Juntgen, J. Klein, and J. Reichenberger.
U.S. Patent No. 4,007,116, 7 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 955, no 2, p 581, February 8, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Organic wastes, *Water purification, Water pollution treatment, *Activated carbon, Adsorption.
Identifiers: Carbon regeneration.

Waste water is purified by passing it upward through a bed of activated carbon particles confined in a column or adsorber while a portion of the spent carbon particles is continuously withdrawn from the bottom of the column. The carbon particles that are thus withdrawn are thermally reactivated and returned to the top of the column to replace the spent carbon particles that were withdrawn at the bottom of the column. In the processes of the invention, the fresh activated carbon particles are moved through an adsorber from its top to its bottom while the waste water is passed upward through it. The water thus flows countercurrently to the movement of the carbon. During this process, the contaminants, particularly the dissolved organic substances, are adsorbed from the water by the activated carbon. In making most efficient use of activated carbon, they should have adsorbed the maximum amount of contaminants that they are capable of before being subjected to regeneration. This object is achieved by adjusting and controlling the rate at which the spent carbon particles are withdrawn and are replaced by freshly regenerated carbon particles at the top of the column. (Sinha-OEIS)
W77-11012

METHODS OF RECOVERING WOOL GREASE FROM SPENT WOOL SCOURING LIQUOR,
New Zealand Inventions Development Authority, Wellington. (Assignee).
D. K. Smith, and C. N. S. McLachlan.
U.S. Patent No. 4,007,117, 6 p, 1 fig, 2 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 955, no 2, p 581, February 8, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution control, Water pollution sources, Separation techniques, Alcohols, Organic compounds.
Identifiers: Wool scouring liquor, Wool grease.

The removal of grease from wool scour liquor is advantageous because the grease is of commercial value, its removal increases the useful life of the scour liquor and grease removal reduces the pollution load of effluent discharged from a scour plant and renders it more amenable to further treatment. The method comprises mixing scouring liquor effluent with sufficient alcohol to produce a concentration in excess of saturation to leave a discrete alcohol phase, adding a selected flocculant to effect a liquid/liquid separation of grease from the liquor and stripping the separated grease from the alcohol phase. (Sinha-OEIS)
W77-11013

OZONE OXIDATION OF WASTE WATER,
Cubic Corp., San Diego, Calif. (Assignee).
D. F. Ciambrone.
U.S. Patent No. 4,007,118, 5 p, 3 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 955, no 2, p 581-582, February 8, 1977.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, *Oxidation, *Ozone, Catalysts.
Identifiers: Metal oxides.

A powdered metal oxide such as manganese trioxide, ferric, copper and nickel oxide is positioned in a tank. The tank receives a quantity of effluent that is to be rendered inert by ozone gas that is injected into the container. The oxide acts as a catalyst, in that the amount of ozone otherwise required to oxidize the fluid sufficiently to kill the bacteria and render the fluid inert is substantially reduced. The metal oxide may be utilized in the form of a powder contained in fabric bags, disposed on substrates in the tank, or dispersed within the fluid. (Sinha-OEIS)
W77-11014

REACTOR FOR PURIFICATION OF WATER BY FLUID FILTRATION,
Agrotechnika, Narodyn Podnik, Zvolen (Czechoslovakia). (Assignee).
For primary bibliographic entry see Field 5F.
W77-11016

APPARATUS FOR DISPOSAL OF EFFLUENTS,
W. G. Castell.
U.S. Patent No. 4,008,155, 7 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 955, No 3, p 935, February 15, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Biological treatment, Aerobic treatment, Floating, Equipment, Waste disposal.

This invention relates to the disposal of effluents especially sewage, at sea, on a lake, or in esturial or other natural or artificial waters. It envisages primarily, treatment by aerobic processing. The apparatus is floatable in water and able to be moored or otherwise located while floating and comprises at least one enclosure of an area of the water which is exposed to atmosphere, in which degradable waste may be broken down, particularly by the activity of bacteria or other biological organisms. The invention includes means for any necessary physical or chemical treatment or any combination for preparation of the waste to render it suitable for treatment. Such preparatory treatment may include the removal or reduction in size of particulate matter, adjustment of the content of materials containing certain chemicals particularly nitrogen and phosphorus, and the removal after segregation or dispersal of oil, fat and grease. The apparatus consists of at least two pliable walls of circular cross-section and held concentric and suspended by buoyancy to as to occupy a certain draught but clear of the sea bed, means for supplying the sewage by pumping, means for treating sewage by aeration, and means for mooring the whole structure and its ancillary parts. (Sinha-OEIS)
W77-11017

DEWATERING MACHINE,
Envirotech Corp., Menlo Park, Calif. (Assignee).
S. S. Davis.
U.S. Patent No. 4,008,158, 9 p, 7 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 955, p 36, February 15, 1977.

Descriptors: *Patents, *Waste water treatment, *Sludge treatment, Filtration, *Dewatering, Pressure, Compaction.
Identifiers: Filter cakes.

The object of the invention is to provide an apparatus to dewater slurries and sludges in an economical and efficient manner such as are found in wastewater treatment operations. The dewatering machine comprises an integral and cooperative combination of a vacuum filter of the rotary drum type and an expression device of the diaphragm type. An intermittently-indexed endless filter medium belt carries a sheet of filter cake to the expression device after the cake is formed on the vacuum filter. The belt indexing action is coordinated with pressurization of the expression device so that the filter drum is indexed only when the diaphragm is relaxed and the pressurization is effected only at such times as the drum is not being indexed. (Sinha-OEIS)
W77-11019

RECLAMATION OF IRRIGATION FIELD DRAINAGE WATER,
California Univ., Los Angeles.
J. W. McCutchan, V. Goel, D. B. Brice, and K. Yamamoto.
Desalination, Vol. 19, 153-160, December 1976. 1 fig, 1 tab, 4 ref.

Descriptors: *Desalination processes, *Reverse osmosis, *Reclaimed water, *Drainage water, *Desalination apparatus, Irrigation water, Ion exchange, Water softening, Pre-treatment(Water), Dissolved solids, Calcium sulfate, Fouling, Semipermeable membranes, Desalination plants.
Identifiers: Sodium hexametaphosphate.

Tests were conducted for 18 months on three reverse osmosis plants with modular designs of the tubular, spiral wound, and hollow fine fiber type. The three pilot plants were operated on a continuous basis using feedwater from a subsurface tile drainage system (agricultural waste water) which was softened by an ion-exchange during the last 12 months of the study. All three modular designs were effective in desalting the waste water return flow, with no time-related deterioration of the semipermeable membrane from chemical or biological activity. Successful desalination depended mainly on adequate feedwater pretreatment and maintenance of the modules. There were seasonal variations in the level of feedwater total dissolved solids and a high calcium sulfate content, as well as bacterial organisms capable of attacking the membrane material or creating a build-up of material that 'fouls' the membrane surface. Fouling and scaling by the agricultural waste water limited pilot plant productivity; the different responses of each plant to cleaning procedures are described. Sodium hexametaphosphate used to inhibit calcium sulfate precipitation also increased desalted water production. (Jahns-Arizona)
W77-11113

COLUMNS REPRESENTING MOUND-TYPE DISPOSAL SYSTEMS FOR SEPTIC TANK EFFLUENT: II. NUTRIENT TRANSFORMATIONS AND BACTERIAL POPULATIONS,
Vermont Univ., Burlington.
F. R. Magdoff, D. R. Keeney, J. Bouma, and W. A. Ziebell.
J Environ Qual. Vol 3 No 3. p 228-234, 1974.

Descriptors: *Septic tanks, Effluents, Chemical oxygen demand, Bacteria, Carbon, Coliforms, Columns, Denitrification, Disposal, Nitrogen, Nutrients, Phosphorus, Streptococci.
Identifiers: Crusting, Mound, Oxygen, Pathogenic, Phosphate.

C, N and P transformations and bacterial populations were studied in columns representing a mound disposal system. Total-N, total-P, and the chemical oxygen demand (COD) of the influent (septic tank effluent) averaged 42, 21, and 25 mg/l, respectively. The reduced-N forms present in the influent (NH_4-N and organic-N) were oxidized to NO_3-N in the aerobic fill and about 32% of the total-N was lost by denitrification during water passage through the anaerobic silt loam at the bottom of the column. P (mainly dissolved orthophosphate) concentrations in column effluents, increased gradually, stabilizing at about 60% of the influent P concentration. P removal from the percolating water probably occurred by both sorpton and precipitation. The COD of column effluents was very low, indicating essentially complete C removal. After crusting developed and caused permanent ponding the fill became anaerobic, and the column effluent N was mainly NH_4-N. P concentrations of the effluent increased gradually with time and reached a constant value of 2-6 ppm. The COD of the effluent from the totally anaerobic columns was higher than that from the uncrested columns. Perforating column walls to more closely simulate field conditions permitted aerobic conditions in the fill after crust development caused continous ponding. The C, N and P transformations in the perforated crusted columns were similar to those observed in the nonperforated uncrusted (i.e., aerobic) columns. Fecal indicator bacteria were not detected in any column effluent even though the counts of fecal streptococci and fecal coliform in the influent averaged (3.8 x 10 to the 4th power) and (1.7 x 10 to the 5th power)/100 ml, respectively. (See also W75-03220) Copyright 1974, Biological Abstracts, Inc.
W77-11369

SAMPLING THE UNSATURATED ZONE IN IRRIGATED FIELD PLOTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W77-11400

PALMER LAKE SANITATION DISTRICT PALMER LAKE, COLORADO (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 1 Price codes: A21 in paper copy, A01 in microfiche. Report EPA-C-080306. December 1974. 492 p.

Descriptors: *Sewage treatment, *Colorado, *Sewage effluent, *Aerated lagoons, *Water quality control, Water pollution, Water pollution sources, Sewage, Sewage lagoons, Sewage disposal, Domestic wastes, Environmental effects, Balance of nature, Ecology, Environmental control, Aquatic life, Oxidation lagoons, Water pollution control, Water quality, Land use.

Identifiers: *Environmental impact statement.

The Environmental Protection Agency has submitted a final Environmental Impact Statement for a waste water treatment facility of the aerated lagoon type to serve the Palmer Lake Sanitation District, the Monument Sanitation District, and the Woodmar Water Sanitation District. Necessitated by the failure of septic tank drain fields and cesspools in the area, the projected capacity of the facility is 0.84 mgd, or 7500 persons. The present population of the area is 2600 persons. Under the project, the effluent discharge into Monument Creek would not only be improved in quality but would meet current water quality standards. In addition, the project woud make possible a greater density of urban development in the area while conforming to local land use plans and assuring adequate sewage treatment for an incresing population. About 15 acres would be committed for the life of the project. Projected adverse impacts include disturbance of 10-20 acres of land as well as various human environment impacts, all of which are deemed insignificant. An improvement in receiving water quality is projected. Although various alternatives to the project were suggested, the proposed alternative represents a reconciliation of water quality preservation, minimization of environmental impact, and cost effectiveness. (Brightman-Florida)
W77-11452

NALYSIS OF THE IMPACT OF DELAYING OMPLIANCE WITH 1977 WATER QUALITY TANDARDS,
athematica, Inc., Philadelphia, Pa. Regional and nvironmental Studies Group.
or primary bibliographic entry see Field 5G.
77-11453

RITERIA FOR DEVELOPING POLLUTION BATEMENT PROGRAMS FOR INACTIVE ND ABANDONED MINE SITES,
r primary bibliographic entry see Field 5G.
77-11454

OUISIANA PACIFIC CORPORATION AND ROWN SIMPSON PULP COMPANY EQUESTS FOR VARIANCES FROM BPCT-).
vironmental Protection Agency, Washington, C.
r primary bibliographic entry see Field 5G.
7-11459

TROGEN FIXATION (ACETYLENE REDUC-ON) IN A SALT MARSH AMENDED WITH WAGE SLUDGE AND ORGANIC CARBON D NITROGEN COMPOUNDS,
daway Inst. of Oceanography, Savannah, Ga.
primary bibliographic entry see Field 5C.
7-11481

ALUATION OF RECOVERY METHODS TO TECT COLIFORMS IN WATER,
st Virginia Univ., Morgantown. Div. of Plant nces.
primary bibliographic entry see Field 5A.
7-11483

NCEPTUAL MODEL FOR ACTIVATED DGE PROCESSES,
homa State Univ., Stillwater. Bioenvironmenngineering Labs.
. Gaudy, Jr., R. Srinivasaraghavan, and M. h.
nal of the Environmental Engineering Divi-ASCE, Vol. 103, No. EE1, p 71-86, February, . 8 fig, 2 tab, 2 append. OWRT A-035-LA(4).

Descriptors: Model studies, *Activated sludge, *Sludge treatment, *Mathematical models, Design criteria, Biological properties, Chemical properties, Physical properties, Suspended solids, *Waste water treatment, Sanitary engineering.

A conceptual model was developed for activated sludge processes, using the recycled sludge concentrations and biomass concentration in the reactor as design and/or operational parameters. Engineering parameters were related to biological constants. Selectable engineering parameters such as dilution rates, the mean hydraulic retention time, and the hydraulic sludge recycle ratio had an overriding effect, indicating good engineering control over the biological process. The model can be confirmed by reconciliation with other design approaches, such as the 'food to organism ratio'. The model was found to be very useful in determining functional inadequacies in plant design and in aiding designers to create a facility which will deliver a reliable, high quality effluent. (Collins-FIRL)
W77-11485

HYDROGEN PEROXIDE CONTROLS ODOR, CORROSION IN COLLECTION SYSTEMS,
Corpus Christi Dept. of Public Utilities, Tex.
D. G. Matthews.
Water and Sewage Works, Vol. 124, No. 6, p 52-54, June, 1977. 1 ref.

Descriptors: *Concrete pipes, *Corrosion control, *Odor, *Hydrogen sulfide, *Anaerobic bacteria, *Linings, Chlorination, Oxidation, Equipment, Conveyance structures, Sewers, Sewage treatment, Sewage effluents, Waste water treatment.
Identifiers: Corpus Christi(TX).

A review was presented of efforts to control concrete sewer corrosion in Corpus Christi, Texas Experiences were related concerning one line using pipe factory-coated with Polycor Enamel and carrying flows of nearly one-half its diameter. Corrosion was noted soon after completion, and attributed to the reduction of inorganic sulfates and organic compounds to hydrogen sulfide or the hydrosulfide ion by anaerobic bacteria. The hydrogen sulfide combined with oxygen to form water and sulfur. Thiobacillus bacteria converted the sulfur to sulfuric acid, which combined with calcium oxide in the concrete to form calcium sulfate. The resultant porosity of the structure allowed sulfuric acid penetration of the sewer pipe. Several correctives were considered. Replacement with smaller diameter clay pipe at steeper grades using lift stations was too costly and disruptive. Sliplining the pipe with a polyethylene liner and injecting air into the sewage for bacterial control were discussed. Chlorine could be added to end sulfide production or to oxidize hydrogen sulfide rapidly. High chlorine levels would be required to destroy bacterial colonies. Hydrogen peroxide, originally suggested for odor control, was chosen for testing. It was injected into the collection system well before the concrete component. Sulfides were undetectable for three miles and then reached a concentration of 1 ppm. Concentrations reached 12 ppm at the end of the line. Feed rates were increased in summer to control higher sulfide concentrations. The city found that the best solution would be hydrogen peroxide addition, unless polyethylene sliplining could be federally funded. (Collins-FIRL)
W77-11487

KEEP MAINTENANCE IN MIND WHEN DESIGNING OR USING PUMPS.
R. D. Bright.
Water and Wastes Engineering, Vol. 14, No. 5, p 62-65, May, 1977. 6 fig.

Descriptors: *Pumps, *Maintenance, *Operations, *Performance, Sewers, Hydraulic equipment, Design, Optimization, Equipment, Personnel, Waste water treatment.

The proper choice and placement of pumps can reduce costs and increase dependability and economy of sewage handling systems. Several useful steps were recommended. Provision should be made for maintenance in the initial phases of system design. Pumping systems should be adapted to handle current volumes to maintain efficiency. Pump suction conditions should be accurately determined. The equipment should be scheduled for maximum running time. Effective maintenance programs and personnel training should also be provided. (Collins-FIRL)
W77-11488

PROCEEDINGS OF WORKSHOP ON MICROORGANISMS IN URBAN STORMWATER,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W77-11489

MICROORGANISMS IN URBAN STORMWATER -- A U.S. ENVIRONMENTAL PROTECTION AGENCY PROGRAM OVERVIEW,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W77-11490

THE ENHANCEMENT OF HIGH-RATE DISINFECTION BY THE SEQUENTIAL ADDITION OF CHLORINE AND CHLORINE DIOXIDE,
O'Brien and Gere Engineers, Inc., Syracuse, N. Y.
E. C. Tifft, P. E. Moffa, S. L. Richardson, and R. Field.
In: Report EPA-600/2-76-224, 1976. p 96-119, 5 fig, 9 tab, 10 ref.

Descriptors: *Disinfection, *Chlorination, *Viruses, *Bioindicators, Microorganisms, Water pollution sources, Sewers, Overflow, Treatment facilities, Chemical reactions, Waste water treatment.

A two-part evaluation was made of the treatment of combined sewer overflows (CSO) by chlorine or chlorine dioxide for the reduction of microbial organisms. The massive volume of CSO in highly developed urban areas precludes treatment by conventional techniques. This would require long detention times and large facilities. Bench-scale tests were conducted to determine the disinfectant doses needed to reduce microbial counts to acceptable levels. Full-scale plants tested those results for verification. It was found that point-source treatment by high-rate application of 25 mg/liter of chlorine or 12 mg/liter of chlorine dioxide reduced indicator organisms and viruses to levels acceptable for discharge to recreational waters. A sequential (15 to 30 second intervals) addition of 8 mg/liter of chlorine and 2 mg/liter of chlorine dioxide produced lower counts after two mminutes contact time than corresponding single-stage disinfection. This was attributed to an interaction of the disinfectants. It was suggested that chlorine dioxide was regenerated by a reaction of chlorine with the chlorite produced by the decomposition of chlorine dioxide. (See also W77-11489) (Collins-FIRL)
W77-11491

EXPERIENCES WITH RECOVERY OF VIRUSES FROM STORM WATER,
Syracuse Univ., N. Y. Dept. of Biology.
J. E. Smith.
In: Report EPA-600/2-76-244, 1976. p 88-95, 1 fig, 5 tab.

Descriptors: *Viruses, *Storm water, *Separation techniques, *Equipment, Hydrogen ion concentration, Pollutant identification, Analytical techniques, Sewage treatment, Overflow, Adsorption, Runoff, Waste water treatment.
Identifiers: Syracuse(NY), Baltimore(MD).

The Aquella virus concentrator was used to detect live animal viruses in real or simulated combined storm overflows. Storm waters from Syracuse, New York, and Baltimore, Maryland, were studied. Viruses were preferentially adsorbed to Cox epoxy fiberglass filters by two methods. Picornaviruses were able to withstand a combination of low (3.5) pH for adsorption and high (11.5) pH for elution. This eliminated adenoviruses and reoviruses which were adsorbed at pH 4.5 and eluted at pH 9.0. Picornaviruses, adsorbed under these conditions, could be eliminated by the addition of antisera. About 60+% of storm water isolates were poliviruses. These were suppressed since they quickly overgrow most other viruses. Many single-strand RNA viruses were suppressed by benzimidazoles, but DNA adenoviruses or double-strand RNA reoviruses were hardly affected. Several cell types were compared for plating efficiency. BGM cells would be the most likely cell line for most water-borne viruses of human origin. Pig kidney PK15 cells did not prove to be a broad adenovirus indicator line and were inferior to HEK cells. Operating experience with the virus concentrator indicated a likely efficiency of 30% for viral recovery from large volumes of storm overflow. This was especially true when a combination of heavy silt and high organic content was present. Enteroviruses survived experimental holding conditions very well. Data on adenoviruses and reoviruses was incomplete. Poliovirus was the most prevalent, but other viruses were detected in all raw sewage and chlorinated effluent samples. The detection frequency was similar in overflow samples from both cities. (See also W77-11489) (Collins-FIRL)
W77-11492

PRIMARY TREATMENT.
In: 1977 Public Works Manual and Catalog File, Billings, C. H., Conner, S. H., and Kircher, J. R., editors, p D16-D24, 1977. 1 fig.

Descriptors: *Treatment facilities, *Separation techniques, Screens, Settling basins, Flocculation, Flotation, Sludge treatment, Automatic controls, Scum, Suspended solids, Waste disposal, Equipment, Filtration, Design criteria, Waste water treatment, Incineration.
Identifiers: Sludge thickening, Grit.

Primary treatment was defined in terms of methods which remove coarse and high specific gravity solids from waste water. These processes include screening, comminution, grit collection, clarification, settling, and scum removal. Various process aids are described, including flocculation, flotation, and sludge thickening. Screen types described were coarse and fine screens, drum screens, and rotating screens. Screenings disposal would be by incineration, burial, digestion with sludge, or shredding for return to the sewage. Comminution and its placement in the treatment cycle were briefly reviewed. Grit collection can be accomplished by channel collectors or washing collectors. Design and operational data were presented for settling tanks, scum removal, flotation, flocculation, and sludge thickening. Predesigned factory assembled treatment units and components were mentioned with sources for their purchase. (Collins-FIRL)
W77-11493

SECONDARY TREATMENT.
In: 1977 Public Works Manual and Catalog File, Billings, C. H., Conner, S. H., and Kircher, J. R., editors, p D24-D32, 1977. 1 fig.

Descriptors: *Treatment facilities, *Biological treatment, *Chemical treatment, Oxidation, Filtration, Biochemical oxygen demand, Suspended solids, Hydrogen ion concentration, Microorganisms, Aerobic conditions, Anaerobic conditions, Activated sludge, Aeration, Oxidation lagoons, Trickling filters, Design, Waste water treatment.

Secondary treatment was originally defined as methods involving microbial growth and its metabolic use of organics in waste water for purposes of solids removal. PL 92-500 effluent standards which were required under this heading were BOD and suspended solids of 30 mg/liter or less, and a pH between 6.0 and 9.0. This may be maintained by use of aerobic or anaerobic conditions. Settling basins and clarifiers usually operate under aerobic conditions, whereas solids are primarily digested under anaerobic conditions. Activated sludge processes, stabilization ponds, or trickling filters were the bsic methods for the biological stabilization of waste water. Process and equipment criteria were presented for the activated sludge process. Equipment was described for diffused and mechanical aeration. Variations of the process which were described included activated aeration, mixing-aeration, contact stabilization, extended aeration, and the complete mixing activated sludge process. Design criteria were presented for oxidation ponds, especially for pond liners, and associated pipework. Construction, design, and maintenance of trickling filters were discussed. (Collins-FIRL)
W77-11494

ADVANCED TREATMENT.
In: 1977 Public Works Manual and Catalog File, Billings, C. H., Conner, S. H., and Kircher, J. R., editors, p D32-D38, 1977. 2 fig.

Descriptors: *Tertiary treatment, *Treatment facilities, *Chemical treatment, Phosphorus, Nitrogen, Biochemical oxygen demand, Suspended solids, Separation techniques, Ion exchange, Filtration, Anaerobic conditions, Adsorption, Activated carbon, Ammonia, Ultimate disposal, Nutrients, Coagulation, Organic matter, Disinfection, Waste water treatment.

The term 'tertiary treatment' was used to describe any treatment which follows conventional secondary treatment to produce an effluent of a substantially improved quality. Processes involved in this phase are multi-media filters or microstrainers, carbon filters or columns for nitrogen and organic adsorption, ion exchange, or combinations of these. Solids removal by filtration and the use of activated carbon to remove nutrients were described with process design criteria. Coagulant aids, such as aluminum sulfate, sodium aluminate, lime, ferric chloride, ferric sulfate, and ferrous sulfate were described in their various applications. A physical-chemical treatment was presented which involved pretreatment, clarification, filtration, adsorption, and disinfection. The reuse of treated waste water was described for land applications such as overland flow, rapid infiltration/percolation, and crop irrigation. (Collins-FIRL)
W77-11495

SLUDGE DIGESTION AND DISPOSAL.
For primary bibliographic entry see Field 5E.
W77-11496

DISINFECTION AND ODOR CONTROL.
In: 1977 Public Works Manual and Catalog File, Billings, C. H., Conner, S. H., and Kircher, J. R., editors, p D49-D52, 1977.

Descriptors: *Disinfection, *Odor, *Chlorination, *Ozone, Chemical treatment, Oxidation, Equipment, Costs, Irradiation, Cleaning, Operations, Water purification, Corrosion control, Waste water treatment.

Disinfection and odor control of waste water were discussed. The major choices for disinfection include chlorination and ozonation. These methods can control septicity and odor as well. However, odor can also be controlled by the use of hydrogen peroxide or other oxidizing agents to react with odor-causing substances or to act as masking agents. Procedures and equipment for chlorine and ozone application were included. Ultra-violet radiation has recently become a more widespread method of disinfection. Systems were presented for odor combustion and adsorption, as well as for ozone deodorization. (Collins-FIRL)
W77-11497

OPERATION CONTROL.
In: 1977 Public Works Manual and Catalog File, Billings, C. H., Conner, S. H., and Kircher, J. R., editors, p D52-D57, 1977.

Descriptors: *Operations, *Measurement, *Instrumentation, Testing, Laboratory testing, Laboratories, Equipment, Flow, Gases, Sludge, Temperature, Analysis, Biochemical oxygen demand, Chemical oxygen demand, Safety, Microorganisms, Automation, Treatment facilities, Waste water treatment.

Various aspects of operations control in waste water treatment facilities were reviewed. Expert design notwithstanding, a treatment plant's functioning greatly depends upon control of the many inputs to the treatment system, of its equipment, and of process parameters. Advanced instrumentation and analytical procedures contribute to the efficient operation of any plant. Equipment was described for measuring flow, gas, temperature, rain, and sludge. Quality control can be implemented through the measurement and analysis of process parameters which include suspended solids, settleability, biochemical oxygen demand, total organic carbon, pH, dissolved oxygen, and bacteriological activity. Various pieces of laboratory equipment for testing and analysis were presented for chemical, physical, and biochemical parameters. Safety instrumentation for the detection of combustible or poisonous gases were described, as were control systems for collection systems. (Collins-FIRL)
W77-11498

SEWER MAINTENANCE AND REHABILITATION.
In: 1977 Public Works Manual and Catalog File, Billings, C. H., Conner, S. H., and Kircher, J. R., editors, p D57-D62, 1977. 1 fig.

Descriptors: *Sewers, *Maintenance, *Rehabilitation, Evaluation, Hydraulic structures, Conveyance structures, Monitoring, Infiltration, Inflow, Cleaning, Chemical treatment, Equipment, Repairs, Safety, Conduits.

Tests for evaluating sewer systems were presented. These were needed to maintain sig performance levels of treatment plants. Publi Law 92-500 provided for 75% of construction costs of interceptors and treatment plants if the applicant could demonstrate that related sewe systems were not subject to excessive infiltra tion/inflow. The evaluation procedures consist o an infiltration/inflow analysis and a physica evaluation survey. These must be conducted be fore rehabilitation can proceed. The first analysi includes area topography, soil conditions an hydrology; wet and dry weather patterns and 10 year flood crest; projected population and indus trial growth and growth patterns; industrial ef fluent characteristics; environmental aesthetic ef fects of treatment facilities; mapping of collecto lines and manhole inspection to determine infiltra tion; treatment costs of extraneous water; com parison of metered water sales and returne volume for treatment; health hazards of bypas pumping into recreational waters; and a smok and/or dye test to locate hidden infiltratio sources. The second test includes evaluation o soil cavitation; potential exfiltration/infiltratio areas; visual grade variance; maintenance of wa and system; qualification of damage from surfac forces; and soil characteristics. The effect o groundwater conditions should also be examine Various mechanical and chemical means for clea

g obstructions from sewers were described, as ell as methods for rehabilitation, such as chemi- l grouting and sewer relining. Maintenance and fety measures and equipment were suggested. ollins-FIRL)
77-11499

OLLECTION SYSTEMS.
: 1977 Public Works Manual and Catalog File, llings, C. H., Conner, S. H., and Kircher, J. R., itors, Public Works Journal Corporation, dgewood, N. J., 1977, p D2-8, 1977.

scriptors: *Sewers, *Design criteria, *Physical operties, *Chemical properties, Construction, intenance, Clay pipes, Concrete pipes, Metal es, Plastic pipes, Joints(Connections), Linings, nholes, Construction materials, Conduits.
ntifiers: Asbestos-cement pipes.

e collection system is the most expensive por- n of a sewage system; therefore, its design and nstruction are important in order to avoid future blems with maintenance and treatment plant eration. Pipe materials, such as clay, iron, ncrete, and asbestos-cement were presented h various specifications for each. These in- ded strength, fittings, installation, and testing cedures. Linings, coatings, and other methods prevention of corrosion and proper operation e presented. Linings for concrete sewers in- ded polyvinyl chloride and vitrified clay. Joint- materials were briefly discussed, as were vari- manhole designs and materials. Septic tanks cesspools were discussed for use in small tems where sewers were not installed. The use low regulators in sewers was also considered. llins-FIRL)
7-11500

. Ultimate Disposal Of Wastes

ECTION OF ACIDIC INDUSTRIAL WASTE O THE FLORIDAN AQUIFER NEAR BELLE ADE, FLORIDA: UPWARD MIGRATION D GEOCHEMICAL INTERACTIONS 1973-75,
logical Survey, Tallahassee, Fla. Water ources Div.
primary bibliographic entry see Field 5B.
-10870

-LEVEL MONITORING OF THE IN- ERATION OF ORGANIC CHLORIDE TE BY M/T VULCANUS IN THE THERN GULF OF MEXICO SHELL TE BURN NO. 2.
co Corp., College Station, Tex.
primary bibliographic entry see Field 5G.
-10885

TER QUALITY DATA DURING SEP- BER 10-13, 1974 AT WARD COVE AND GASS NARROWS, ALASKA.
ronmental Protection Agency, Anchorage, ka. Alaska Operations Office; Environmental ction Agency, Seattle, Wash. Region X.; and ronmental Protection Agency, Seattle, Wash. ysis Div.
rimary bibliographic entry see Field 5C.
10890

ROGEOLOGIC CONSIDERATIONS IN ID WASTE DISPOSAL,
nsin Univ., Madison. Dept. of Geology and ysics.
Born, and D. A. Stephenson.
l of Soil and Water Conservation, Vol. 24, March-April 1969. 4 p, 2 fig, 7 ref.

iptors: Hydrogeology, Groundwater geolo- *Groundwater, *Infiltration, Hydrologic t, *Infiltration rates, *Permeability, *Porosity, *Irrigation water, Soil texture, Soil saturation, *Soil water movement, *Waste water disposal, *Liquid wastes, Groundwater recharge, *Groundwater discharge, Storage capacity.
Identifiers: *Groundwater mounds.

The geologic conditions controlling infiltration, flow and storage of municipal and industrial liquid wastes, when disposed of through irrigation, are reviewed. The irrigation disposal of liquid wastes aims to achieve secondary benefits while guarding against possible pollution of groundwater supplies. For efficient management of an irrigation system the ground water flow patterns must be identified, a pattern determined by topography and soil-rock conditions. Infiltration capacity is controlled by: disposition of discharge and recharge points in the flow system; the nature of pore space, depth to impermeable zones, and texture of ground surfaces; degree of soil saturation; velocity of water within the saturated zone. Calculating the velocity of effluent movement allows prediction of the time required for decay of groundwater mounds built up during irrigation. Zones of increased weathering, solution and high permeability are often localized along geologic fractures. (Gentry-NC)
W77-10926

EFFECT OF SEDIMENT ORGANIC MATTER ON MIGRATION OF VARIOUS CHEMICAL CONSTITUENTS DURING DISPOSAL OF DREDGED MATERIAL,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 5B.
W77-10937

DREDGED MATERIAL AS A NATURAL RESOURCE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
M. R. Walsh.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 103, No WW3, Proceedings Paper 13148, p 309-319, August 1977. 4 fig, 1 tab, 6 ref, 1 append.

Descriptors: *Dredging, *Land use, *Natural resources, Recreation facilities, Projects, Reclamation, Recreation, Water management(Applied), Spoil banks, Waste disposal, Environmental effects, Environment.
Identifiers: *Dredged material, *Dredges, Environmental impact statement.

The Corps of Engineers conducted research on use of dredged material as a manageable natural resource. Historically, dredged material produced as a result of dredging operations to maintain the Nation's navigable waterways had been considered strictly a waste product. The concern about the environmental effects of the disposal of dredged material and the need to use all resources efficiently changed the perspective towards dredged material so that it is viewed as a potentially productive natural resource. To foster the new philosophy, the Productive Uses Project was included as an integral part of the Dredged Material Research Program that was conducted at the Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. The objectives of the project were to identify and to assess concepts for the productive use of dredged material or disposal sites, or both, and to develop workable systems applicable to dredging projects both within and outside of the Corps. (Roberts-ISWS)
W77-10962

MIGRATION OF LANDFILL LEACHATE THROUGH GLACIAL TILLS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5B.
W77-10968

INITIAL DILUTION WITH DEEPWATER DIFFUSERS,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5B.
W77-10974

APPARATUS FOR DISPOSAL OF EFFLUENTS,
For primary bibliographic entry see Field 5D.
W77-11017

ANALYSIS OF BRINE DISPOSAL IN THE GULF OF MEXICO. (3) CAPLINE SECTOR,
National Oceanic and Atmospheric Administration, Washington, D.C. Center for Experiment Design and Data Analysis.
C. A. Burroughs (Ed.).
NOAA Environmental Data Service Report to Federal Energy Administration Strategic Petroleum Reserve Program Salt Dome Storage, May 1977. 200 p, 54 fig, 18 tab, 107 ref, 4 append.

Descriptors: *Brine disposal, *Gulf of Mexico, *Environmental effects, *Water quality, *Baseline studies, Water resources, *Louisiana, *Meteorological data, Ecology.
Identifiers: *Outer Continental Shelf, *Oceanographic data, Environmental conditions, Resources management.

In implementing the Strategic Petroleum Reserve (SRP) Program, the Federal Energy Administration (FEA) proposes to use storage caverns leached out of salt domes in the Capline Sector at Weeks Island and Chacahoula along the Louisiana Coast. Discharge into the Gulf of Mexico is an alternative under consideration for disposal of the saturated brine to be produced as additional caverns are solution-mined. This report examines the potential environmental impact of this brine disposal alternative. Included is an extensive summary of physiographic, meteological, and oceanographic conditions in the Capline Sector; a comprehensive review of ecological conditions in the area; analysis of the dispersion of salt brine to be discharged at several locations offshore, under different environmental conditions and for selected diffuser designs; general criteria for a brine diffuser for each of the two sites under consideration; and the potential impact of brine due to osmotic stress. (NOAA)
W77-11049

HYDRAULIC AND THERMAL PROPERTIES OF A SANDY SOIL AS INFLUENCED BY INCORPORATION OF SEWAGE SLUDGE,
Minnesota University, St. Paul; and Agricultural Research Service, St. Paul, Minn.
For primary bibliographic entry see Field 5B.
W77-11236

COLUMNS REPRESENTING MOUND-TYPE DISPOSAL SYSTEMS FOR SEPTIC TANK EFFLUENT: II. NUTRIENT TRANSFORMATIONS AND BACTERIAL POPULATIONS,
Vermont Univ., Burlington.
For primary bibliographic entry see Field 5D.
W77-11369

OCEAN DUMPING--PART 3 (OVERSIGHT OF THE MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972, AND INVESTIGATING THE WASTE DISPOSAL IN THE NEW YORK AREA),
For primary bibliographic entry see Field 6E.
W77-11451

OCEAN DUMPING,
Health Effects Research Lab., Cincinnati, Ohio. Water Quality Div.
For primary bibliographic entry see Field 5G.
W77-11469

SLUDGE DIGESTION AND DISPOSAL.
In: 1977 Public Works Manual and Catalog File, Billings, C. H., Conner, S. H., and Kircher, J. R., editors, p D38-D49, 1977. 3 fig.

Descriptors: *Sludge digestion, *Sludge disposal, Anaerobic digestion, Aerobic treatment, Pathogens, Biological treatment, Gases, Heat treatment, Filtration, Instrumentation, Chemical treatment, Dewatering, Drying, Fertilizers, Equipment, Incineration, Oxidation, Design.
Identifiers: Sludge conditioning, Composts, Wet-air oxidation.

Various processes for the digestion and disposal of sludge was presented. Though anaerobic digestion is the traditional means of organic matter stabilization, the required long detention times have produced certain nuisances, such as a liquid fraction which is difficult to handle. Aerobic digestion is most feasible at small plants, but both processes produce the problem of solids disposal. Means of combating these treatment problems include thickening, conditioning, stabilization, dewatering, heat drying, reduction, and final disposal by ocean dumping, subsurface injection, cropland applications, landfilling, and power generation. Pyrolysis may be a disposal solution for urban centers. Aspects of anaerobic digestion covered were tank design and capacity, biological action, sludge handling, gas collection, supernatant disposal, and mixing and scum breaking. The process of aerobic digestion and utilization and storage of resultant gases was described. A method of chemical stabilization was reviewed, and dewatering by air drying and vacuum filtration was assessed. Composting, sludge shredding, flash or spray drying, and rotary drying were presented. Disposal by incineration through wet-air oxidation and the use of fluidized beds were also discussed. (Collins-FIRL)
W77-11496

5F. Water Treatment and Quality Alteration

SIMULATION AIDED MODELING OF THE DYNAMIC BEHAVIOR FOR SOME ELEMENTS OF A SURFACE WATER TREATMENT PLANT,
Philips Forschungslaboratorium G.m.b.H., Hamburg (West Germany).
M. Klinck.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 467-475, 1975. 8 fig, 5 ref.

Descriptors: *Simulation analysis, *Water treatment, *Treatment facilities, *Control, *Behavior, Surface waters, Physics, Hybrid computers, Reservoirs, Storage, Flow, Ionization, Projects, Mathematical models, Systems analysis.
Identifiers: Sandfilters, Ionizer station, Simulation language.

For the instrumentation and control of a complex water treatment plant, in a first step, information concerning the dynamic behavior of the incorporated elements is obtained using simulation and a hybrid computer. The models of the elements--rapid sandfilters, storage reservoirs, and pumping stations--are derived with the corresponding physics as a background. To these element models, the appropriate controller models are added, and the results of the investigations on the dynamic behavior are reported. Finally, the behavior of the complete system is demonstrated for level control and flow control concepts. Considered is the appropriate simulation language for the task at hand. (See also W77-10806) (Bell-Cornell)
W77-10815

SIMULATION AND OPTIMISATION OF A BIOLOGICAL WATER TREATMENT PLANT,
Eidgenoessische Technische Hochschule, Zurich (Switzerland); and Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5D.
W77-10816

SAFE DRINKING WATER ACT OF 1974--HISTORY AND CRITIQUE,
For primary bibliographic entry see Field 5G.
W77-10923

WATER FILTER DEVICE,
Gelman Instrument Co., Ann Arbor, Mich.
C. Gelman, and A. Vadnay.
U.S. Patent No. 4,001,120, 6 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 954, No 1, p 297, January 4, 1977.

Descriptors: *Patents, *Water quality control, *Water purification, *Filtration, Separation techniques, Filters, Domestic water, Water quality, Water treatment.

A water filtering device for attachment to a faucet comprises a generally tubular passage with an inlet for water from the faucet at its upper end and an outlet for water at the lower end. An annular water filtering chamber surrounds the passage. A valve causes water to flow from the passage into and through the filtering chamber and then back into the passage and out of the water outlet. A filter is provided for the filter chamber which provides highly pure water while at the same time providing extended useful filter life. (Sinha-OEIS)
W77-10993

PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER FROM AQUEOUS WASTES,
Hanover Research Corp., East Hanover, N.J. (Assignee).
For primary bibliographic entry see Field 5D.
W77-11011

OZONE OXIDATION OF WASTE WATER,
Cubic Corp., San Diego, Calif. (Assignee).
For primary bibliographic entry see Field 5D.
W77-11014

REACTOR FOR PURIFICATION OF WATER BY FLUID FILTRATION,
Agrotechnika, Narodyn Podnik, Zvolen (Czechoslovakia). (Assignee).
S. Mackrle, V. Mackrle, and O. Dracka.
U.S. Patent No. 4,008,153, 5 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 955, No 3, p 934, February 15, 1977.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, Filtration, Flow, Flocculation, Equipment, Waste water treatment.
Identifiers: Homogenation.

A reactor for purification of water by fluid filtration is designed for chemical purification of water with homogenization of the created floccular suspension and with separation of this suspension by fluid filtration. The reactor comprises a tank with a vertical axis, in which homogenizing, separating and thickening spaces are formed by inserted walls. The homogenizing space is situated at the bottom of the tank and has the shape of an upturned diffusor. The water flows upwards and in the homogenizing space passes over at the top through a passage for the treated medium into a separating space. The separating space has the shape of a diffusor and is situated above the homogenizing space. The thickening space is defined by walls of both the homogenizing and separating diffusors and the wall of the reacto tank and is connected with the upper part of th separating space by a passage for the treated med um. (Sinha-OEIS)
W77-11016

PROCESS FOR SCALE INHIBITION,
Nalco Chemical Co., Oak Brook, Ill. (Assignee).
J. D. Watson, and J. R. Stanford.
U.S. Patent No. 4,008,164, 4 p, 9 ref; Offici Gazette of the United States Patent Office, Vo 955, no 3, p 938, February 15, 1977.

Descriptors: *Patents, *Water treatment, *Wat purification, *Scaling, Calcium, Descaling, Inhil tors, Industrial water, Cooling water.

Copolymers of acrylic acid and methyl acryla are prepared which are stable against precipitati in waters containing calcium even at a pH of and at elevated temperatures and are especial useful in inhibiting the deposition of calcium fr waters containing calcium, in underground form tions, in cooling waters and other processes whe it is desirable to prevent calcium deposits on me surfaces or other surfaces in contact with wa containing calcium. (Sinha-OEIS)
W77-11021

SOLAR PONDS AS HEAT SOURCE FOR LO TEMPERATURE MULTI-EFFECT DISTILL TION PLANTS,
Hebrew Univ., Scientific Research Foundati Jerusalem (Israel).
For primary bibliographic entry see Field 3A.
W77-11119

5G. Water Quality Control

A WASTE CONTROL PROGRAM FOR RIVER WITH HIGHLY VARIABLE CONCE TRATION OF CONSERVATIVE SUBSTANCE
Hydraulic Research Inst., Brno (Czechoslovaki V. Hrazdil.
In: Proceedings of the IFIP Working Confere on Computer Simulation of Water Resour Systems. G.C. Vansteenkiste (Ed.), Ghent, Be um, July 30-Aug. 2, 1974. American Elsev Publishing Company, Inc., New York, N.Y. 453-456, 1975. 2 fig, 4 ref.

Descriptors: *Rivers, *Water pollution cont *Streams, Computer models, Equations, Dig computers, Networks, Measurement, Mine wa Discharge(Water), Sulfates, Optimization, Syst analysis.
Identifiers: Conservative pollutants, Newt Raphson technique, DSCT method.

Water quality in streams seems to be highly fected by wastewater discharges. Herein, problem of mathematical modeling of vari stream pollution by conservative pollutants (i decaying substances) is solved. A partial ferential equation describing water qu changes in time and space in a stream represen parabolic type with one space variable. Using DSCT method known for hybrid computer gramming, the partial differential equation adapted to an equation system. The problem solved on a digital computer with the aid of a routine based on a Runge-Kutta formula. A pr cal example involves a variable sulphate-con tration caused by highly mineralized mine w discharges. The mathematical model of conse tive pollutants based on the optimization parameters enabled one to perform a measuren analysis of the water quality in streams. Calc tion of the longitudinal dispersion coefficient described, and the solution was based on the N ton-Raphson iterative technique. (See also W 10806) (Bell-Cornell)
W77-10813

DESCRIPTION OF AN INTENDED PROJECT ON WATER QUALITY ESTIMATION,
Eidgenoessische Technische Hochschule, Zurich (Switzerland); and Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5B.
W77-10817

SYSTEMS ANALYSIS, (LITERATURE REVIEW),
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W77-10832

CONTROL OF WATER QUALITY IN POLLUTED STREAMS,
Alberta Univ., Edmonton. Dept. of Electrical Engineering.
V. Gourishankar, and K. Ramar.
International Journal of Systems Science, Vol. 8, No. 5, p 575-585, May 1977. 8 fig, 11 ref.

Descriptors: *Water quality control, *Streams, *Dissolved oxygen, Aeration, Simulation analysis, Biochemical oxygen demand, Computer models, Design, Upstream, Equations, Mathematical models, Systems analysis.
Identifiers: *Pole assignment technique, Eigenvalue sensitivity functions, Effluent discharge.

A technique familiar to control system engineers, namely pole assignment, is used to design a controller for maintaining the concentration of dissolved oxygen in a polluted stream at a desired level. Artificial in-stream aeration and volumetric flow rate of effluent discharge are used as the controls. Since the model parameter values are affected by the controls, and since all the states are not available for feedback, the pole-assignment technique described herein uses output feedback and minimizes the sensitivity of the poles to parameter variations. Computer simulation results are included. The scheme presented is shown to yield significantly better results compared to two other schemes--constant two-control scheme, and the scheme using a variable effluent discharge rate as the only control. (Bell-Cornell)
W77-10834

OPTIMAL ALLOCATION OF ARTIFICIAL IN-STREAM AERATION,
Consiglio Nazionale delle Ricerche, Milan (Italy). Centro di Teoria dei Sistemi.
A. Rinaldi, and R. Soncini-Sessa.
Research Report RR-77-7, International Institute for Applied Systems Analysis, Laxenburg, Austria, April 1977. 18 p, 6 fig, 11 ref.

Descriptors: *Water quality control, *Aeration, River basins, *Dissolved oxygen, *Standards, Economic efficiency, Optimization, Dynamic programming, Algorithms, Low flow, Food chains, Constraints, Economies of scale, Tributaries, Equations, Mathematical models, Systems analysis.
Identifiers: Cost minimization, Differential equations.

Presented are some simple properties of the problem of optimal allocation and design of a system of mechanical surface aerators able to attain a given dissolved oxygen (DO) standard during periods of low flow and high temperature. These properties are shown to be valid for an extremely wide class of river quality models including all currently used models. It is demonstrated how these properties can be usefully employed to simplify the allocation problem by breaking it down into a set of simpler problems and to improve the efficiency of an already proposed solution algorithm based on dynamic programming. The optimal control problem is one of determining the number of units to be used, their location, and their power, which is a function of the DO increment, in such a way that the DO standard is not violated at any point in a given river stretch and that the total aeration cost is minimized. Once the steady state design conditions are fixed, a river quality model can be selected to describe the system. Finally, a method is suggested for dealing with the allocation problem for a whole basin composed of a main stream and its tributaries; the new aspect here is the existence of confluence points where two streams come together and form a larger one. In formulating the optimal control in-stream aeration problem described by differential equations, two properties are proved for a constant flow rate: (1) all aerators must be located where the DO level is equal to the standard; and (2) one need not account for the whole river, but rather suitable segments of it. (Bell-Cornell)
W77-10835

ENVIRONMENTAL MODELING AND DECISION MAKING: THE UNITED STATES EXPERIENCE.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 6A.
W77-10839

INDEX OF LAKE BASIN LAND USE FOR LAND USE PLANNING PURPOSES,
Vermont Agricultural Experiment Station.
F. O. Sargent, and F. J. Zayac.
Water Resources Bulletin, Vol 13, No 2, p 365-372, April 1977. 4 tab, 16 ref. OWRT A-019-VT(2) and C-5342(4240)(3).

Descriptors: *Water resources, *Planning, *Water quality, *Land use, *Lake basins, *Lake shores, Measurement, Watersheds(Basins), Eutrophication, Pollutants, Sewage disposal, Nutrients.
Identifiers: *Land classification, Rating, Lake vulnerability, Public use areas, Road location, Lot size, Forested land.

In order to plan for land use in a lake basin to maintain or improve lake water quality, municipal planners need a method of evaluating lakeshore and watershed land use that is technically sound, objective, reasonably quick, and cheap enough to be incorporated into their time and dollar budgets. Such a system is presented herein. It consists of measuring and rating four lakeshore land use characteristics (type of sewage disposal system, lot size, road proximity, and intensity of public use areas), and three upland watershed land use characteristics (intensity of development, forest cover, and agriculture and open space). These seven characteristics are measured, rated, and then combined to provide a two-digit index number. This number, when compared with the indexes of the other lakes in the region and interpreted with assistance from officials of the State Health and Water Resources Department, indicates on a relative basis the degree to which various land uses are contributing to accelerated, cultural eutrophication. Interpretation of the index suggests land use controls necessary to improve lake water. It supplements, and should be used with, an index of lake vulnerability to accelerated eutrophication and a comparative measure of present water quality. (Bell-Cornell)
W77-10852

REDESIGN, FABRICATION AND TEST OF A 1000-GPM HIGH SEAS OIL RECOVERY SYSTEM AND DESIGN ONLY OF A 500-GPM HIGH SEAS OIL RECOVERY SYSTEM,
Ocean Systems, Inc., Reston, Va.
T. N. Blockwick, and R. J. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A023 534, Price codes: A04 in paper copy, A01 in microfiche. Coast Guard Final Report No. CG-D-182-75, June 1975. 108 p, 4 fig, 5 tab, 5 append. DOT-CG-226-A.

Descriptors: Water quality control, *Oil spills, *Water pollution control, *Oil pollution, Skimming, Equipment, Weirs.
Identifiers: *Outer Continental Shelf, *Oil recovery systems.

The redesign, fabrication and test of a 1000-GPM high seas oil recovery system is reported. The design of a 500-GPM oil recovery system is also discussed. The system was built primarily from the components of the 2000-GPM system. Modification, improvements and some redesign were incorporated in this unit based on previous basin and at-sea tests. Changes were made primarily in the weir/basin and included the elimination of the trailing hoses. Limited oil collection tests in an inland tow tank and at-sea tests in the ocean were conducted using the 1000-GPM system. The oil recovery system consists of a weir/basin recovery unit, a pumping and power system, a control system, and handling and packaging components. The weir/basin recovery unit contains primary and seconary weirs for oil collection. Both weirs are supported by discrete foam flotation elements which allow the unit to be highly surface-conforming. (Sinha-OEIS)
W77-10879

EVALUATION OF A PASSIVE MICROWAVE TECHNIQUE FOR THE MEASUREMENT OF OIL FILM THICKNESS IN A TEST TANK ENVIRONMENT,
Naval Research Lab., Washington, D.C. Advanced Space Sensing Applications Branch.
For primary bibliographic entry see Field 5A.
W77-10880

MARINE ENVIRONMENTAL PROTECTION PROGRAM: AN ANALYSIS OF MISSION PERFORMANCE.
Coast Guard, Washington, D.C. Marine Environmental Protection Div.
Available from the National Technical Informational Service, Springfield, VA 22161 as AD-A025 325, Price codes: A12 in paper copy, A01 in microfiche. Report No CG-WEP-1/76, August 1975. 269 p, 16 fig, 28 tab, 12 ref, 6 append.

Descriptors: *Water pollution control, *Oil spills, *Oil pollution, *Monitoring, *Performance, Resources development, Statistics.
Identifiers: *Outer Continental Shelf, Resources management.

USCG oil pollution statistics and analyzed and effectiveness measures and performance standards for the USCG Marine Environmental Protection program are established. The study is divided into four major sections. In the Introduction the complexity and background of the problem is addressed. Section II, Oil Pollution in the United States, provides a complete statistical description of the oil pollution problem the standards are designed to solve. The information presented is extracted from the U.S. Coast Guard Pollution Incident Reporting System (PIRS), the most comprehensive oil pollution data base in the world. The fact that the activities prescribed by the standards are aimed at significant sources and causes of pollution can be inferred from these statistics. The analysis of the standards and proposed revisions are contained in Section III. Section IV, Resource Determination and Methodology, shows how the standards are used to determine resource requirements and how the results of the analysis of Section III can be utilized in a sophisticated resource allocation model. (Sinha-OEIS)
W77-10882

AN ANALYSIS OF COASTAL ZONE MANAGEMENT PROGRAM PROPOSALS TO DETERMINE THEIR EFFECT ON THE UNITED STATES AIR FORCE,
Air Force Inst. of Tech., Wright-Patterson A.F.B., Ohio. School of Systems and Logistics.
E. R. Beachem, and J. D. Davenport.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 245, Price codes: A05 in paper copy, A01 in microfiche. Master's Thesis No SLSR-33-76A, June 1976. 79 p, 18 ref.

Descriptors: *Coasts, *Management, *Water quality control, Water resources, *Resources development, Delaware, Maryland, South Carolina, Virginia, Washington, Florida, California.
Identifiers: *Outer Continental Shelf, *Coastal zone management, Resources management.

The objective of this study was to analyze the individual states' Coastal Zone Management Program proposals and from these analyses develop guidelines to be used by any USAF coastal zone base's Civil Engineer (CE) in analyzing that state's coastal zone management program. These guidelines would also enable that base's CE to convey the USAF's requirements to the state agency responsible for the coastal zone program during the program's earliest conceptual planning stage. The purpose of the guidelines is to insure that the USAF national defense mission is not impaired by that program and to minimize any adverse effect on the mission support functions. The coastal zone management program proposals were analyzed to determine their general scope and objectives. Primary areas analyzed were (information permitting): (1) the limitations placed on natural resources, including water, fuel sources, and vegetation, (2) additional pollution control required over existing pollution control legislation, including water, air, sewage treatment, and noise, (3) restriction on land use, water use, and master planning, (4) coordination required between USAF and state agencies prior to any development activity, and (5) identification of the coastal zone boundaries. (Sinha-OEIS)
W77-10883

SEA-LEVEL MONITORING OF THE INCINERATION OF ORGANIC CHLORIDE WASTE BY M/T VULCANUS IN THE NORTHERN GULF OF MEXICO SHELL WASTE BURN NO. 2.
Tereco Corp., College Station, Tex.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 365, Price codes: A04 in paper copy, A01 in microfiche. Report to The Environmental Protection Agency, January 10, 1975. 62 p, 9 fig, 9 tab, 2 append. EPA Contract 68-01-2829.

Descriptors: *Waste disposal, *Organic wastes, *Water pollution control, *Water quality control, Waste treatment, *Monitoring, Gulf of Mexico, Burning, Incineration.
Identifiers: *Outer Continental Shelf, Ocean dumping, Vinyl chloride.

The burning of the organic chloride wastes derived from the Shell Deer Park Complex by M/T VULCANUS caused no detectable changes in the waters of the Gulf of Mexico that would be harmful to the marine biota. This conclusion is based upon the facts that no signficant differences were found between the pH and chlorinity values of the test and associated control runs, even though the tests were sufficiently discriminatory as to (a) delineate differences in sampling techniques (selective vs. random sampling) and (b) to detect differences in day and night CO2 content of the waters. Although it is suggested that the technique for determination of possible long-range effects can be improved in future monitoring programs, it is concluded that incineration at sea is the most effective method now available for the relatively harmless disposal of organic chloride and related wastes. (Sinha-OEIS)
W77-10885

OIL SPILL AND OIL POLLUTION REPORTS, FEBRUARY 1975 - APRIL 1975,
California Univ., Santa Barbara. Marine Science Inst.
F. A. DeWitt, Jr., and P. Melvin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 724, Price codes: A11 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Quarterly Report No. EPA-670-2-75-059, June 1975. 246 p. R-803063.

Descriptors: *Oil pollution, *Oil spills, *Bibliographies, *Patents, *Water pollution effects, *Baseline studies, Environmental effects, *Biodegradation, Microbial degradation.
Identifiers: Environmental impact.

The purpose of the 'Oil Spill and Oil Pollution Reports' series is to present a concise, comprehensive information source on oil pollution events, current research and oil pollution related publications. This is the third quarterly edition. Included are bibliographic citations and summaries of articles from the scientific and technical literature, the status and results of Current Research Project entries, additional Current Research Projects and oil pollution related patents. (Sinha-OEIS)
W77-10891

INTRODUCTION: RATIONALE, OBJECTIVES AND LOGISTICS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10894

SEASONAL VARIATION IN THE NUTRIENT CHEMISTRY AND CONSERVATIVE CONSTITUENTS IN COASTAL ALASKAN BEAUFORT SEA WATERS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10899

A SUMMARY OF OBSERVATIONS OF BIRDS AT OLIKTOK POINT AND NOTES ON BIRDS OBSERVED ALONG THE COLVILLE RIVER--SUMMER 1971,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10903

COASTAL ZONE POLLUTION IN INDONESIA WITH EMPHASIS ON OIL. A RECONNAISSANCE SURVEY.
Lembaga Minyak Dan Gas Bumi, Djakarta (Indonesia).
For primary bibliographic entry see Field 5B.
W77-10907

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE. SPEC. REPT. III: A METHODOLOGY FOR INVESTIGATING FRESH WATER INFLOW REQUIREMENTS OF A TEXAS ESTUARY, VOLUME II--APPENDICES,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 2L.
W77-10908

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 9D.
W77-10917

SAFE DRINKING WATER ACT OF 1974--HISTORY AND CRITIQUE,
T. J. Douglas.
Environmental Affairs, Vol. 5, p 501-543, Summer 1976.

Descriptors: *Potable water, *Legal aspects, *Environmental sanitation, *Water purification, Public health, Domestic water, Water quality standards, Regulation, Water pollution, Human diseases, Water pollution effects, Financing, Research and development, Water law, Legislation.
Identifiers: *Safe Drinking Water Act of 1974, *Drinking water standards, Enforcement, Contamination standards, Implementation.

This article examines the problems which provided the incentive for increased Federal involvement in public water systems, culminating in the enactment of the Safe Drinking Water Act (SDWA). The article also examines the role of the Federal government as the assuror of safe drinking water. The incidence of waterborne disease which led to the establishment of the Public Health Service and to the promulgation of drinking water standards are discussed, as are the limitations of the drinking water standards. The re-emergence of concern over drinking water quality in the 1960's is examined. The Congressional deliberations which preceded passage of the SDWA revolved around three programs, including Federal research and drinking water standards, enforcement of contamination standards, and Federal financial assistance. The arguments for and against each program are considered. The major provisions of the SDWA are enumerated. The limitations of the Act as it has been implemented by EPA are analyzed. Provisions of the Act considered crucial to achievement of its objectives include development and subsequent revision of the primary regulations, public notification of systems failing to comply with the primary standards, and EPA oversight of state water supervision programs where the state has primary enforcement responsibilities. (Nessa-NC)
W77-10923

NATIONAL ENVIRONMENTAL POLICY COORDINATION OR CONFUSION,
North Texas State Univ., Denton.
For primary bibliographic entry see Field 6E.
W77-10927

IMPACT ON TEXAS WATER QUALITY AND RESOURCES OF ALTERNATE STRATEGIES FOR PRODUCTION, DISTRIBUTION, AND UTILIZATION OF ENERGY IN TEXAS IN THE PERIOD 1974-2000,
Texas Univ. at Austin.
For primary bibliographic entry see Field 5C.
W77-10930

THE INTERRELATIONSHIP OF MATERIAL TOXICITY STREAM PROPERTIES AND QUANTITY OF SPILLED MATERIAL IN ASSESSING THE RISK OF HAZARDOUS MATERIAL SPILLS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-10938

STRIP MINING (CITATIONS FROM THE NTIS DATA BASE).
National Technical Information Service, Springfield, Va.
Available from the National Technical Information Service, Springfield, VA 22161 as NTIS/PS-76/0810, Price codes: A99 in paper copy, A99 microfiche. Report NTIS/PS-76/0810, October 1976. 206 p, 206 ref. A.S. Hundemann, editor.

Descriptors: *Abstracts, *Strip mines, *Strip mi wastes, *Mining, Environment, Environmen control, Land reclamation, Land managemen Mining engineering, *Legal aspects, *Economic

Safety, Remote sensing, *Strip mine lakes, *Bibliographies, Water pollution.

Abstracts primarily pertaining to environmental impacts, land reclamation, and satellite remote sensing of mines are presented. A few abstracts deal with mining equipment, legal factors, economics, and safety aspects of strip mining. (This updated bibliograhy contains 206 abstracts, 60 of which are new entries to the previous edition.) Search period covered 1964 to September 1976. (Katz)
W77-10939

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: MERCAPTOBENZOTHIAZOLES,
Syracuse Research Corp. N.Y.
For primary bibliographic entry see Field 5C.
W77-10940

NITRATES IN EFFLUENTS FROM IRRIGATED LANDS - ANNUAL REPORT,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-10941

TROUGH CREEK LIMESTONE BARRIER INSTALLATION AND EVALUATION,
Africa Engineering Associates, Inc., Huntingdon, Pa.
S. C. Yocum.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 766, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Protection Technology Series, Report EPA 600/2-76-114, May, 1976. 92 p, 13 tab, 29 fig, 3 ref.

Descriptors: *Acid mine waters, Acidic water, Acidity, *Pennsylvania, Water pollution effects, Iron, *Limestone, *Mine acids, *Mine wastes, Mine drainage, Neutralization, Hydrogen ion concentration, Stream improvement, Streamflow, Water pollution treatment.
Identifiers: *Acid mine drainage, *Limestone barriers, *Crushed limestone, Low-iron acidic streams.

Six prototype crushed limestone barrier installations were constructed in Trough Creek in South Central Pennsylvania to demonstrate the neutralizing ability of this type structure in low-iron acidic streams. The project included a stream gaging and sampling program to evaluate the effectiveness of limestone barrier performance under actual stream conditions, and to assess the adequacy of design relationships developed from laboratory research. Limestone barrier performance was excellent during periods of low streamflow, in terms of reducing acidity and raising the pH of the water, but their effectiveness was marginal at design or average streamflow, and they were ineffective when high runoffs were experienced. Limestone barrier performance deteriorates after the structures are initially constructed and placed in operation, because progressive accumulations of sediment clog interstices between the stones, which decreases the hydraulic conductivity of the barriers, and surfaces of the stones become coated with silt, which causes a reduction in reactivity of the rock (limestone) with flowing acidic water. The design of limestone barriers should take these factors into account, and the units should be sized sufficiently large to overcome this deficiency. (Katz)
W77-10943

HAZARDOUS WASTES: A RISK-BENEFIT FRAMEWORK APPLIED TO CADMIUM AND ASBESTOS.
Stanford Research Inst., Menlo Park, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 951, Price codes: A12 in paper copy, A01 in microfiche. Environmental Protection Agency, Socioeconomic Environmental Studies Series, Report EPA 600/5-77-002, February, 1977. 75 p, 16 tab, 26 fig, 92 ref.

Descriptors: *Asbestos, *Cadmium, *Risks, *Decision making, *Hazards, Wastes, Environment, *Public health, Social impact, Political aspects, Political constraints, Benefits, Landfills, Bibliographies.
Identifiers: Social welfare, Tradeoff, Hazardous waste standards, Land waste disposal problems, Alternative waste control measures, *Environmental disposal mechanisms, *Human exposure, Equity distribution, Social acceptance, *Risk/benefit relationships.

This study develops a decision framework for evaluating hazardous waste standards in terms of social risks and product benefits. The analysis focuses on cadmium and asbestos as examples of land waste disposal problems, but it also estimates waste quantities in air and water. Effects of uncertainties in the individual estimates on overall confidence limits, resultant decision criteria, and research needs are evaluated. The approach encompasses the full chain of variables leading to decision criteria, including (1) wastes escaping into the various media from each step in the hazardous material flow process, including extraction, refining, manufacturing, use, and disposal; (2) cost and effectiveness of alternative waste control measures; (3) their economic, employment, and balance-of-trade effects; (4) environmental dispersion mechanisms; (5) human exposures, dose-damage relationships, and resultants mortalities; (6) risk/benefit relationships; and (7) equity distribution, social acceptance, and other independent criteria. An extensive bibliography is included. (Katz)
W77-10959

WATER FILTER DEVICE,
Gelman Instrument Co., Ann Arbor, Mich.
For primary bibliographic entry see Field 5F.
W77-10993

ACOUSTIC METHOD FOR DETECTING LEAKS FROM SUBMERGED PIPELINES,
Exxon Production Research Co., Houston, Tex. (Assignee).
W. E. Holland, and G. R. Burrell.
U.S. Patent No. 4,001,764, 5 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 954, No 1, p 485, January 4, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution sources, *Water pollution control, Water quality control, Acoustics, Pipelines, Sonar, Leakage.
Identifiers: Submerged pipelines, Outer Continental Shelf.

This invention concerns the detection of liquids leaking from submerged pipelines. The detection function is predicted on the difference in acoustic properties between seawater and the foreign liquid material, such as hydrocarbon liquids (crude oil) escaping from a submerged pipeline. To enhance the detection technique gas such as gaseous hydrocarbons, air, nitrogen or CO2 etc. and/or liquid such as fresh water, alcohol etc., may be introduced into the pipeline. The introduced gases and/or liquids escape through the leak into the seawater along with the liquid being conducted through the pipeline to provide a greater difference in acoustic impedance between seawater and the leaking gas and/or liquids than would be provided by the liquid alone. Sonar reflecting targets or transponders are prelocated along the submerged pipeline to direct the survey path of the sonar along the pipeline. Also, fluids (liquid and/or gas) leaks in a pipeline may be located by comparing 'leak' and 'no-leak' sonar scans of the pipeline. (Sinha - OEIS)
W77-10995

STUDY OF MINERALIZATION IN AN AGRICULTURAL SOIL OF RESIDUAL MUDS OF VARIOUS ORIGINS, (IN FRENCH),
Ecole Nationale Superieure d'Agronomique et des Industries Alimentaires de Nancy (France). Laboratoire Matiere Org. Environ.
J. L. Morel, and F. Jacquin.
Bull Ec Natl Super Agron Ind Aliment 18(1/2), p 81-90, 1976.

Descriptors: Mineralogy, Soils, *Muds, Soil stabilization, *Microbial degradation, Flocculation, Carbon dioxide, Biodegradation.
Identifiers: *Mineralization, *Residual muds.

Residual muds do not behave as a biologically inert material when they are incorporated in agricultural soil. Their effect on mineral activity is significant and positive: release of CO2 is not substantially inhibited. Muds added to the soil produce the same microbial reaction as natural organic materials, judging by the release of CO2. Different muds have different biological activities. This variation is due to the origin of the water used. Muds from dairy industry activities are degraded in the soil more rapidly than those from urban water purification plants. The technology of mud treatment (stabilization, flocculation, drying) also effect the soil reaction. Lime flocculation of the mud unfavorably affects biodegradation.--Copyright 1977, Biological Abstracts, Inc.
W77-10998

OIL ABSORBENT MATERIAL AND METHOD OF OIL REMOVAL,
Owens-Corning Fiberglass Corp., Toledo, Ohio. (Assignee).
R. E. Langlois, and C. R. Morrison.
U.S. Patent No. 4,006,079, 5 p, 4 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 955, No 1, p 206, February 1, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Water quality control, Oil spills, *Absorption, Application methods.
Identifiers: Fiber glass mats.

A method of removing oil from the surface of water contaminated with oil is comprise of floating elongated blankets of non-woven, discontinuous glass fibers on the surface to absorb the oil. The glass fibers are sprayed with phenolformaldehyde as a binder and also sprayed with silicone as a hydrophobic oleophilic agent solely before curing the binder. The binder is cured and the fibers are bonded to each other to form the blankets. Each blanket has a width of from one to three feet and a length in excess of ten times the width. It is capable of being fed lengthwise onto the surface of oil-contaminated water. The voids present between the fibers are in sufficient numbers and of such a size to enable the blanket to absorb oil in an amount over thirty times its weight. It is reinforced with woven scrim having tensil strength sufficient to enable it to be pulled lengthwise from the surface of the water when soaked with oil. (Sinha-OEIS)
W77-11002

METHOD FOR PREVENTING GELATION OF THERMOSETTING RESINS IN WASTE WATER,
Sumitomo Durez Co. Ltd., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W77-11004

PROCESS FOR EMERGENCY SMALL SPILL CONTROL,
Murphy-Pacific Marine Salvage Co., Emeryville, Calif. (Assignee).

D. E. Irons.
U.S. Patent No. 4,006,082, 8 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 955, no 1, p 207, February 1, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution sources, *Water pollution treatment, Water quality control, Barriers, Obstruction to flow.
Identifiers: Containment, Floating booms.

A floating sump is placed on the surface of the water near an oil spill for the collection of pollutants on the surface. A floating and flexible boom, dead ended to one side of the sump lip surrounds the spill. The boom is threaded through vertical take up rollers and then dead ended to the side of the small boat used for the control of the spill. Upon collection of the floating boom at the vertical take up rollers, collection and confinement of the pollutants to two confined areas occurs. The boom when collected, decreases the area forcing the collection of the pollutants to the sump lip. The solution inlet to a collecting pump is placed at an elevation with respect to the surface of the ambient waters so that collection of pollutants only occurs. Secondly, as the boom is passed from the sump to and beyond the sump, a second pollutant containment area is defined. This second pollutant containment area typically surrounds the residual non-collected pollutants. This second area may be subsequently cleaned by using towels on the surface of the water. By the process of manipulating the boom back and forth to define respective decreasing and increasing pollutant collection areas, collection by pumping or sponging can occur. (Sinha-OEIS)
W77-11005

APPARATUS FOR REMOVAL OF OIL FILMS FROM WATER,
Kabushiki Kaisha Kyoei Senpaku Kogyo, Yokohama (Japan). (Assignee).
I. Tsunoi.
U.S. Patent No. 4,006,086, 5 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 955, no 1, p 209, February 1, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water pollution control, *Water quality control, Oil spills, Separation techniques, Oil-water interfaces, Weirs, Equipment.

This invention relates to a device for recovery aboard a ship of oil floating on the surface of water while separating the oil from water. The object of the invention is to provide a floating oil recovery device which prevents the agitation and mixing of the oil with water at the time when the oil layer floating on the surface of the water flows into the oil dam, and makes it possible to recover the oil with high purity. The invention provides for a number of vertical holes, for separation and rectification of the oil and water, bridging between a barrier or dam section and an associated weir so that the oil layer is guided into a chamber formed ahead of the dam section along a guide plate while the water passes over the weir and flows into the lower section of the chamber past the vertical holes. Both the oil and water are separately sucked up by respective sucking means. (Sinha-OEIS)
W77-11007

DEVICE FOR SUCKING THE UPPER LAYER OF A POLLUTED WATER SURFACE,
L. Chastan-Bagnis.
U.S. Patent No. 4,008,156, 4 p, 3 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 955, No 3, p 935, February 15, 1977.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, *Oil pollution, Skimming, Floating.
Identifiers: Suction, Collectors, Floating pollutants, Hydrocarbons.

The device of the invention comprises a collector in the form of a scoop provided with two vertical sides. Between these two vertical sides and set back it is eventually possible to place one or more hollow bodies dividing the liquid stream by making it to pass into channels thus formed presenting a section called Venturi. In this zone the level of the polluted layer is substantially increased in the proportion of the flowing slowness. Above each of these particular zones there is a collecting trunk. The trunk is provided with a suction pipe which opens into a tight chamber wherein the polluted materials are stocked along with a certain quantity of water. In the chamber two masses are formed according to the decreasing order of specific gravity, i.e. from top to bottom, water and then the most frequently non-miscible hydrocarbons. A conduit opens into the chamber at the upper part which permits the evacuation by suction of the polluted bodies. (Sinha-OEIS)
W77-11018

TIME-STRESSED COASTAL ENVIRONMENTS: ASSESSMENT AND FUTURE ACTION.
Coastal Society, Arlington, Va.
Proceedings of Second Annual Conference of the Coastal Society held at New Orleans, LA, on November 17-20, 1976, 1976, 295 p. E. L. Pruitt, (Ed.).

Descriptors: *Water pollution, *Oil pollution, *Erosion, *Baseline studies, *Resources development, *Environmental effects, Water resources, Dredging, Coastal structures.
Identifiers: *Outer Continental Shelf, *Coastal zone management, Stressed environments.

A collection of papers constitutes the proceedings of the Second Annual Conference of the Coastal Society held in New Orleans, Louisiana on November 17-20, 1976. The subject of the proceedings, Time-stressed Coastal Environments encompasses the subject fields of coastal dredging, real estate development, hydrocarbon stress, pipelines, diking and groins, and current critical developments and issues. (See W77-11023 thru W77-11044) (Sinha-OEIS)
W77-11022

RELATIVE SIGNIFICANCE OF CONTEMPORARY DREDGING IMPACTS IN SAN DIEGO BAY, AN HISTORICALLY STRESSED ENVIRONMENT,
Smith (David D.) and Associates, San Diego, Calif.
D. D. Smith, and K. F. Graham.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 3-30, 8 fig, 36 ref.

Descriptors: *Dredging, *Environmental effects, *Resources development, *California, Water pollution, Baseline studies, Coasts, Bays.
Identifiers: *Outer Continental Shelf, Coastal zone, *San Diego Bay(Calif).

The significance of contemporary dredging impacts in San Diego Bay, in light of the heavily stressed environmental conditions which obtained in the bay for nearly a century prior to 1963 are qualitatively examined. The complex procedural mechanisms for regulating contemporary dredging work, using San Diego Bay as an example is reviewed. The major time and cost consequences of these regulatory controls by means of a current San Diego Bay case history is illustrated. The stresses to San Diego Bay were caused by four types of man's activities: diversion and damming of all principal tributary drainages with virtual elimination of fresh water input to the bay; dredging and filling; discharge of sewage and primary effluent, industrial wastes, and powerplant cooling water to the bay; and intensive urbanization of adjacent lands. (See also W77-11022) (Sinha-OEIS)
W77-11023

IMPACT OF DREDGING IN THE TAMPA BAY ESTUARY, 1976-1976,
Hillsborough Community Coll., Tampa, Fla.
For primary bibliographic entry see Field 5C.
W77-11024

CONTAINMENT SPOILING IN CENTRAL LONG ISLAND SOUND: AN EXAMPLE OF SHORT-TERM BIOLOGICAL ENHANCEMENT,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
D. C. Rhoads.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 56-69, 7 fig, 2 tab, 6 ref.

Descriptors: *Dredging, *Water pollution, *Resources development, *Environmental effects, *Productivity, *Baseline studies, Connecticut, New York, Invertebrates, Aquatic life.
Identifiers: *Outer Continental Shelf, *Long Island Sound, New York Bight, Ocean dumping, Spoil disposal.

Nineteen active spoiling sites located in Long Island Sound regularly receive dredge spoils from harbor maintenance projects principally from the Connecticut coast. The short-term effects of containment spoiling appears to favor a pioneering assemblage of near surface living invertebrates which feed at, or above, the bottom. Their life history features result in exponential rates of recruitment, culminating in a dense albeit transient assemblage of high species richness. Secondary productivity is high relative to the ambient (undisturbed) seafloor assemblage. In the absence of further disturbance, this biological enhancement is short lived. Because the survivorship of group I colonizers is short and group I species tend to over-exploit resources, the pioneering sere is unpredictable in both space and time. On the time scale of several years the density of organisms in the dump, as well as species number, is expected to have high variance relative to the ambient community. (See also W77-11022) (Sinha-OEIS)
W77-11025

DREDGING AND ITS IMPACTS ON UPPER CHESAPEAKE BAY: SOME OBSERVATIONS,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
J. R. Schubel, and A. D. Williams.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 70-115, 8 fig, 1 tab, 45 ref.

Descriptors: *Dredging, *Water pollution, *Baseline studies, *Resources development, *Environmental effects, *Chesapeake Bay, Maryland, Economics, Coasts.
Identifiers: *Outer Continental Shelf, Shipping, Coastal zone, Baltimore Harbor.

It is the purpose of this paper to assess whether or not shipping is an important and legitimate activity for the upper Chesapeake Bay; one that can be accommodated with acceptable risk to the environment and its biota through proper planning and management. Attention is focused on the dredging and disposal activities required to support this activity. In making this assessment the sedimentation processes that characterize the upper Bay are described, the magnitude and nature of dredging and disposal operations are reviewed, the impact these activities have had on the environment and its resources are assessed, and the economic importance of the Port of Baltimore to the City of Baltimore and to the State of Maryland is evaluated. (See also W77-11022) (Sinha-OEIS)
W77-11026

IMPACTS OF COASTAL DREDGING IN SAN PEDRO BAY, CALIFORNIA,
R. R. Weir.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 116-129, 5 fig.

Descriptors: *Legislation, *Pollution abatement, *Resources development, *Environmental effects, Water pollution, California, Coasts, Dredging, Bays.
Identifiers: *Outer Continental Shelf, *Coastal Zone Management, San Pedro Bay(Calif).

This study is concerned with the impacts of recent California conservation and environmental planning and coastal zone management legislation affecting California ports in general and the San Pedro Bay ports of Los Angeles and Long Beach in particular. The intent is to emphasize the fact that environmentalists must consider developed ports as a unique element in a coastal zone and must develop standards for such prime national economic bases which are different from standards for pristine, undeveloped coastal areas. (See also W77-11022) (Sinha-OEIS)
W77-11027

COASTAL ZONE MANAGEMENT: A LAWYER'S PERSPECTIVE,
Environmental Defense Fund, East Setauket, N.Y.
For primary bibliographic entry see Field 6E.
W77-11028

THE ROLE OF GOVERNMENT IN REAL ESTATE DEVELOPMENT,
Louisiana State Planning Office, Baton Rouge. Coastal Resources Program.
For primary bibliographic entry see Field 6E.
W77-11029

RECREATIONAL DEVELOPMENT AND COASTAL ECOLOGY - SEEKING THE RIGHT BALANCE,
Wallace, McHarg, Roberts and Todd, Philadelphia, Pa.
For primary bibliographic entry see Field 6G.
W77-11030

HYDROCARBON STRESS IN COASTAL WETLANDS,
Chevron Oil Co., New Orleans, La.
M. G. Frey.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 181-183, 1 tab.

Descriptors: *Oil pollution, *Water pollution sources, *Baseline studies, *Resources development, *Environmental effects, Pipelines, Coasts, Bays, *Wetlands, *Organic compounds.
Identifiers: *Outer Continental Shelf, Deepwater ports, Superports.

The use of offshore to shore pipelines and the establishment of superports would do much to reduce oil pollution of coastal bays and river mouths. The lightening of large crude carriers into barges and small tankers for transportation to coastal installation is more prone to accidents and resulting pollution than pipelines and deepwater ports. There are 100 deepwater ports throughout the world. None in the United States. (See also W77-11022) (Sinha-OEIS)
W77-11031

ENVIRONMENTAL CONSIDERATIONS OF THE OIL AND GAS PRODUCTION INDUSTRY IN THE COASTAL ZONE,
Texaco Inc., New Orleans, La.
H. Clotworthy.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 184-194, 2 fig.

Descriptors: *Oil pollution, *Legislation, *Water pollution sources, *Resources development, Environmental effects, Baseline studies, Coasts, Wetlands, Louisiana.
Identifiers: *Outer Continental Shelf, Oil and gas industry.

The environmental laws and regulations which apply to petroleum producing industry operations are becoming increasingly more numerous and complex. This discussion centers on how these controls affect operations in the marshes and waters of South Louisiana, including both federal and state regulatory programs. The extensive impact of the regulations are brought into focus by reviewing the environmental requirements and permits which must be achieved in the drilling of a wildcat well and construction of facilities to put it on production. (See also W77-11022) (Sinha-OEIS)
W77-11032

FIELD STUDIES ON MARINE LIFE INHABITING AREAS OF CHRONIC LOW LEVEL EXPOSURE TO PETROLEUM,
Chevron Research Co., Richmond, Calif.
For primary bibliographic entry see Field 5C.
W77-11033

OIL IN SOUTHERN CALIFORNIA MARSHES,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5C.
W77-11034

IMPACT OF THE MARSH BUGGY ON THE WETLANDS,
Nicholls State Univ., Thibodaux, La. Dept. of Earth Science.
For primary bibliographic entry see Field 4C.
W77-11035

CHANGES IN MARSH ENVIRONMENTS THROUGH CANALIZATION,
Nicholls State Univ., Thibodaux, La. Dept. of Earth Science.
For primary bibliographic entry see Field 5C.
W77-11036

EROSION DEFENSE STRUCTURES ON THE PUGET SOUND SHORELINE,
Western Washington State Coll., Bellingham. Dept. of Geography and Regional Planning.
For primary bibliographic entry see Field 4D.
W77-11038

EDIZ HOOK: PAST, PRESENT, AND FUTURE,
Western Washington State Coll., Bellingham. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-11039

HUMAN INDUCED STRESS ON THE CAUCASIAN COAST OF THE BLACK SEA,
Illinois Univ. at Urbana-Champaign. Dept. of Geography; and Akademiya Nauk Gruzinskoi SSR, Tiflis.
For primary bibliographic entry see Field 4D.
W77-11040

SHORELINE PROTECTION IN JAPAN,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 4D.
W77-11041

PROBLEMS IN THE ADOPTION OF NEW IDEAS AND PRACTICES,
Louisiana State Univ., Baton Rouge. Cooperative Extension Service.
For primary bibliographic entry see Field 6B.
W77-11042

INFORMATION, CRITERIA, AND GUIDELINES TO IMPROVE COASTAL WETLAND MANAGEMENT,
Chesapeake Research Consortium, Inc., Baltimore, Md.
For primary bibliographic entry see Field 6G.
W77-11043

ENVIRONMENTAL IMPLICATIONS OF MAN-MADE LINEAR ELEMENTS IN COASTAL WETLANDS,
Coastal Environments, Inc., Baton Rouge, La.
For primary bibliographic entry see Field 6G.
W77-11044

WATER QUALITY AND MOLLUSCAN SHELLFISH: AN OVERVIEW OF THE PROBLEMS AND THE NATURE OF APPROPRIATE FEDERAL LAWS,
Stanford Research Inst., Arlington, Va. Center for Resource and Environmental Systems Studies.
D. R. Zoellner.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $3.75. NOAA, National Marine Fisheries Service, March 1977. 227 p, 12 tab, 4 append.

Descriptors: *Water quality, *Water pollution effects, *Federal government, *Legislation, *Public health, Shellfish, Commercial fishing, Oysters, Clams, Mussels, Recreation, Mollusks.
Identifiers: *Outer Continental Shelf, Coastal zone, Natural phenomena.

The effect of water quality on molluscan shellfish and the impact of Federal Laws concerning water quality are reviewed. The report discusses the threats to the shellfish acreage open or closed to recreational and commercial harvesting, the availability of the shellfish resource, and the closure of harvestable areas in the interest of public health and the general health of the resource. The report addresses questions related to oysters, clams and mussels, since these are the principal molluscan shellfish consumed raw or partially cooked. Water quality requirements for reproduction, growth and general vigor of a given shellfish species, its harvest and use, are considered to be the same whether stocks are wild, planted or controlled and whether stocks are in open or controlled waters. Relevant laws are reviewed to consider their effectiveness and pertinent enforcement, abatement, and advisory programs are reviewed as to their effect on shellfish resources. (NOAA)
W77-11048

PROGRESS REPORT. DEEP OCEAN MINING ENVIRONMENTAL STUDY--PHASE I.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5C.
W77-11053

EFFECTS OF IRRIGATION MANAGEMENT ON THE QUALITY OF IRRIGATION RETURN FLOW IN ASHLEY VALLEY, UTAH,
Superior Farming Co., Bakersfield, Calif.

For primary bibliographic entry see Field 5B.
W77-11079

ENVIRONMENTAL IMPACT ANALYSIS: THE CENTRAL ARIZONA PROJECT AS AN EXAMPLE,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W77-11082

THE POLITICS OF SALT: BACKGROUND AND IMPLICATIONS OF THE MEXICAN-AMERICAN TREATY OF 1944,
Arizona Univ., Tucson, Inst. of Government Research.
For primary bibliographic entry see Field 6E.
W77-11097

COAL MINE POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-11152

STATE PROTECTION FROM OIL SPILLS: ASKEW V AMERICAN WATERWAYS OPERATORS, INC.,
Lewis and Clark Coll., Portland, Oreg. Northwestern School of Law.
For primary bibliographic entry see Field 6E.
W77-11153

WATER POLLUTION CONTROL ACROSS THE NATION,
Environmental Science and Technology, Vol 7, No 9, p 786-92 (Sept 1973). 1 photo, 2 tab, 2 chart.

Descriptors: *State governments, *Regulation, *Water quality standards, Planning, Basins, Interstate compacts, Interstate commissions, Permits, Monitoring, Wetlands, Coasts, Financing, Law enfocement, Water law, Water policy, Governments, Water pollution control, Sampling, Legislation, Grants, Government finance.

To gain insight into the accomplishments, problems and frustrations that various states encounter with regard to the Federal Water Pollution Control Act (FWPCA) Amendments of 1972, comments were solicited from environmental agency officials of eighteen states. Officials addressed topics such as basin planning requirements, interstate agreements, permits and monitoring, wetlands and coastal zones, financing, and enforcement. Many states are members of interstate commissions which are sometimes able to handle environmental problems and other times are hindered by lack of authority and cooperation. The majority of state officials contacted felt that the federal construction grant program has not been a disincentive to states in the past. However, they complain that current withholding of funds already designated for construction have hindered some states' pollution control programs. No state appears to be completely pleased with the new law. While criticisms vary, a number of states stand together somewhat uniformly on differences. Officials complain about blanket regulations regarding all states despite geography, successful ongoing programs, and population distribution and effects. In sum, while the law's philosophy is commendable, some of the goals are unrealistic and the time frame much too stringent for realistic accomplishment. (Rieck-Florida)
W77-11159

WILD RIVERS FLOWING FREE.
For primary bibliographic entry see Field 6E.
W77-11161

REGIONAL WATER QUALITY CONTROL,
For primary bibliographic entry see Field 6E.
W77-11162

COAL MINE WATER POLLUTION: AN ACID PROBLEM WITH MURKY SOLUTIONS,
Appalachian Research and Defense Fund of Kentucky, Lexington.
J. T. Begley, and J. P. Williams.
Kentucky Law Journal, Vol 64, No 3, p 507-47, Winter 1975-76.

Descriptors: *Tennessee, *Kentucky, *Coal mine wastes, *Water pollution, Regulation, Law enforcement, Legislation, Appalachian Mountain Region, Rivers and Harbors Act, Water pollution sources, Water quality, Federal government, State governments, Energy, Financing, Federal Water Pollution Control Act, Water Quality Act, Erosion, Stripmines, Drainage water, Reclamation.

High priority must be given to the abatement of coal mine water pollution since coal will be the nation's dominant source of energy for the next decade. This type of pollution causes aesthetic, economic and severe environmental problems to the Appalachian Region. Although no federal law specifically regulates environmental effects of coal mining, the Federal Water Pollution Control Act regulates mine discharges. However, the primary system for regulating coal mine water pollution is at the state level where there are various water pollution control statutes. Specific regulatory mechanisms vary from state to state, depending on the structure of state government and the functions of state agencies. The regulatory systems of Kentucky and Tennessee are described in detail as examples of state level approaches taken to abate coal mine water pollution. The federal and state laws and regulations are generally adequate legal tools to accomplish the regulatory goals. With a few minor legislative adjustments this would certainly be true in Kentucky and Tennessee. Commitments are needed by Congress and the state legislatures for adequate funding of regulatory agencies to accomplish the attainment of dual goals--increased coal production and clean water. (Rieck-Florida)
W77-11163

EPA JURISDICTION OVER WELL INJECTION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT,
Environmental Protection Agency, Washington, D.C.
A. W. Eckert.
Natural Resources Lawyer, Vol 9, No 3, p 455-65, 1976.

Descriptors: *Well permits, *Groundwater, *Injection wells, *Waste disposal wells, Permits, Navigable waters, Legal aspects, Legislation, Administrative agencies, Well regulation, Discharge(Water), Judicial decisions, Water pollution control, Water quality control, Jurisdiction, Waste disposal.

Among the minimum requirements for state permit programs under the National Pollutant Discharge Elimination System (NPDES) is the authority to control disposal of pollutants into wells. If the Environmental Protection Agency (EPA) has the authority to require and approve such programs, it must derive from the basic authority to control discharges into navigable waters either directly by defining navigable waters as including underground waters or as ancillary to the quality control of surface waters. A broader basis for federal control over well injection posits that such authority is inherent in the EPA's discretion to issue or deny permits for surface water discharges. That Congress intended well injection to be subject to the permit program is clear and thus the EPA has acted on that basis alone without judicial challenge to date. Even if the Federal Water Pollution Control Act does not provide sufficient authority for such administrative control, it may be derived from the National Environmental Policy Act. The recently enacted Safe Drinking Water Act does establish a regulatory program in this area but its delayed implementation leaves a void which still must be absorbed under the NPDES. (Moorhouse-Florida)
W77-11164

EVERY POND AND PUDDLE--OR, HOW FAR CAN THE ARMY CORPS STRETCH THE INTENT OF CONGRESS,
Pierce, Atwood, Scribner, Allen, and McKusick, Portland, Maine.
For primary bibliographic entry see Field 6E.
W77-11165

CONSULTANT LOOKS AT 208 PROGRAM,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 6E.
W77-11166

THE WATER QUALITY PROBLEM ON THE COLORADO RIVER,
New Mexico Interstate Streams Commission, Santa Fe.
S. E. Reynolds.
Natural Resources Journal, Vol 12, No 4, p 480-86, October, 1972.

Descriptors: *Colorado River, *Salinity, *Water quality, *Mexico Water treaty, Colorado River Basin, Mexico, Water quality control, Water policy, Beneficial use, Equitable apportionment, United States, River basins, Consumptive use, Legal aspects, Governmental interrelations, Water allocation(Policy), International commissions, International law, Interstate rivers, Treaties.

In an effort to solve the problem of salinity of the Colorado River, the Federal Water Pollution Control Administration promulgated policy guidelines for the involved states. The first guideline, which states in part that standards providing for less than existing water quality will not be acceptable, could have a disastrous effect on the Upper Basin states of the Colorado River. The Colorado River Basin Compact allocates to the Upper Basin States the beneficial consumptive use of 7.5 million acre-feet of water. Presently these states are consuming only about 3 million acre-feet. Because the beneficial consumptive use of water results in a degradation of its quality by an increase in the concentration of dissolved solids in the water, a strict interpretation of the guidelines would not allow the consumptive use to be increased. Since this is clearly unreasonable the Environmental Protection Agency (EPA) has recommended that a basin-wide salinity control program be established. The program would offset the increase in salinity caused by an increase in beneficial consumptive use. Although nonnumerical salinity standards have been set, the basin states have unanimously adopted the EPA recommendation. (Petruf-Florida)
W77-11168

MEXICAN-AMERICAN INTERNATIONAL WATER QUALITY PROBLEMS: PROSPECTS AND PERSPECTIVES,
Universidad Nacional Autonoma de Mexico, Mexico City. School of International Law.
For primary bibliographic entry see Field 6E.
W77-11169

UNITED STATES APPROACHES TO THE SALINITY PROBLEM ON THE COLORADO RIVER,
Department of State, Washington, D.C. Office of the Legal Advisor.
For primary bibliographic entry see Field 6E.
W77-11170

SALINITY IN THE COLORADO: AN INTERPRETATION OF THE MEXICAN-AMERICAN TREATY OF 1944,
Universidad Nacional Autonoma de Mexico, Mexico City. School of International Law.
For primary bibliographic entry see Field 6E.
W77-11171

THE COLORADO RIVER: INTERNATIONAL ASPECTS,
International Boundary and Water Commission, El Paso, Tex.
For primary bibliographic entry see Field 6E.
W77-11172

A HISTORY AND INTERPRETATION OF THE WATER TREATY OF 1944,
For primary bibliographic entry see Field 6E.
W77-11174

FLORIDA ENVIRONMENTAL PERMITTING AND WETLANDS PROTECTION ACT (PROPOSED LEGISLATION).
For primary bibliographic entry see Field 6E.
W77-11177

AMADOR VALLEY INVESTORS V CITY OF LIVERMORE (THE ACTS OF A CITY ARE NOT PRIVILEGED WHEN PRIVATE PROPERTY DAMAGE RESULTS FROM INADEQUATE PLANNING OF WASTE DISPOSAL).
For primary bibliographic entry see Field 6E.
W77-11181

FALLEN LEAF PROTECTION ASSOCIATION V SOUTH TAHOE PUBLIC UTILITIES DISTRICT (PROVISIONS OF CALIFORNIA WATER CODE REQUIRING SPECIFIC PROPERTY OWNERS TO CONNECT TO SEWER LINES UPHELD AGAINST CONSTITUTIONAL CHALLENGE).
For primary bibliographic entry see Field 6E.
W77-11182

REGIONAL WASTE DISPOSAL ACT.
For primary bibliographic entry see Field 6E.
W77-11190

CRIMINAL PROSECUTION FOR WATER POLLUTION.
For primary bibliographic entry see Field 6E.
W77-11192

SAVE OUR INVALUABLE LAND, INC V NEEDHAM (APPLICABILITY OF FWPCA AMENDMENTS TO PROJECTS ALREADY FUNDED).
For primary bibliographic entry see Field 6E.
W77-11199

E I DUPONT DE NEMOURS AND COMPANY V TRAIN (REVIEW OF EFFLUENT LIMITATIONS FOR CHEMICAL INDUSTRY).
For primary bibliographic entry see Field 6E.
W77-11201

WATER HYACINTHS FOR REMOVAL OF PHENOLS FROM POLLUTED WATERS,
National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab.
J. C. Wolverton, and M. M. McKnown.
Aquatic Botany, Vol. 2, 1976, p 191-201, 2 tab, 3 fig, 34 ref.

Descriptors: *Aquatic plants, Aquatic weeds, Aquatic weed control, Aquatic productivity, Water hyacinths, *Nuisance algae, *Phenols, Bayous, *Waste treatment, Plant physiology, Laboratory tests.

Removal of phenol by water hyacinths, Eichhornia crassipes (Mart.) Solms, in static water was investigated. A quantity of 2.75 g dry weight of this aquatic plant demonstrated the ability to absorb 100 mg of phenol per 72 h from distilled water, river water, and bayou water. One hectare of water hyacinth plants is potentially capable or removing 160 kg of phenol per 72 h from water polluted with this chemical. (Katz)
W77-11268

EXTRACTION OF IRON FROM WATER BY CHLORELLA VULGARIS AND SCENEDESMUS QUADRICAUDA,
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
For primary bibliographic entry see Field 5C.
W77-11303

RIVER-QUALITY ASSESSMENTS,
Geological Survey, Reston, Va. Water Resources Div.; Advisory Committee on Water Data for Public Use, Longboat Key, Fla. Working Group on River-Quality Assessment; and Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-11379

REAERATION COEFFICIENTS OF STREAMS--STATE-OF-THE-ART,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-11382

AGRICULTURAL LEGISLATION'S POTENTIAL IN REDUCING DISCHARGE OF POLLUTANTS,
Agricultural Stabilization and Conservation Service, Washington, D.C. Environmental Quality and Land Use Staff.
E. L. Gambell.
Water Resources Bulletin, Vol 12, No 6, p 1171-1179, December 1976. 12 ref.

Descriptors: Agriculture, *Pollution abatement, Legal aspects, *Legislation, *Agricultural runoff, Return flow, Water quality, Water pollution.

Agricultural lands (including most forest lands) make up almost four-fifths of the total land area of the United States and include, or are traversed by, perhaps an equal proportion of our ground and surface waters. Therefore, a very large part of out environment is directly 'agriculture-related' in any consideration of the discharge of pollutants. Several important Federal and State laws relate to the control or abatement of agriculture-related pollution. Existing legislation generally mandates the control or abatement of pollution (from point or nonpoint sources) or authorizes the use of public funds or other resources for such purposes. Some of these laws can be effective instruments in keeping pollutants from being discharged into surface or ground waters or into the air, but the degree to which some pollutants originating from agricultural lands and operations constitute a serious environmental hazard in waters remaining controversial. Although most of the technology exists to reduce greatly the movement of these pollutants, investments are often required which benefit the nonfarm public without economic returns to the farmer. Whether a zero discharge is either an environmentally or economically feasible alternative to more limited or selective control, is explored. However, if the public is willing to bear its reasonable share of the cost for clean air and water, the needed basic legislation already largely exists. Under it, agricultural land holders may apply program standards and use their own and available program resources to bring about effective control or abatement of pollutants. (Skogerboe-Colorado State)
W77-11395

REDUCING TAILWATER RUNOFF FOR EFFICIENT IRRIGATION WATER USE,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 3F.
W77-11412

AQUATIC ENVIRONMENTAL QUALITY: PROBLEMS AND PROPOSALS,
Fisheries and Marine Service, Ottawa (Ontario). Oceanography Branch.
For primary bibliographic entry see Field 5A.
W77-11421

BIOLOGICAL AQUATIC WEED CONTROL BY FISH IN THE LOWER SONORAN DESERT OF CALIFORNIA,
For primary bibliographic entry see Field 4A.
W77-11423

OPTIMIZATION OF RUNOFF AGRICULTURE ON RECLAIMED MINE LANDS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W77-11436

POTOMAC RIVER (HEARINGS ON THE STATE OF THE POTOMAC RIVER AS TO WATER SUPPLY AND WATER POLLUTION).
For primary bibliographic entry see Field 6E.
W77-11449

OCEAN DUMPING--PART 3 (OVERSIGHT OF THE MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972, AND INVESTIGATING THE WASTE DISPOSAL IN THE NEW YORK AREA),
For primary bibliographic entry see Field 6E.
W77-11451

PALMER LAKE SANITATION DISTRICT, PALMER LAKE, COLORADO (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5D.
W77-11452

ANALYSIS OF THE IMPACT OF DELAYING COMPLIANCE WITH 1977 WATER QUALITY STANDARDS,
Mathematica, Inc., Philadelphia, Pa. Regional and Environmental Studies Group.
J. A. Orlando, R. B. Wrightington, D. E. Baker, and A. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 953, Price codes: A10 in paper copy, A01 in microfiche. Report EPA 68-01-2454. October 1974. 218 p.

Descriptors: *Cost-benefit analysis, *Pollution abatement, *Water quality standards, *Waste treatment, Cost analysis, Effluents, Water pollution, Water pollution control, Analytical techniques, Cost comparisons, Pollutants, Planning, Water treatment, Water resources development, Waste water(Pollution), Waste water treatment, Costs.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

The relationship between the total cost of water pollution control and the date of compliance with the water quality goals specified in the 1972 Federal Water Pollution Control Act Amendments was evaluated. The report includes a description of the major parameters that affect the cost of a specific water pollution abatement program, an analysis of recent trends in the values of these parameters, and a proposed methodology for

analyticaly estimating the cost of water treatment for individual industrial discharges. Two case studies of rivers in Indiana and Missouri, examined in terms of costs of waste treatment programs, indicate that by allowing delays in compliance for up to three years: (1) there is no significant cost savings for highly heterogeneous effluents such as industrial discharges, and (2) significant cost reductions are possible under certain conditions for highly homogeneous effluents such as municipal discharges. The authors recommend that the EPA set up specific criteria for review of delay requests. (Denker-Florida)
W77-11453

CRITERIA FOR DEVELOPING POLLUTION ABATEMENT PROGRAMS FOR INACTIVE AND ABANDONED MINE SITES,
J. D. Robins, and S. C. Hutchins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 279, Price codes: A21 in paper copy, A01 in microfiche. Report EPA 440/9-75-008, August 1975. 461 p.

Descriptors: *Mineral industry, *Mining, *Pollution abatement, *Reclamation, Resources development, Mine drainage, Mine water, Mine wastes, Abatement, Resources, Mining engineering, State governments, Pollutants, Runoff, Planning, Surveys, Investigations, Watersheds(Basins), Alternative planning, Environmental effects.

The critiera for statewide pollution abatement programs for inactive and abandoned mine sites have been developed for use by the Environmental Protection Agency in guiding states conducting pollution abatement and reclamation programs. The study covers abatement criteria for all mined commodities except gas and oil production, well-sites and off-shore mining. It includes: background information on mineral commodity extraction and pollution problems; organizational, financial and legal considerations in implementing a program; and development of a technical inventory of types of mine pollution and site reclamation programs. Many post-mining problems can be eliminated by adherence to environmental guidelines for mine closure. Legal problems occur in determining whether the state, miners or private landowners will pay the costs of pollution abatement. Inherent to the planning and evaluation of a statewide abatement and reclamation program is the collection of tremendous amounts of qualitative and quantitative data. Planners need detailed topographical base maps of the proposed reclamation areas, as well as a thorough water quality survey. Other necessary data include: surface and underground mine costs, cost effectiveness and reclamation priorities. (Denker-Florida)
W77-11454

STATE WATER CONTROL BOARD V TRAIN (STATE COMPLIANCE WITH EFFLUENT LIMITATION DEADLINE MANDATORY UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS).
For primary bibliographic entry see Field 6E.
W77-11456

REGULATION OF FORESTRY RELATED NON-POINT SOURCE POLLUTION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Debevoise and Liberman, Washington, D.C.
M. C. Miskovsky, and M. B. Van Hook.
Natural Resources Lawyer, Vol 9, No 4, p 645-71, 1976.

Descriptors: *Forestry, *Forest management, *Water pollution sources, *Federal Water Pollution Control Act, Legislation, Administrative agencies, Regulation, Forests, Water law, Legal aspects, Water pollution control, Water quality control, Runoff, Pesticides, Pesticide residues, Precipitation excess, Administrative decisions, Multiple purpose.
Identifiers: *Nonpoint sources(Pollution), *Federal Water Pollution Control Act Amendments of 1972.

The Federal Water Pollution Control Act (FWPCA) has heretofore lacked comprehensive regulations for controlling nonpoint sources of pollution. Nonpoint sources are unspecified means of transferring pollutants as opposed to point sources which transfer pollutants via discernible conveyances. Nonpoint sources which are the major source of pollution in silvicultural (forestry-related) industries evolve from such operations as pesticide application, fire conrol, reforestation, nurseries and precipitation runoff following harvesting. Pursuant to Sections 208 and 303 of FWPCA management, in particular, will be affected by these regulations. Currently, the Forest Service is operating under a legislative mandate to manage the National Forests. Present Forest Service management techniques such as multiple-use and sustained yield principles conflict with the new FWPCA regulations. Under Section 208 and 303, the Environmental Protection Agency (EPA) will have significant enforcement capabilities over state forest management. The biggest problem facing the EPA is identification of nonpoint sources and formulation of regulatory strategies. In addition, consideration must be given to whether it is appropriate to promote comprehensive land use planning from the sole perspective of water pollution control. (Denker-Florida)
W77-11458

LOUISIANA PACIFIC CORPORATION AND CROWN SIMPSON PULP COMPANY (REQUESTS FOR VARIANCES FROM BPCTCA).
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 42, No 106, p 28167-72, June 2, 1977.

Descriptors: *Effluents, *Pulp wastes, *Waste water treatment, *Federal Water Pollution Control Act, *Industrial wastes, Water quality control, Sludge disposal, Waste water disposal, Ultimate disposal, Suspended solids, Wood wastes, Waste assimilative capacity, Water pollution, Water law, Legal aspects, Aerobic bacteria, Biochemical oxygen demand, Liquid wastes, Oxygen sag, Oceans, Pacific Ocean.

Variances from the best practicable control technology currently available (BPCTCA) effluent limitation guidelines were requested from the Environmental Protection Agency (EPA) by two pulp mills which discharged into the ocean their compliance with the BPCTCA requirements would result in little or no improvement in receiving water quality, and would have detrimental, non-water quality, environmental consequences including energy consumption and sludge disposal problems. The requested variances were approved by the reviewing state agency and submitted to the EPA Administrator for final approval. The Administrator tentatively refused the variances, objecting to them on two grounds. The Federal Water Pollution Control Act forbids consideration of the nature or quality of particular receiving waters in adopting BPCTCA effluent limitation guidelines and applying them to individual point sources, since BPCTCA guidelines are technology-based regulations and therefore require no consideration of the nature of the receiving waters. Furthermore, the state erred in holding that the non-water quality environmental impacts formed a sufficient basis for the variances, since these impacts were not found to be fundamentally different from those found on a national level. (Brightman-Florida)
W77-11459

AQUACULTURE PROJECTS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 42, No 95, p 25478-82, May 17, 1977.

Descriptors: *Effluents, *Aquiculture, *Federal Water Pollution Control Act, *Water quality standards, *Marine biology, Regulation, Thermal pollution, Navigable waters, Administrative agencies, Federal government, Industrial wastes, Water quality control, Aquatic life, Permits, Legal aspects, Legislation, Beneficial use, Experimental farms.

As authorized by Section 318(a) of the Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) has issued regulations which provide the mechanism for permits for the discharge of pollutants to navigable waters from an aquaculture project and a point source. The regulations are intended to allow, on a selective basis, controlled discharges, otherwise unlawful under the Act, in order to determine the existing and potential feasibility of utilizing pollutants to grow aquatic organisms which can be harvested and used beneficially while at the same time protecting other beneficial use of the waters. The authority to issue permits is delegated to the regional administrators. The regulations set guidelines for the processing of permits. The criteria for the issuance of permits is established; the regional administrator is to determine the effluent limitations to apply to the discharger of pollutants to the project and to discharge from the aquaculture area. In addition, the regulations call for the public posting of applications and any affected persons may, within the stated manner, object to the issuance thereof and request a public hearing. (Jones-Florida)
W77-11460

POLLUTION PREVENTION--VESSEL AND OIL TRANSFER FACILITIES.
Coast Guard, Washington, D.C.
Federal Register, Vol 42, No 123, p 32670-84, June 27, 1977.

Descriptors: *Oil wastes, *Oil pollution, *Coast Guard Regulations, *Ships, *Water pollution control, Oil, Oil industry, Oily water, Oil spills, Water pollution, Environmental control, Regulation, Water law, Legal aspects, Aquatic environment, Water pollution sources, Pollution abatement.

The Coast Guard has proposed amendments to the pollution prevention regulations for vessels and oil transfer facilities. The express purpose of these amendments is to reduce accidental discharges of oil or oily wastes during vessel operations and the transfer of such substances to or from vessels. These changes are proposed pursuant to suggestions from industry, Coast Guard operations experiences, and new requirements promulgated by the Inter-Governmental Maritime Consultative Organization in the 1973 International Convention for the Prevention of Pollution from Ships. Certain of the proposed changes would also facilitate enforcement of the regulations by the Coast Guard. The rules, as amended are presented in full, along with a discussion of the specific amendments. These rules apply to oil transfer facilities which handle vessels with a capacity of 250 barrels, or more; design and operation of all vessels transporting oil, excluding public vessels; and oil transfer operations in navigable waters to or from any vessel with a capacity of 250 or more barrels of oil. (Brightman-Florida)
W77-11461

EFFECT OF WASTE DISCHARGE REGULATIONS ON REAL PROPERTY DEVELOPMENT.
Indiana Univ. at Bloomington. School of Law.
N. L. White.
Real Property, Probate and Trust Journal, Vol 11, p 490-506, Fall 1976.

Descriptors: *Water quality control, *Land development, *Water pollution, *Waste disposal, Clean Air Act, Federal Water Pollution Control Act, Air pollution, Effluents, Legislation, Water law, Waste treatment, Federal jurisdiction, Navigable waters, Water pollution treatment, Air pollution effects, Storm drains, Sewage treatment, Real property, Drainage systems, Economic impact.

Since federal water and air pollution regulations are in a constant state of flux and since state and local implementation of the federal laws varies, real property developers have found it necessary to keep their knowledge of the laws' developments current. When the navigable waters scope of the Federal Water Pollution Control Act Amendments of 1972 was expanded to include many interstate waters, most developers suddenly found themselves subject to federal jurisdiction. Section 208 of the Act deals with area-wide water quality management and may have a significant impact on local land use decisions by requiring developers to comply with federal and state water quality control regulations. Under the National Pollution Discharge Elimination System permit program, subdivisions and new industries would have to obtain permits for points source discharges. The Environmental Protection Agency has published guidelines dealing with non-point source discharges from construction activities such as erosion, increased storm runoff, fertilizer runoff and pesticide runoff. Developers may incur increased costs in preventing these discharges. Industrial developers face the additional demands from the Clean Air Act of 1970 to regulate pollutants in plants, refineries, or incinerators. (Cocheu-Florida)
W77-11462

NATIONAL AND INTERNATIONAL EFFORTS TO PREVENT TRAUMATIC VESSEL SOURCE OIL POLLUTION,
Coast Guard District (13th), Seattle, Wash.
J. W. Anderson.
University of Miami Law Review, Vol. 30, No. 4, p 1035-1051, Summer 1976.

Descriptors: *Oil pollution, *Oil spills, Accidents, *Ships, Pollutants, Water pollution, International commissions, Navigation, International law, Algae toxins, Algae poisoning, Oily water, Marine animals, Marine algae, Plankton, Photosynthesis, Poisons, Water pollution effects, Water pollution sources, Fish, International waters.

Traumatic vessel source oil pollution is defined as an oil spillage resulting from unexpected damage to the physical container of the oil. Oil pollution is extremely destructive to the marine environment since it disrupts the food chain by poisoning and smothering algae, plankton and intertidal organisms. It also interferes with phytoplankton photosynthesis, reduces dissolved water oxygen, impairs recreational facilities, and has been linked with genetic/carcinogenic changes in marine life and higher animals including man. The problem is magnified by the lack of uniform cleanup systems, the mobility of oil slicks, the increase of supertankers in maritime oil transportation, and conflicting instruction and equipment requirements in different countries, as well as conflicting laws in international and coastal water. The intergovernmental Maritime Consultative Organization has attempted uniform regulation of technical and economic aspects of maritime commerce. Efforts underway to regulate sea traffic include training and certification programs. Navigation technology exists to prevent groundings and collisions including the use of offshore deepwater ports to reduce traffic density in coastal zones. More international cooperation is necessary. The author concludes that methods already exist to prevent traumatic oil pollution without awaiting a technological breakthrough. (Denker-Florida)
W77-11467

OCEAN DUMPING,
Health Effects Research Lab., Cincinnati, Ohio. Water Quality Div.
J. A. Rogers.
Environmental Law, Vol. 7, No. 1, p 1-23, Fall 1976.

Descriptors: *Oceans, *Water pollution, *Waste disposal, *Sludge, Sludge disposal, Solid wastes, Sewage sludge, Industrial wastes, Organic wastes, Sewage wastes, Dredging, Organic matter, Water pollution sources, Federal government, Administrative agencies, Legislation, International law, Treaties, Water pollution control.
Identifiers: *Ocean Dumping Act, *Ocean dumping.

About ten percent of the pollutants entering the world's oceans are the product of ocean dumping. Few governmental controls over ocean dumping existed prior to the passage of the Ocean Dumping Act. This legislation requires the issuance of a permit from the Environmental Protection Agency (EPA) before any wastes may be dumped in the oceans. However, in the three years since the passage of the Ocean Dumping Act no significant changes have occurred in the total quantities of materials dumped in the sea. The EPA has also experienced difficulty in enforcing the mandates of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. The problem stems from an inability to determine exactly how much pollutant dumping is permitted under the language of the Convention. On the domestic level, the EPA is handicapped by the lack of scientific knowledge of the environmental effects of dumping and also the absence of a clear congressional mandate. While uncertainty continues over the proper resolution of the ocean dumping problem, irreversible environmental harm may be occurring. (Moorhouse-Florida)
W77-11469

SECTIONS 9 AND 10 OF THE RIVERS AND HARBORS ACT OF 1899: POTENT TOOLS FOR ENVIRONMENTAL PROTECTION,
California Univ., Berkeley. School of Law.
For primary bibliographic entry see Field 6E.
W77-11470

SUPERTANKERS AND THE LAW OF THE SEA,
For primary bibliographic entry see Field 6E.
W77-11472

SURVEILLANCE IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. C. Ward, S. R. Nichols, and G. V. Skogerboe.
Journal of Water Pollution Control Federation, Vol 45, No 10, p 2081-87 (1973). 2 fig. OWRT A-010 Colo(3), 14-31-0001-3806.

Descriptors: *Data collections, *Sampling, *Monitoring, *Water quality standards, *Water management(Applied), Pollutant identification, Basic data collections, Measurement, Engineering, Research and Development, Planning, Legal aspects, Regulation, Federal government, Local governments, Law enforcement, Water policy, Standards, Legislation.

A water quality management program consists of planning, regulation, legal enforcement, engineering assistance, research, and surveillance. However, technical data is the backbone of water quality management. Identification of polluting substances, violation of stream standards, monitoring to indicate compliance, as well as identification of trends in water quality are all dependent on data. Currently, this data backbone is quite weak. There is a failure at the federal level to require, and at the state level adopt, a plan to monitor water quality on a continuing basis. No statutory authority exists that directs where and how samples should be taken in order to identify trends. In addition, there is no specific procedure prescribed in the law whereby the data can be applied to accomplish enforcement. Two solutions are proposed to this problem. Either data collection should be upgraded to match its importance in enforcing stream standards, or the need for such data should be reduced by changing the law that requires it. In actual practice, a combination of the two will probably provide the best solution. (Rieck-Florida)
W77-11478

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

COMPUTER SIMULATION IN WATER RESOURCES SYSTEMS.
Brussels Univ. (Belgium); and Ghent Rijksuniversiteit (Belgium).
For primary bibliographic entry see Field 2A.
W77-10806

DESIGNING SIMULATION MODELS FOR OPTIMIZATION STUDIES,
Lancaster Univ., Bailrigg (England). Dept. of Operational Research.
J. C. Wilkinson, and D. K. Smith.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G. C. Vansteenkist (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N. Y. p 169-175, 1975. 4 fig, 7 ref.

Descriptors: *Simulation analysis, *Optimization, *Water resources, Design, River systems, Planning, Decision making, Costs, Pumped storage, Reservoirs aquifers, Demand, Recharge, Pipelines, Inter-basin transfers, Mathematical models, Operations research.
Identifiers: *Search procedure, Minimization, Maximization, River Nene(UK), River Welland(UK).

The performance and total cost of a complex water resource system can frequently be measured only by means of a computer simulation model. The expense of obtaining such measures for each of a virtually infinite number of possible configurations which may be contemplated at the design stage of a system to serve any large area, together with the nature of some internal characteristics of such systems, precludes the use of classical search procedures to find the best configuration. A purpose-designed search procedure is required which recognizes the limitations imposed by the simulation model. But just as the way in which function evaluations are obtained (by simulation) has implications for the search procedure, so may the method of search have implications for the design of the simulation model. The simulation run provides a large amount of information relevant to the properties of the system with a given set a component sizes; optimization condenses this into usable quantities. The total process of designing an optimal water resource system will be more efficient if the simulation model and optimizing routine are seen not as distinct and independent phases, but as complementary and interactive parts of an integrated procedure. An example problem is presented based on studies of the rivers Welland and Nene in the United Kingdom, illustrating some of the data sets and methods of analysis. The river system embraces a pumped storage reservoir, an artificially recharged aquifer, and several demand centers. (See also W77-10806) (Bell-Cornell)
W77-10808

SYSTEMS ENGINEERING APPROACH TO AGRICULTURAL AND RURAL DEVELOPMENT SYSTEMS,
Nairobi Univ. (Kenya). Dept. of Electrical Engineering.
For primary bibliographic entry see Field 3F.
W77-10819

DYNAMIC MODEL FOR LONG-TERM DEVELOPMENT OF WATER RESOURCES MANAGEMENT,
National Water Authority, Budapest (Hungary).
L. David, F. Szidarovszky, and L. Duckstein.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resource Systems. G.C. Vansteenkiste (Ed.) Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., 1975, p 579-590. 4 fig, 2 tab, 6 ref.

Descriptors: *Water resources development, *Mathematical models, *Long-term planning, *Water management(Applied), Economic efficiency, Social aspects, Algorithms, Computer programs, River basins, Equations, Systems analysis.
Identifiers: Dynamic models, Eastern Hungary.

Developed is a dynamic, discrete-time continuous state model for comparing alternative water resources development strategies under limited economic, manpower, and natural resources. At each yearly state the following variables and functions are defined: state variables and constraints, input variables, state transition functions and output functions. The dual objective model contains an economic efficiency measure and a social criterion and should enable optimization by dynamic programming. A realistic example based on a case in a region of Eastern Hungary is presented with a 5-year horizon. Seven alternative strategies are examined under several different hypotheses for resources availability which yields 44 alternative cases of development. The computational algorithm is coded in ICL FORTRAN language: the total run time was 10 minutes on an ODRA 1304 computer for the example considered. (See also W77-10806) (Bell-Cornell)
W77-10820

NEW TECHNIQUES IN PLANNING A WATER MANAGEMENT SYSTEM: A CASE STUDY OF COOPERATIVE RESEARCH BETWEEN HUNGARY AND THE USA,
Arizona Univ., Tucson.
M. Fogel, I. Bogardi, and D. Davis.
In: Modeling and Simulation of Water Resources Systems. Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., 1975. p 591-597, 21 ref.

Descriptors: *Water resources, *Decision making, *Water requirements, *Stochastic processes, *Forecasting, *Simulation analysis, Computer programs, Control, Scheduling, Irrigation water, Precipitation, Hydrology, Effects, Mathematical models, Systems analysis, Project planning, Risks.
Identifiers: Cost effectiveness, Bayesian decision theory, Land modifications, *Hungary.

Decision-making under uncertainty is the main theme of a cooperative water resources research project between the Hungarian National Water Authority and the University of Arizona. Several categories of uncertainties have been distinguished and efforts are being made to quantify them by the application of existing techniques or the development of new ones. Within the cost-effectiveness framework, the techniques of interactive computer programming, Bayesian decision theory and the Hungarian-developed induced safety algorithm are being applied at various levels of the decision-making process. For situations where agricultural water requirements are to be met, the cooperative research is investigating the use of inventory control theory for scheduling irrigation water. Event-based stochastic precipitation models are being developed to describe natural uncertainty which, for example, can be used in determinig the hydrologic effects of land modifications. (See also W77-10806) (Bell-Cornell)
W77-10821

PLANNING MODEL FOR SIMULATING DISTRIBUTION AND COST IN A REGIONAL WATER SUPPLY SYSTEM,
Department of the Environment, Reading (England). Central Water Planning Unit.
R. C. Steiner.
In: Modeling and Simulation of Water Resources Systems. Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 599-602, 1975. 2 ref.

Descriptors: *Water supply development, *Resource allocation, *Cost analysis, *Long-term planning, Simulation analysis, Water demand, Alternative, Computer programs, Mathematical models.
Identifiers: Data selection.

Simulation techniques are well suited to planning long-term water resources development. Described herein is a study which examined the operation of a large number of potential sources, demands and interconnecting links over a planning period of 26 years. A resource allocation and costing model was run many times in order to compare different source configurations, deficiencies, discount rates, and other measures sensitivity. The fundamental data needed to run the model consisted of source yields, demand center defieiencies, link characteristics and unit costs. Allocation was based on the financial ranking of water transhipment along all feasible sources to demand routes. Staged construction of system constituents was specified and could be varied as desired. Results produced by the mode include annual real and discounted capital and running costs of the system, yields of sources, flows in links and satisfied and unsatified demands. (See also W77-10806) (Bell-Cornell)
W77-10822

INTEGRATED SURVEYS OF LAND AND WATER RESOURCES FOR DEVELOPMENT PURPOSES,
International Inst. for Aerial Survey and Earth Sciences, Enschede (Netherlands).
W. H. de Man.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 603-610, 1975. 2 fig.

Descriptors: *Surveys, *Water resources development, *Simulation analysis, Land development, Water policy.

Discussed are the ways in which such concepts as modeling and simulation can be applied to integrated surveys of land and water resources for development purposes. 'Integrated surveys' includes: (1) all activities related to the formulation of the survey objectives and tasks; and (2) the subsequent collection, analysis, and interpretation of all relevant information needed for the formulation of concrete action programs for development purposes. Considered are the criteria according to which the survey phasing is arranged. The phases include pre-survey, reconnaissance survey, semi-detailed survey, and detailed survey. Considered next are the different steps in each phase: (1) (re)definition of development goals; (2) definition of survey objectives; (3) design of survey; (4) monitoring of survey under execution; and (5) presentation of survey results. In conclusion, the explicit application of concepts like modeling and simulation to integrated surveys guarantees that the choice of an optimal alternative will be guided not only be quantified targets and criteria but also by targets and criteria which cannot be described in a mathematical way. A problem, however, is the lack of reliable quantified data when sophisticated methods are applied. Needed are adapted, relatively simple methods and procedures for the fruitful application of these concepts to integrated surveys. (See also W77-10806) (Bell-Cornell)
W77-10824

KEY NOTES AND IMPACTS OF SIMULATION AND MODELING TECHNIQUES FOR DECISION MAKING WATER RESOURCES PROJECTS IN DEVELOPING AREAS,
Madhya Pradesh Government Control Board for Major Projects, Raipur (India).
D. R. Sikka.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., 611-615, 1975. 2 ref.

Descriptors: *Water resources, *Project, *Simulation analysis, Effects, Mathematic models, Optimization, Planning, Water utilization.
Identifiers: *Developing areas.

A principal requirement for the modeling and simulation of water resources systems is to understand the objectives and alternatives to be considered for the final decision by those responsible for making large-scale public investments on such projects as dam and canal construction across rivers to provide irrigation, hydro power, water supplies, flood control, etc. Not only must the input data based on economic and technical factors be sound, but also the impact of political, legal, social and environmental parameters must be correlated in the appropriate perspective. The efficient criteria gained from other projects in similar circumstances should be applied with corrective coefficients. In some cases, it is necessary to apply the hierarchical approach, particularly in urban watersheds and environmental control. The concept of equivalent rural watersheds is suggested. To insure integrated and comprehensive water development, it is necessary to know the size of and system of action for the plan in a large country like India. Perhaps in developing countries a 'requirement approach' may have to be phased into the various model operations both for short term and long term plans keeping in view the increase in population and in the use of water, as in the case of the California State Water Plan. In the case of Mahanadi Hasdeo, optimization of benefits by undertaking time bound stage construction programs in large projects involving heavy investments has been suggested at minimum investment rate. (See also W77-10806) (Bell-Cornell)
W77-10825

THE DEVELOPMENT OF MODELLING AND SIMULATION TECHNIQUES APPLIED TO A COMPUTER-BASED TELECONTROL WATER SUPPLY SYSTEM,
Cambridge Univ. (England).
For primary bibliographic entry see Field 4A.
W77-10826

OPTIMIZING A PRESSURIZED PIPE-LINE NETWORK USING A NEW METHOD,
Dwars, Heederik and Verhiey Ltd., Amersfoort (Netherlands).
For primary bibliographic entry see Field 5D.
W77-10829

AN APPLICATION OF THE INTERREGIONAL I/O MODEL FOR THE STUDY OF THE IMPACT OF THE MCCLELLAN-KERR ARKANSAS RIVER MULTIPLE PURPOSE PROJECT,
Catholic Univ., of America, Washington, D.C.
U. Kim, and S. K. Kwak.
IWR Contract Report 77-2, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, March 1977. 212 p, 15 fig, 32 tab, 1 map, 72 ref, 4 append.

Descriptors: *Input-output analysis, *Regional analysis, *Rivers, *Multiple-purpose projects, *Navigation, Assessment, Construction, Effects, Economic impacts, Costs, Benefits, National income, Recreation, Mathematical models, Equations, Systems analysis.
Identifiers: *Arkansas River, Spatial impacts.

This report is one of a series examining the impacts of the completed McClellan-Kerr Arkansas River Navigation System. The primary objective of this contract study was to apply the Interregional Input-Output Model of the United States, developed for the Economic Development Administration by Harvard University, to the assessment of the impacts of constructing the McClellan-Kerr project. The model will also be used to assess the economic and spatial impacts of recreation and navigation among other project outputs. The gross direct and indirect construction impact of the project was estimated by the Interregional Input-Output Model to be $6.4 billion in output and $2.1 billion in household income in 1963 dollars. Of this amount, apparently 35.8 percent of the output and 52 percent of the income are estimated to be shared by the project region. This assessment is based essentially on short-term construction impacts and does not represent net increments of national income. Other more enduring benefits and costs will be obtained through the functional outputs of the McClellan-Kerr Arkansas River Navigation System--transportation, flood control, water supply, electric power, sediment control and channel stabilization, recreation, and fish and wildlife enhancement. (Bell-Cornell)
W77-10831

SYSTEMS ANALYSIS, (LITERATURE REVIEW),
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
D. P. Loucks, and J. B. Bell.
Journal of the Water Pollution Control Federation, Vol. 49, No. 6, p 1525-1537, June 1977 (Annual Literature Review). 113 ref.

Descriptors: *Water pollution control, *Planning, *Management, *Design, *Systems analysis, Decision making, Economic efficiency, *Simulation analysis, *Optimization, *Bibliographies, Water quality, Waste water(Pollution), Ecosystems, Desalination, Statistical methods, Regional analysis, Economic impact, Land use, Groundwater, Mathematical models, Analytical techniques.
Identifiers: Data management.

Enumerated and briefly summarized are 113 documents pertaining to the field of water pollution control. These comprise a review of the 1976 literature on the development and application of systems analysis techniques for defining and evaluating alternative water pollution control policies. The article is divided into six categories: (1) aquatic ecosystems; (2) wastewater and stormwater collection; (3) wastewater treatment and disposal; (4) salinity and desalination; (5) data management; (6) statistical models; (7) regional water quality planning and control; (8) economic and regulatory impacts; (9) land use impacts; (10) groundwater quality; and (11) conference proceedings. The writings, including reports, monographs, articles, and proceedings, consider a broad spectrum of mathematical modeling techniques, such as simulation analysis, linear and nonlinear programming, dynamic programming, discriminant analysis, mixed integer programming, multiple regression analysis, geometric programming, prescriptive goal programming, as well as the combined use of simulation and optimization methods, to evaluate feasible and often minimum cost design and management alternatives for water quality planning. (Bell-Cornell)
W77-10832

LOW COST DRAINAGE NETWORKS,
South Australian Inst. of Tech., Adelaide.
For primary bibliographic entry see Field 4A.
W77-10833

OPTIMAL ALLOCATION OF ARTIFICIAL IN-STREAM AERATION,
Consiglio Nazionale delle Ricerche, Milan (Italy). Centro di Teoria dei Sistemi.
For primary bibliographic entry see Field 5G.
W77-10835

RESERVOIRS WITH SEASONALLY VARYING MARKOVIAN INFLOWS, AND THEIR FIRST PASSAGE TIMES,
For primary bibliographic entry see Field 2E.
W77-10836

ENVIRONMENTAL MODELING AND DECISION MAKING: THE UNITED STATES EXPERIENCE.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
Report by the Holcomb Research Institute for the Scientific Committee on Problems of the Environment, Butler University, Indianapolis, Indiana. Praeger Special Studies in U.S. Economic, Social, and Political Issues, Praeger Publishers, N.Y., N.Y., 1976. 152 p, 1 fig, 2 tab, 215 ref. Price - $16.50.

Descriptors: *Environment, *Mathematical models, *Decision making, *Simulation analysis, *Pollution abatement, Water resources, Atmosphere, Ecology, Agriculture, Water pollution control, Water policy, Delaware River, Salinity, Standards, Colorado River, Hawaii, Constraints, Projects, DDT, Air pollution, Planning, Fisheries, *Surveys.
Identifiers: *Case studies, Urban modeling, Regional management, World systems, Chicago(Ill), Nutrition system simulation game, Community renewal programs, Operations modeling.

This report is the United States contribution to the simulation modeling assessment project sponsored by the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU). Evaluated is the present state of environmental modeling in the United States, with particular emphasis on the use of models in environmental policy formulation and decision making. The constraints and institutional circumstances surrounding both model development and decision making are examined to identify such factors as data, theory, validation, and cost, which affect the transfer and use of modeling. General surveys are presented which assess the current state of modeling and model use in seven areas: atmospheric, water resources, ecological, agricultural, urban, regional environmental management, and world systems. Five case studies of models applied to decision making are examined and evaluated, including the use of water resource models in urban policy making. It is concluded that models intended for a single client are successful. Future challenges lie in the development and use of models of complex systems in which longer-term planning or policy-type decisions are involved for numerous clients and with input from many disciplines. Technical modeling problems related to data, theory, and validation increase with the complexity of the model. One of the greatest obstacles to improved model use is that of achieving effective interaction among modelers from different disciplines and between modelers and decision makers. (See W77-10840 thru W77-10842) (Bell-Cornell)
W77-10839

WATER RESOURCE MODELING.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
In: Environmental Modeling and Decision Making: The United States Experience. Report by Holcomb Research Institute, Indianapolis, Indiana. Praeger Special Studies in U.S. Economic, Social, and Political Issues, Praeger Publishers, N.Y., N.Y., 1976, p 45-52. 16 ref.

Descriptors: *Water resources, *Mathematical models, *Simulation analysis, *Water policy, *Planning, Management, Water quality, Optimization, Hydrology, Projects, Flood control, Water supply development, Computers, Systems analysis.
Identifiers: Interdisciplinary analysis, Operations models.

In the 1950s, the introduction of the computer facilitated the development and use of systems analysis as opposed to simpler analytical methods for water resource management. Throughout the 1960s and 1970s, a growing concern for environmental quality and a recognition of the strain being put upon traditional water supply sources by an increasing variety of conflicting uses both stimulated interest in the optimization of multiple resource objectives and in the interdisciplinary analysis of water resource issues. In response to these trends, the current U.S. modeling effort of water resources has made significant advances in integrating the knowledge of many disciplines addressing problems of allocating a finite resource among many differing demands. The present array of water resources simulation models deal mainly with: (1) water quantity; (2) water quality, involving the control of manmade or natural pollutants; or (3) the interrelationship between water quantity and quality. Discussed are operations models under the separate categories of water quantity and water quality. Next, the quantity and quality aspects are considered jointly in the c ontext of the more complex planning-policy models. These rely on the interfacing of the natural and social sciences and represent a newer and less sophisticated area of water resources research. (See also W77-10839) (Bell-Cornell)
W77-10840

ECOLOGICAL MODELING.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
In: Environmental Modeling and Decision Making: The United States Experience. Report by Holcomb Research Institute, Indianapolis, Indiana. Praeger Special Studies in U.S. Economic, Social, and Political Issues, Praeger Publishers, N.Y., N.Y., p 53-65, 1976. 3 ref.

Descriptors: *Ecology, *Surveys, *United States, *Mathematical models, Computer models, Decision making, Evaluation, Fisheries, Operations, Planning, Rangelands, Colorado, Projects, Systems analysis, Forestry.
Identifiers: *Resource management, Research modeling, Policy models, Environmental impact assessment.

The technology of computer science has proved to be an efficient tool for studying ecological systems. So far, computer models have been used mainly to advance ecological science; the application of ecological models to decision making is even newer and is limited by a number of factors described in this paper. Presented is a survey which reviews progress in modeling ecological systems and in the application of these models in the United States. First, developments in ecological modeling before and during the United States International Biological Program are described. This is followed by an evaluation of modeling in

environmental impact assessment. Finally, the use of operations and planning-policy models is examined for forestry, fisheries, and rangeland management. (See also W77-10839) (Bell-Cornell)
W77-10841

REGIONAL ENVIRONMENTAL MANAGEMENT MODELING.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
In: Environmental Modeling and Decision Making: The United States Experience. Report by Holcomb Research Institute, Indianapolis, Indiana. Praeger Special Studies in U.S. Economic, Social, and Political Issues, Praeger Publishers, N.Y., N.Y., p 80-89 (Chapter 9), 1976. 1 ref.

Descriptors: *Regional development, *Regional analysis, *Model studies, *Water quality control, *Delaware River, *Colorado River, *Hawaii, Estuaries, Environment, Management, Salinity, Standards, River basins, Interstate rivers, Water policy, Simulation analysis, Planning, Dissolved oxygen, Political aspects, Systems analysis.

The idea of managing both renewable and nonrenewable resources on a regional basis has developed steadily during this century. Regional simulation models have proliferated in recent years. With the increase in quantity of data and the complexity of the systems being modeled, not to mention political and institutional complications, the widespread use of models in regional-environmental problem solving has been hindered. Discussed herein are the salient characteristics of three representative regional modeling experiences: the Delaware River Eustuary pollution control policy; the Colorado River salinity control standards; and regional environmental management for Hawaii. The Delaware Estuary and Colorado River models both involve regional management aspects of interstate river basins. However, the former has proved to be largely unsuccessful while the latter has made a substantial contribution to the formation of regional policy. In the third example, models developed by the Hawaii Environmental Simulation Laboratory have been applied to a number of regional planning issues at the state and local levels. All three cases involve planning-policy-type models. (See also W77-10839) (Bell-Cornell)
W77-10842

SEASONAL AND NONSEASONAL ARMA MODELS IN HYDROLOGY,
Hackensack Water Co., Weehawken, N. J.; and Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 2A.
W77-10843

INCOMMENSURABLES AND TRADEOFFS IN WATER RESOURCES PLANNING,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6B.
W77-10844

MANAGEMENT OF GROUNDWATER AND SURFACE WATER VIA DECOMPOSITION,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4B.
W77-10845

OPTIMAL STORAGE CONTROL IN A COMBINED SEWER SYSTEM,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-10846

PRESCRIPTIVE MODELS FOR NONSTRUCTURAL FLOODPLAIN PLANNING,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 6F.
W77-10847

EXTENDED PERIOD SIMULATION OF WATER SYSTEMS--PART A,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-10848

LINKED MODELS FOR MANAGING RIVER BASIN SALT BALANCE,
California Univ., Davis, Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-10849

QUANTIFYING SOCIETAL GOALS: DEVELOPMENT OF A WEIGHTING METHODOLOGY,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
R. L. Gum, T. G. Roefs, and D. B. Kimball.
Water Resources Research, Vol 12, No 4, p 617-622, August 1976. 3 fig, 1 tab, 24 ref. OWRT C-4330(9049)(3)(UTAH).

Descriptors: *Planning, *Methodology, *Water resources, *Water policy, Measurement, Decision making, Arizona, New Mexico, Economics, Aesthetics, Recreation, Constraints, Systems analysis, Equations.
Identifiers: *Societal goals, Preference weights.

The basic structure of the Techcom planning methodology is reviewed. In the context of this system, a weighting methodology is developed to measure preferences regarding the attainment of postulated societal goals. The selected methodology, the Metfessel general allocation test, is applied to the hierarchies of three Techcom goals relating to aesthetics, economics, and recreation. The weighting methodology is tested with answers to a mail questionnaire randomly distributed throughout Arizona and New Mexico. Examples of the resulting preference weights are presented, and the use of such measures by decision makers is discussed. (Bell-Cornell)
W77-10850

INDEX OF LAKE BASIN LAND USE FOR LAND USE PLANNING PURPOSES,
Vermont Agricultural Experiment Station.
For primary bibliographic entry see Field 5G.
W77-10852

6B. Evaluation Process

DESIGNING SIMULATION MODELS FOR OPTIMIZATION STUDIES,
Lancaster Univ., Bailrigg (England). Dept. of Operational Research.
For primary bibliographic entry see Field 6A.
W77-10808

DYNAMIC MODEL FOR LONG-TERM DEVELOPMENT OF WATER RESOURCES MANAGEMENT,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W77-10820

NEW TECHNIQUES IN PLANNING A WATER MANAGEMENT SYSTEM: A CASE STUDY OF COOPERATIVE RESEARCH BETWEEN HUNGARY AND THE USA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6A.
W77-10821

SYSTEMS ANALYSIS, (LITERATURE REVIEW),
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W77-10832

THE VALUES OF GOODS AND SERVICES--IMPLICATIONS FOR A FLEXIBLE NATIONAL WATER POLICY,
Economic Research Service, Washington, D.C.
R. B. McKusick, R. M. Adams, and J. H. Snyder.
Water Resources Bulletin, Vol. 13, No. 3, p 489-498, June 1977. 1 fig, 1 tab, 13 ref.

Descriptors: *Water policy, *Economics, *Water resources, Measurement, Planning, California, Cost-benefit analysis, Evaluation, Equations, Mathematical models, Systems analysis.
Identifiers: *Commodity demand curves, *Goods and services, Producer and consumer surplus, Interregional competition, Quadratic programming, Values.

This paper evolved from a concern that water resource administrators and planners do not have a consistent definition of the value of goods and services of outputs from projects and programs. A more flexible approach to planning and evaluation is presented that recognizes the interaction of production and consumption through the use of commodity demand curves. Use of the concept of consumer surplus permits measurement of the differential impacts on producers' and consumers' welfare. Quadratic programming is suggested as a consistent means of quantifying these differential impacts. That such an approach is empirically feasible is verified by a recent study of the California agricultural sector which, employing a quadratic solution procedure, was used to estimate the value of goods and services and producer and consumer tradeoffs. Two major limitations in the particular application of this approach may be the lack of good regional demand estimates and the exclusion of water demand relationships for other uses, such as fish and wildlife. These problems, however, can gradually be met as data bases and methodology improve. (Bell-Cornell)
W77-10837

INCOMMENSURABLES AND TRADEOFFS IN WATER RESOURCES PLANNING,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
G. D. Lynne.
Water Resources Bulletin, Vol. 13, No. 1, p 93-105, February 1977. 3 fig, 3 tab, 14 ref. OWRT B-017-MASS(7).

Descriptors: *Water resources, *Planning, *Economics, *Mathematical models, Decision making, Equations, Evaluation, Prices, Benefits, Costs, Reservoirs, Systems analysis.
Identifiers: *Multiple objectives, *Tradeoffs, *Neoclassical economic models, *Conceptual models, Price ratios.

Society has many objectives, many of which are not commensurable. This problem of incommensurability is generally referred to as the multiple objective problem and leads to the notion of tradeoffs. Various approaches to calculating tradeoffs in water resource development have been advocated by several authors. Many have made errors in the context of the conceptual model presented herein. It is argued that the correct framework for tradeoff analysis is the neoclassical economic model. The relevant tradeoffs, then, are really price ratios. These, in turn, must be calculated so as to allow comparison of product mixes where the expenditure on resources is the same. This is where several authors have erred. An empirical example, based in part on actual data for the proposed Bronco dam and reservoir complex in western North Dakota, which illustrates the correct application of the model is presented. (Bell-Cornell)

W77-10844

QUANTIFYING SOCIETAL GOALS: DEVELOPMENT OF A WEIGHTING METHODOLOGY,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6A.
W77-10850

ENGINEERING-ECONOMIC ANALYSIS OF SHORE PROTECTION SYSTEMS: A BENEFIT/COST MODEL,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 2H.
W77-10905

THE POTENTIAL FOR GROWTH AND DEVELOPMENT IN TENNESSEE,
Arkansas State Univ., State University. Dept. of Geography.
For primary bibliographic entry see Field 6D.
W77-10916

CITIZEN PERCEPTION OF COASTAL AREA PLANNING AND DEVELOPMENT: A STUDY OF THE ATTITUDES AND KNOWLEDGE OF LOUISIANAS,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
J. L. Lindsey, K. W. Paterson, and A. L. Bertrand.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 018, Price codes: A03 in paper copy, A01 in microfiche. Report LSU-T-76-001, March, 1976, 30 p, 25 tab, 9 plates, 1 fig, 9 ref, 1 appendix.

Descriptors: *Louisiana, *Coasts, *Attitudes, Land management, Psychological aspects, Social aspects, Management, Motivation, Land development, Planning, Land resources.
Identifiers: *Citizen perception, Coastal area planning, Coastal zone management.

This study presents data on the Louisianan's perception of the coastal zone, knowledge of and attitudes toward coastal zone management and development, feelings about responsibility for control and development of coastal zone resources, and the relation of selected socio-personal characteristics to the conception of coastal zone problems and management. Citizens perceive the coast as being a non-urban region even when urban centers are part of the coast. They feel that mineral extraction and commercial fishing are the most important activities. The people and the way of life are thought to be different from the rest of the state. Most citizens have no knowledge of coastal zone management. They are aware of problems in the coastal zone but could not name specific types of problems. They feel that marshes could be used for recreation and light industry. There is strong sentiment for owner control of privately held land. Opinion is divided on whether state, local, or private interests should be responsible for coastal zone management, but most agree that the Federal Government should not play a major role. The groups most knowledgeable about coastal zone management and problems include younger persons, more highly educated persons, more affluent persons, whites, and urbanites. (Nessa-NC)
W77-10932

PROBLEMS IN THE ADOPTION OF NEW IDEAS AND PRACTICES,
Louisiana State Univ., Baton Rouge. Cooperative Extension Service.
Wade la Bretonne, Jr.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 281-288, 1 fig, 1 tab, 5 ref.

Descriptors: *Information exchange, *Fisheries, *Coasts, *Resources development, Education.
Identifiers: *Outer Continental Shelf.

A new Marine Advisory Program has been implemented through the Louisiana Sea Grant Program and Extension to reach producers and users of the marine environment. This paper describes the problems involved in dissemination of information from the researcher to the target audience. Additionally, the adoption practices by various groups in relation to the traditional Extension education programs and the feed-back mechanisms of the programs are discussed. (See also W77-11022) (Sinha-OEIS)
W77-11042

ENVIRONMENTAL IMPACT ANALYSIS: THE CENTRAL ARIZONA PROJECT AS AN EXAMPLE,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W77-11082

DEVELOPMENT OF AN AREAL MANAGEMENT CONCEPT FOR GULF PENAEID SHRIMP,
Louisiana Wildlife and Fisheries Commission, New Orleans, La.
For primary bibliographic entry see Field 2L.
W77-11124

LAND AND WATER RESOURCES FOR ENVIRONMENTAL RESEARCH ON THE OAK RIDGE RESERVATION,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 6G.
W77-11130

FUTURE WATER POLICIES (A COMMENTARY ON THE NATIONAL WATER COMMISSION REPORT),
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-11160

TOCKS ISLAND DEAUTHORIZATION (HEARINGS ON S 3106, WHICH WOULD DEAUTHORIZE TOCKS ISLAND RESERVOIR PROJECT FROM PARTICIPATION IN THE DELAWARE RIVER BASIN PROJECT).
For primary bibliographic entry see Field 6E.
W77-11448

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

PLANNING MODEL FOR SIMULATING DISTRIBUTION AND COST IN A REGIONAL WATER SUPPLY SYSTEM,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 6A.
W77-10822

LOW COST DRAINAGE NETWORKS,
South Australian Inst. of Tech., Adelaide.
For primary bibliographic entry see Field 4A.
W77-10833

COST-EFFECTIVE COMPARISON OF LAND APPLICATION AND ADVANCED WASTEWATER TREATMENT,
Environmental Protection Agency, Washington, D. C. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W77-10928

SENSITIVITY OF DESALTED WATER COSTS FROM VARIOUS PROCESSES TO CHANGING ENERGY PRICES,
Mekorot Water Co., Tel-Aviv (Israel). Engineering Div.
For primary bibliographic entry see Field 3A.
W77-11072

THE USE OF CROSSOVER DISCOUNT RATES IN IRRIGATION SCHEME DESIGN,
Bradford Univ. (England). Dept. of Economics.
For primary bibliographic entry see Field 3F.
W77-11401

ARIZONA PUMP WATER BUDGETS, 1977. (MARICOPA, PIMA, PINAL, COCHISE AND GREENLEE COUNTIES),
Arizona Univ., Tucson. Coll. of Agriculture.
For primary bibliographic entry see Field 8C.
W77-11431

FEASIBILITY OF INTRODUCING SOLAR-POWERED IRRIGATION ON A REPRESENTATIVE ARIZONA FARM,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W77-11440

6D. Water Demand

THE POTENTIAL FOR GROWTH AND DEVELOPMENT IN TENNESSEE,
Arkansas State Univ., State University. Dept. of Geography.
H. B. Stroud.
Growth and Change, Vol. 7, No. 4, October 1976, p 13-17, 3 fig.

Descriptors: *Tennessee, *Water supply, *Water demand, *Dependable supply, *Groundwater availability, Groundwater resources, Low flow, Planning.
Identifiers: Growth management.

Surface water and groundwater supplies are compared with existing demands in Tennesse. The comparison helps to identify regions where water may be in short supply in the future. The seven-day, ten-year low stream flow, expressed as millions of gallons per day, was computed for all gaging stations, and then divided by the drainage area above the gage. This provided flow figures that could be used on a comparable basis as flow expressed in millions of gallons per day per square mile. Three significantly different magnitudes of flow were used as a basis for identifying low flow regions. These regions were mapped and analyzed. Ground water data were analzyed and a revised groundwater potential map was developed. Water withdrawal rates were compared to minimum potential surface and groundwater supplies. On the generalized scale of this study, water appears abundant. However, localized demands will exceed the regional averages mapped here. Problem areas are identified and discussed. A similar study at a larger scale is recommended in order to identify localized problems. The study results are recommended for use by regional planners who wish to identify water limited regions for growth management purposes. (Nessa-NC)
W77-10916

IMPACT ON TEXAS WATER QUALITY AND RESOURCES OF ALTERNATE STRATEGIES FOR PRODUCTION, DISTRIBUTION, AND UTILIZATION OF ENERGY IN TEXAS IN THE PERIOD 1974-2000,
Texas Univ. at Austin.
For primary bibliographic entry see Field 5C.
W77-10930

CROP PRODUCTION POTENTIALS IN INDIA--A WATER AVAILABILITY BASED ANALYSIS,
Punjab Agricultural Univ., Ludhiana (India).
For primary bibliographic entry see Field 3F.
W77-11091

GROUND WATER SYSTEM EVALUATION FOR WADI NISAH-SAUDI ARABIA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W77-11426

6E. Water Law and Institutions

SYSTEMS ENGINEERING APPROACH TO AGRICULTURAL AND RURAL DEVELOPMENT SYSTEMS,
Nairobi Univ. (Kenya). Dept. of Electrical Engineering.
For primary bibliographic entry see Field 3F.
W77-10819

KEY NOTES AND IMPACTS OF SIMULATION AND MODELING TECHNIQUES FOR DECISION MAKING WATER RESOURCES PROJECTS IN DEVELOPING AREAS,
Madhya Pradesh Government Control Board for Major Projects, Raipur (India).
For primary bibliographic entry see Field 6A.
W77-10825

SUMMARY STATEMENTS OF WATER RESOURCES INVESTIGATIONS 1976-77,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 9C.
W77-10863

SAFE DRINKING WATER ACT OF 1974--HISTORY AND CRITIQUE,
For primary bibliographic entry see Field 5G.
W77-10923

NATIONAL ENVIRONMENTAL POLICY: COORDINATION OR CONFUSION,
North Texas State Univ., Denton.
S. Adams, F. P. Williams, P. M. Ginter, and A. C. Rucks.
Environmental Science and Technology, Vol 10, No 8, August 1976, p 757-760, 1 fig, 1 tab, 6 ref.

Descriptors: *Administration, *Environmental effects, Management, Environment.
Identifiers: *Environmental Impact Statement, National Environmental Policy Act, Environmental protection.

A brief explanation of the Council on Environmental Quality's (CEQ's) history and purpose is presented. The environmental impact statement (EIS) process is then described. Several sources of confusion in EIS preparation are identified. First, there are a multitude of formats. Although the CEQ has developed general guidelines governing EIS preparation, each agency affected by the process has additional guidelines, which creates confusion when more than one agency must review the same project. Second, the determination of what constitutes a significant environmental impact varies between agencies, and between agencies and the CEQ. The CEQ's effectiveness as a [illegible]nating and governing board is discus[illegible] available evidence is considered inconclu[illegible] two-fold criticism is presented. First, t[illegible]'s efforts have simply been inadequate [illegible]riticism is tempered by the conclusion that a[illegible]te techniques for evaluating environmental [illegible]cts are not always available. The EIS process is [illegible]een as a catalyst in the development of the needed techniques. Second, bureaucratic stumbling blocks, red tape, and the cost of EIS preparation have given the CEQ a political emphasis. Examples are provided to reinforce these criticisms. (Nessa-NC)
W77-10927

THE NATIONAL FLOOD INSURANCE PROGRAM AND COASTAL REAL ESTATE DEVELOPMENT: THE EXPERIENCE OF WESTERLY, CHARLESTOWN, AND SOUTH KINGSTOWN, RHODE ISLAND,
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6F.
W77-10931

COASTAL ZONE MANAGEMENT: A LAWYER'S PERSPECTIVE,
Environmental Defense Fund, East Setauket, N.Y.
J. T. B. Tripp.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 135-151.

Descriptors: *Legislation, *Land use, *Wetlands, *Resources development, *Environmental effects, Conservation, Coasts, Baseline studies.
Identifiers: *Outer Continental Shelf, *Coastal zone management, Real estate.

A legal framework is developed in which to explain, evaluate and justify a conservationist's view of coastal zone development by real estate and other activities and the role of recent federal environmental legislation in regulating that development. Federal, conservation-oriented legislation, regulating real estate development and other uses of coastal resources in the coastal zone, may be evaluated from two perspectives: (1) the ineffectiveness of nuisance law in protecting property interests, dependent on conservation of coastal water resources, from the adverse impacts of real estate and other development in the coastal zone, and (2) the social necessity for legislation compensating for the impact of traditional federal water resource, development-oriented legislation which has subsidized and continues to subsidize degradation of coastal water resources. (See also W77-11022) (Sinha-OEIS)
W77-11028

THE ROLE OF GOVERNMENT IN REAL ESTATE DEVELOPMENT,
Louisiana State Planning Office, Baton Rouge. Coastal Resources Program.
P. H. Templet, and J. Lindsey.
Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of the Coastal Society, held New Orleans, LA, November 17-20, 1976. p 152-157.

Descriptors: *Land use, *Wetlands, *Resources development, *Environmental effects, *Legislation, Pollution abatement, Louisiana.
Identifiers: *Outer Continental Shelf, *Coastal Zone management, Real estate.

The traditional role of government in real estate development is expanding and now involves the question of where developments can be situated. In Louisiana this becomes a question of wetlands modification and choosing the best areas to site real estate developments. Local governments will probably make most of the decisions regarding such sitings and the role of state government will be to provide technical assistance and to develop guidelines which local governments can implement with some state overview. Intrinsic suitability mapping is part of the technical assistance to local governments for use in siting real estate development. The balance of conservation and development envisioned by the Federal Coastal Zone Management Act can best be carried our in Louisiana by this partnership of state and local gover[illegible]ments utilizing the latest technical informatio[illegible] (See also W77-11022) (Sinha-OEIS)
W77-11029

ENVIRONMENTAL CONSIDERATIONS [illegible] THE OIL AND GAS PRODUCTION INDUSTR[illegible] IN THE COASTAL ZONE,
Texaco Inc., New Orleans, La.
For primary bibliographic entry see Field 5G.
W77-11032

WATER QUALITY AND MOLLUSCAN SHEL[illegible] FISH: AN OVERVIEW OF THE PROBLE[illegible] AND THE NATURE OF APPROPRIA[illegible] FEDERAL LAWS,
Stanford Research Inst., Arlington, Va. Center [illegible] Resource and Environmental Systems Studies.
For primary bibliographic entry see Field 5G.
W77-11048

THE POLITICS OF SALT: BACKGROUND A[illegible] IMPLICATIONS OF THE MEXICAN-AM[illegible] ICAN TREATY OF 1944,
Arizona Univ., Tucson, Inst. of Governm[illegible] Research.
W. Tilden.
Preliminary Report, (1975). 123 p, 5 tab, 62 ref.

Descriptors: *Mexican water treaty, *Colora[illegible] River, *Water law, *Political aspe[illegible] *International waters, International Bound[illegible] Water Comm, Saline water, Water quality, In[illegible] national law, Governmental interrelatio[illegible] Legislation.

Unresolved problems concerning the sal[illegible] Colorado River water supplied to Mexico by [illegible] United States for agricultural irrigation [illegible] discussed. The 1944 Water Treaty between th[illegible] two countries allocated 1.5 million acre-feet [illegible] water to Mexico, but only much later did the U[illegible] agree to accept responsibility for water qual[illegible] Legal analysis deals with the various allocation[illegible] Colorado River water made by treaty and stat[illegible] The legal principles adopted by governments c[illegible] cerning use of international rivers include absol[illegible] territorial sovereignty, absolute territorial inte[illegible] ty, community in waters, or restricted territo[illegible] sovereignty and integrity. In the case of the 1[illegible] treaty, the U.S. basically interpreted its obl[illegible] tions according to the first principle while Mex[illegible] adopted the terms of the fourth principle. The [illegible] precise language of the treaty had much to do w[illegible] water quality disputes in later years. As the U[illegible] political climate changed, resolution of the disp[illegible] was possible; by 1973, the Brownell Commissi[illegible] appointed by President Nixon, submitted rec[illegible] mendations to both governments to facilitate s[illegible] resolution. Game theory, as discussed by H[illegible] sanyi, Riker and Schelling, is used to analyze [illegible] change in U.S. policy. (Jahns-Arizona)
W77-11097

THE ARIZONA GROUNDWATER C[illegible] TROVERSY AT MID-CENTURY,
Montana State Univ., Bozeman.
R. G. Dunbar.
In: Arizona and the West, Univ. of Arizona Pr[illegible] Tucson, Vol. 19, No. 1, p 5-24, Spring 19[illegible] OWRT A-059-MONT(2).

Descriptors: *Arizona, *Groundwater, *W[illegible] utilization, Water wells, Surface waters, Legi[illegible] tion, Agriculture, History, Judicial decisio[illegible] Overdraft, Water resources development.

History of a groundwater controversy is presen[illegible] centering on the Sonoran Desert which inclu[illegible] roughly the southern third of Arizona. Approp[illegible] tion of surface waters by diversion and benefi[illegible] use began when the United States took contro[illegible] Arizona after the Mexican War; subsequent [illegible] tempts at legislative control of surface waters

described. There were rapid increases in the number of wells and volume of water pumped after the mid-1930's, with several factors involved including the increase in cotton cultivation and beginning of a prolonged drought. Some legislation measures to control groundwater use were passed, although opposition was strong until 1948 when the Bureau of Reclamation made passage of a groundwater code prerequisite to the approval of the Central Arizona Project. The Groundwater Code of 1948, which is still in effect, authorizes the state land commissioner to designate as 'critical groundwater areas' any basins in which withdrawals for irrigation exceed recharge. Judicial decisions of importance to this issue are also reviewed. Since 1948 the annual overdraft has exceeded 3 million acre-feet, and water levels in wells have gradually declined. While agricultural claims have increased, urban populations are now competing actively for dwindling water supplies. (Jahns-Arizona)
W77-11102

COAL MINE POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 42, No 80, p 21380-90, April 26, 1977.

Descriptors: *Pollution abatement, *Effluents, *Mining, *Coal mine wastes, Discharge(Water), Mine drainage, Mine wastes, Mine water, Coal mines, Mineral industry, Regulation, Reclamation, Manganese, Pollutants, Iron, Precipitation(Atmospheric), Drainage effects, Drainage, Drainage water, Dissolved solids.

The Environmental Protection Agency (EPA) has promulgated final effluent limitations guidelines for the coal mining point source category which contain substantial changes from the interim guidelines . These guidelines will be incorporated in National Pollutant Discharge Elimination System permits. The guidelines only apply to active mining areas and do not affect mines where reclamation has been commenced or completed. Effluent limitations representing the degree of reduction attainable by the application of the best practicable control technology currently available are established for coal preparation plants and associated areas and for the subcategories of acid or ferruginous mine drainage and alkaline mine drainage. Limitations are set for the allowable pollutant concentrations for iron, manganese, TSS and pH. The regulations do not cover pretreatment standards for coal mining point source categories. Appendices to the regulation include a summary of the legal authority for the regulations, a technical summary and basis for the regulations, and a summary of public comments and participation. (Denker-Florida)
W77-11152

STATE PROTECTION FROM OIL SPILLS: ASKEW V AMERICAN WATERWAYS OPERATORS, INC.,
Lewis and Clark Coll., Portland, Oreg. Northwestern School of Law.
J. D. Judy.
Environmental Law, Vol 4, No 3, p 433-43 (Spring 1974).

Descriptors: *Florida, *Oil spills, *Oil pollution, State jurisdiction, Federal jurisdiction, Oil industry, Oil wastes, Oily water, Regulation, State governments, Water pollution control, Water pollution sources, Shores, Water damages, Legislation, Judicial decisions.

Florida's Oil Spill Prevention and Pollution Control Act was challenged by merchant shippers, world shipping associations, and operators and owners of heavy industries and oil terminal facilities in Askew v American Waterways Operators, Inc. They contended that the Act was invalid because it was pre-empted by the federal Water Quality Improvement Act and because federal maritime law precludes a state from exercising its police powers over sea-to-shore pollution damage. The United States Supreme Court upheld the Act, and found it consistent with federal admiralty jurisdiction. The Act recognizes that states have a paramount interest in the protection of their shores. It allows the state to recover clean up costs due to oil spillage from vessels destined for or leaving terminal facilities within the state's territorial waters. Terminal facilities within the state's territorial waters are also liable for spillage costs. Finally, port managers are authorized to board vessels prior to their entry into Florida ports to determine whether the vessel presents a spillage threat. (Josepher-Florida)
W77-11153

CONFISCATION OF INDIAN WINTER'S RIGHTS IN THE UPPER MISSOURI RIVER BASIN,
Bureau of Indian Affairs, Washington, D.C.
W. H. Veeder.
South Dakota Law Review, Vol 21, No 2, p 282-309 (Spring 1976). 1 map, 86 ref.

Descriptors: *Indian reservations, *Water rights, *Federal government, *Missouri River, *River basin development, Industrial water, Municipal water, Reservation doctrine, Governmental interrelations, Prior appropriation, Administrative agencies, Competing uses, Water contracts, Political aspects, United States.

The United States acts as legal trustee for the land and water rights of Indian tribes. In arid western lands where water is of critical importance, non-Indian demands on a limited supply of water have already diminished the economic potential of some reservations. Very often the Department of the Interior and other federal agencies have encouraged these non-Indian demands in derogation of the fiduciary duty owed the Indian people. For example the Supreme Court has recognized Indian tribes' retention of sufficient water rights in the Upper Missouri River Basin. Developments in that area now indicate that the government has failed to fulfill its responsibility. Agencies have entered into contracts and issued memoranda which encroach upon Indian water rights established in the landmark decision of Winters v United States. The Winters Doctrine places an affirmative duty upon the federal government to protect Indian water rights, present and future. However, an examination of six main stem dams on the Missouri River reveals a pattern of taking of Indian property for public use without payment. As the need for industrial water grows, this pattern is likely to be continued. (Molloy-Florida)
W77-11154

MANGROVES AS MONITORS OF CHANGE IN THE SPANISH RIVER,
Florida Atlantic Univ., Boca Raton., Dept. of Biological Sciences.
D. F. Austin.
Fla Environmental and Urban Issues, Vol 111, No 3, p 4-7, 15-16 (February 1976). 4 fig.

Descriptors: *Mangrove swamps, *Florida, *Salinity, *Saline water intrusion, *Salt tolerance, Brackish water, Vegetation establishment, Plant growth, Vegetation effects, Saline water, Canals, River basins, Water types, Freshwater marshes, Saline water-freshwater interfaces, Tidal marshes, Freshwater, Vegetation.

Mangrove trees with their varying abilities to withstand salt provide an accurate visible barometer for changs in water salinity. Of the approximately 20 species of the mangrove association. Mangove ecology has shown that each of these types has a different ability to stand flooding by salt water. The red mangrove, the most tolerant, grows best in an area where the roots are covered daily by high tides. The black mangrove is found at higher elevations near the mean tide line, and the white trees thrive behind the black. The knarled buttonwoods grow at elevations only flooded by the highest tides; they are the least tolerant of salt water flooding. The mangrove invasion of the Spanish River Basin indicates how the mangroves monitor changes in salinity. From the late 1800's to the early 1900's vegetation consisted primarily of fresh water sawgrass marsh. The first mangroves appeared on the ocean side of the river basin. By 1945 salt water intrusion had occurred, and the mangroves had moved several hundred feet further inland. Continued fresh water loss and salt water intrusion have permitted the mangroves to move another one and one-half miles inland. Rapid urbanization of southern Florida threatens to destroy the mangroves, thus depriving us of their valuable indications of salinity. (Moorhouse-Florida)
W77-11155

THE TEXAS OPEN BEACHES ACT: PUBLIC RIGHTS TO BEACH ACCESS,
R. J. Elliott.
Baylor Law Review, Vol 28, No 2, p 383-94, Spring 1976.

Descriptors: *Texas, *Beaches, *Recreation, *Public access, Recreation facilities, Seashores, Common law, Law enforcement, Penalties(Legal), Public rights, Water law, Legislation, Vegetation, Riparian land, Boundaries(Property), Land tenure, State governments, Barriers, Legal aspects.

The policy statement of the Texas Open Beaches Act supports the public's right of free access to Texas beaches, and opposes obstructions to that access. In terms of pure substantive law the Open Beaches Act creates no right in the public which did not previously exist under common law. However, from a practical viewpoint there are three important changes. First, the statutory publication of public rights has created a greater awareness of those rights throughout the general population. Second, the Act appoints specific litigation experts to bring suit in behalf of the public with their express duty to seek enforcement of rights with quick, hard-hitting remedies. Third, the Act provides the presumptive right of public presence on the privately owned secotr of the beach. Under the prior common law, the landowner had the presumptive right to exclude the public. The only two cases under the Act to date have involved barriers obstructing passage along the beach seaward of the vegetation line. In each case, the barriers were quickly removed pursuant to injunctive orders. (Rieck-Florida)
W77-11156

PUBLIC RIGHTS IN OCEAN BEACHES: A THEORY OF PRESCRIPTION,
Syracuse Univ., N.Y. School of Law.
D. A. Degnan.
Syracuse Law Review, Vol 24, No 3, p 935-66 (Summer 1973). 122 ref.

Descriptors: *California, *Oregon, *Prescriptive rights, *Beaches, *Recreation, Easements, Public access, Public rights, Common law, Legal aspects, Water law, Water rights, Use rates, Seashores, Shores, Oceans, Recreation demand.

When the public acquires an easement in a beach the privately owned land is subjected to the public right. Although title to the land has remained in the property owner, the use of the land for recreational purposes must be shared with the public. The first portion of the article discusses California and Oregon beach cases and analyzes prescription problems relating to the foreshore. Despite the disadvantages of the case by case approach of prescription to secure public rights to ocean beaches, it serves as a protection against private efforts to close off the beaches. This study reveals

the strengths and weaknesses of common law approach to the recreational land use issue. The second portion of the report considers: the relative and limited nature of the public right in the ocean beaches; the adverseness of the public use of ocean beaches, and the contrasting uses of lesser beaches and other land; the presumption of permissive use of unenclosed lands; and questions dealing with time and degree of the use. (Rieck-Florida)
W77-11157

CONSTITUTIONALITY OF THE ECKHARDT OPEN BEACHES BILL,
Yale Univ., New Haven, Conn. Coll. of Law.
C. L. Black.
Columbia Law Review, Vol 74, No 3, p 439-47 (April 1974). 40 ref.

Descriptors: *Constitutional law, *Recreation, *Public access, *Beaches, Legal aspects, Water law, State jurisdiction, Federal-state water rights conflicts, Legal review, Public rights, Governmental interrelations, Legislation, Law enforcement, Federal government, Federal jurisdiction, Competing uses, Seashores, Coasts.

The Open Beaches Bill proposes to counter the enclosure movement which threatens to decrease the number and quality of beaches available to the public. The bill's dominant strategy is to accept the substantive state-law position regarding beach ownership and public rights over beaches, but it 'declares and affirms' that America's beaches shall be open to the public for recreational use wherever the state law does not preclude this result. This makes any obstruction of public right, other than in conformity with state law, unlawful as a matter of federal law. The bill authorizes public suits to vindicate the openness of the beaches. The principal national contribution, then, is to provide remedial machinery and litigation resources for procuring judicial declaration and protection of judicially ascertained public rights. This is of crucial importance, since private encroachments on public beaches may ripen into prescriptive right unless timely legal action is taken. The creation of a rebuttable presumption in favor of public access and the establishment of a framework for federal-state cooperation are well within Congress' constitutional powers. (Rieck-Florida)
W77-11158

WATER POLLUTION CONTROL ACROSS THE NATION,
For primary bibliographic entry see Field 5G.
W77-11159

FUTURE WATER POLICIES (A COMMENTARY ON THE NATIONAL WATER COMMISSION REPORT),
Soil Conservation Service, Washington, D.C.
E. C. Buie.
Journal of Soil and Water Conservation, Vol 28, No 5, p 211-13 (September 1973). 2 photo.

Descriptors: *Optimum development plans, *Project planning, *Water resources development, *Water policy, Comprehensive planning, Planning, Water resources, Rural areas, Water supply, Administrative agencies, Flood control, Irrigation drainage, Navigation, Recreation, Sedimentation, Erosion control, Engineering, Agriculture, Land reclamation, Flood plain zoning.

The National Water Commission report to Congress contains recommendations and conclusions covering almost every aspect of the nation's future water resource problems. The report includes highly controversial suggestions and recommendations that could seriously disrupt established programs. It gives considerable attention to: (1) the problem of water use in food and fiber production; (2) programs for reducing flood losses; (3) erosion and sedimentation control programs; and (4) funding for recreational development. The commission also recommends major adjustments in the engineering responsibilities of the Soil Conservation Servicle, the Army Corps of Engineers, and the Bureau of Reclamation. The report suffers some inconsistencies when dealing with problems relating to rural water supply. The author of this commentary on the report concludes that the federal government's role in water resources development should be influenced significantly by the report. This thought is evident in the report's recommendations that state and local agencies assume full responsibility for conventional developments such as flood control, irrigation, drainage, water supply and navigation. (Rieck-Florida)
W77-11160

WILD RIVERS FLOWING FREE.
D. Sumner.
National Wildlife, Vol 14, No 4, p 20-27 (June 1976).

Descriptors: *River systems, *River regulation, *Water quality control, *Wild rivers, Wildlife, Aquatic habitats, Legal aspects, Condemnation, Water pollution, Land use, Natural resources, Recreation, Social aspects, Aesthetics, Scenery, Wildlife management, Water quality standards, Dams, History, Wildlife conservation, Wildlife habitats, Rivers, Legislation.

Despite the fact that the National Wild and Scenic Rivers System was established eight years ago, the system protects only fifteen rivers today. The basic policy of the act states that clean, free flowing rivers may be worth protecting if they possess 'outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural and other similar values'. Among other things, the law prohibits dams, protects water quality, regulates disruptive onshore activity, curtails private property development and defines three classes of rivers with various restrictions on each. There are numerous reasons why so few rivers are currently in the system. For example, intensive wild-river studies are required before the waterway can be added to the system. Another element is the powerful interest groups including power, mining, agriculture and land developers who fight the rivers' protection. Landowners also resent the law's condemnation and land use procedures. While the 1978 deadline for Congressional action nears, a current survey is attempting to pinpoint exemplary unprotected rivers which represent each type of river ecosystem in order to create the rivers system the law intended. (Rieck-Florida)
W77-11161

REGIONAL WATER QUALITY CONTROL,
R. Disharoon.
University of California, Davis, Law Review, Vol 5, p 272-308, 1972.

Descriptors: *Planning, *Water pollution control, *Water Quality Act, *California, *Water quality control, *State governments, Water quality standards, Pacific Coast Region, Water law, Legislation, Standards, Water pollution, Permits, Administration, Inter-agency cooperation, Water quality, Law enforcement, Industrial wastes, Monitoring.

Control of water quality in California is presently administered under the organizational concept of a state board and nine regional boards. The Porter-Cologne Water Quality Act gives the regional boards primary responsibility for pollution control within their territory, while the state board resolves difficulties that arise when attempting to control the quality of waters which are not confined to a single region. A major problem facing regional water quality control is the lack of sufficient funds to enable each regional board to employ a large, well-paid staff. Slowness of legal action is also a problem at the regional level as is the unlikelihood that a local judge would close down desperately needed local industry unless there is clear, visible evidence of present danger from discharge. To solve the problems of regional water quality control adequate manpower is needed to carry on increased surveillance and monitoring programs. A new methodological approach could be utilized allowing self-monitoring and a response to changing river conditions through seasonal operation of treatment facilities. Discretionary use of publicity and public opinion are also devices available to intimidate the industrial violator into compliance with water quality standards. (Hilburn-Florida)
W77-11162

COAL MINE WATER POLLUTION: AN ACID PROBLEM WITH MURKY SOLUTIONS,
Appalachian Research and Defense Fund of Kentucky, Lexington.
For primary bibliographic entry see Field 5G.
W77-11163

EPA JURISDICTION OVER WELL INJECTION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-11164

EVERY POND AND PUDDLE--OR, HOW FAR CAN THE ARMY CORPS STRETCH THE INTENT OF CONGRESS,
Pierce, Atwood, Scribner, Allen, and McKusick, Portland, Maine.
D. E. Boxer.
Natural Resources Lawyer, Vol 9, No 3, p 467-75, 1976.

Descriptors: *Navigable waters, *Legislation, *Federal jurisdiction, *Permits, Administrative decisions, Non-navigable waters, Legal aspects, Water law, Navigation, Bodies of water, Navigable rivers, Federal government, Regulation, Permits, Administration, Federal Water Pollution Control Act, Wetlands, Marshes, Dredging, Political aspects, Judicial decisions.

In 1975, pursuant to section 404 of the Federal Water Pollution Control Act Amendments of 1972 and in response to a court order, the Corps of Engineers issued interim final regulations which administratively defined navigable waters. The definition included all coastal wetlands, mudflats, swamps, freshwater marshes and shallows, and intrastate lakes and rivers. It is probable, however, that such a definition far exceeds the intent of Congress in its enactment of section 404. Legislative committee reports indicate that a broad definition of navigability including all waterways that serve as a link in the chain of commerce was contemplated. But such a definition sought merely to abandon the restrictive view set forth in the Daniel Ball decision, and adopt the position of more recent cases which held that waterways were navigable if capable of improvement which would facilitate their use in commerce. The regulations promulgated by the Corps have extended federal jurisdiction over waterways beyond the maximum extent permissible under the Commerce Clause. The court decisions around which the congressional intent in section 404 must be analyzed provide no support for the proposed, all-inclusive administration definition of navigable waters. (Moorhouse-Florida)
W77-11165

CONSULTANT LOOKS AT 208 PROGRAM,
Camp, Dresser and McKee, Inc., Boston, Mass.
J. C. Lawler.
Water and Sewage Works, Vol 123, No 9, Cover, 123, September 1976.

escriptors: *Federal Water Pollution Control ct, *Water management(Applied), *Grants, Evaluation, Legislation, Water quality, Coor- nation, Recreation, Non-structural alternatives, egal aspects, Pollution abatement, Water pollu- on control, Federal government, Local govern- ents, State governments, Water pollution, anning.

e president of a consultant firm outlines the asons which he feels have caused the Federal ater Pollution Control Act (FWPCA) Amend- nts of 1972 to fail to meet the stated objectives d time schedule. He refers in particular to the tting up of 208 plans--those covered by Section 8 of the Act which provides for comprehensive ea-wide waste management planning. Among the asons cited for lack of progress achieved under Act are: (1) lack of comprehension at all levels the interrelationships of the various programs the 1972 Amendments; (2) lack of technological perience in nonpoint source pollution control; lack of administrators and consultants who can l with structural and non-structural alterna- es; (4) absence of means to enforce non-struc- al alternatives; (5) lack of program coordination ong state, municipal, and metropolitan agen- s; and (6) lack of real commitment at the state l local level. To make the 208 program success- the author sees a need for a more responsible l informed private consultant sector, and for equate funding and enforcement of legislation to plement the 208 planning process. (Jones- rida)
7-11166

UANA RIVER FLOOD CONTROL PRO- CT,
arings--Subcomm on International Political and itary Affairs, Comm on International Rela- s, U.S. H. Rep., July 21, 27, 1976. 69 p.

criptors: *Flood control, *Mexico, gislation, Flood routing, International Bound. Water Comm., Projects, Treaties, Mexican ter Treaty, Dikes, Canals, Concrete-lined als, Legal aspects, Political aspects, Federal ernment, Water law, Government finance, al governments, Surface runoff.

s hearing considered House Bill H.R. 14645 ch would amend existing law relating to the in- ational Tijuana flood control project. Federal icipation in this project was originally horized in 1966 but so far no action has been n. Now, because of changes in the scope of project, Congressional authorization must be ined to allow the use of federal funds to hase necessary lands or rights of way. The ect as modified by this bill calls for the use of pater dikes rather than a full concrete canal. amended the project would still enable the ed States to fulfill its treaty obligations to ico. Ten witnesses appeared before the com- ee. Six were in favor of the project as nded and two were opposed. The two remain- witnesses expressed no preference either way. or issues of concern to the witnesses included: omic benefits of the project, flood protection, enhancement, surface water runoff, sediment rol, and health hazards such as mosquito ding problems. (Petruff-Florida)
-11167

WATER QUALITY PROBLEM ON THE ORADO RIVER,
Mexico Interstate Streams Commission, Fe.
rimary bibliographic entry see Field 5G.
11168

ICAN-AMERICAN INTERNATIONAL ER QUALITY PROBLEMS: PROSPECTS PERSPECTIVES,
ersidad Nacional Autonoma de Mexico, Mex- ty. School of International Law.
C. Sepulveda.
Natural Resources Journal, Vol 12, No 4, p 487-95, October 1972.

Descriptors: *Mexican Water Treaty, *Canals, *Colorado River Basin, *Salinity, Beneficial use, Drainage, Water pollution, International law, Water quality, Water quality standards, Treaties, Interstate rivers, International Bound. and Water Comm., Water policy, River basins, International commissions.

Two treaties presently govern the control of international waters between the United States and Mexico. Neither of these treaties make any specific reference to water quality, although the 1944 treaty indicates that water suitable for beneficial use will be provided. Because of this omission, in 1961 a dispute arose over the quality of the waters of the Colorado River being delivered to Mexico. As a transitory solution, the International Boundary and Water Commission enacted Minute 218 which required the United States to build a thirteen mile drainage canal. This canal diverts polluted water originating in the Wellton-Mohawk project into the Gulf of California thus preventing it from reaching the Morelos Dam in Mexico. Although Minute 218 has been satisfactorily used for more than five years, it also fails to mention the quality of water turned over to Mexico. To avoid disputes the two countries need to reach a formal agreement which will determine acceptable water quality standards. It is suggested by the author that the International Boundary and Water Commission could serve as the appropriate body for making and implementing such water quality decisions under the treaty. (Petruff-Florida)
W77-11169

UNITED STATES APPROACHES TO THE SALINITY PROBLEM ON THE COLORADO RIVER,
Department of State, Washington, D.C. Office of the Legal Advisor.
D. A. Gantz.
Natural Resources Journal, Vol 12, No 4, p 496-509, October 1972.

Descriptors: *Mexican Water Treaty, *United States, *Colorado River, *Salinity, Equitable apportionment, Water quality, Water quality standards, International law, Legal aspects, Reasonable use, Rio Grande River, Interstate rivers, Water allocation(Policy), Treaties, Colorado River Basin, Water policy, Irrigation.

The 1944 water treaty between the United States and Mexico concerns the equitable sharing of the waters of the Colorado, Tijuana, and Rio Grande rivers. This treaty, without regard to water quality, guarantees Mexico 1,500,000 acre-feet annually of water from the Colorado River. Until 1960, the salinity of this water remained stable. However in 1961, the completion of Wellton-Mohawk project coupled with the fact that the United States reduced its water deliveries to a level near the guaranteed allotment caused an increase in salinity in the water received by Mexico. The two governments reached a temporary solution to this problem with the enactment of Minute 218 in 1965. In 1972, in an attempt to reach a permanent solution, Minute 241 was enacted. This resolution stated that the United States was prepared to undertake certain actions to improve the quality of water going to Mexico. In keeping with this assurance the United States has begun work on a salinity control program. Although the author feels that United States use of the Colorado River can not be characterized as unreasonable, from an international legal standpoint, he recognizes the need for salinity control measures. (Petruff-Florida)
W77-11170

SALINITY IN THE COLORADO: AN INTERPRETATION OF THE MEXICAN-AMERICAN TREATY OF 1944,
Universidad Nacional Autonoma de Mexico, Mexico City. School of International Law.
A. Sobarzo.
Natural Resources Journal, Vol 12, No 4, p 510-14, October 1972.

Descriptors: *Mexican Water Treaty, *Colorado River, *Beneficial use, *Salinity, Treaties, Drainage water, Water quality, Consumptive use, International law, Legal aspects, Water pollution, Water policy, Municipal water, Crops, Domestic water, Water allocation(Policy), Reasonable use, Damages.

The 1944 water treaty between the United States and Mexico does not specify the quality of water to be delivered to Mexico. Article 3 states preference uses for the water with top priorities being given to domestic, municipal, and agricultural uses. The Vienna Convention on the Law of Treaties calls for a treaty to be interpreted in good faith in accordance with the object and purpose of the treaty. This would make irrelevant the exclusion of a specific water quality clause and would deem the treaty violated if the beneficial uses established by Article 3 were unattainable. The author contends that the introduction of highly saline drainage water from the Wellton-Mohawk project into the Colorado River violates the Vienna Convention because it is unreasonable to refer to such waters as a source of the river. Furthermore, the contamination caused by this water adversely affects the beneficial uses of Article 3. Applying international law standards, the author feels that the United States is obligated by the treaty to deliver water from the Colorado River in its natural condition. In addition, the United States should be responsible for damages to crops caused by the salinity. (Petruff-Florida)
W77-11171

THE COLORADO RIVER: INTERNATIONAL ASPECTS,
International Boundary and Water Commission, El Paso, Tex.
J. F. Friedkin.
Natural Resources Journal, Vol 12, No 4, p 515-19, October 1972.

Descriptors: *Mexican Water Treaty, *Colorado River, *Salinity, *Governmental interrelations, International law, Drainage water, Water quality, Treaties, Canals, Legal aspects, Pumping, Drainage wells, Water allocation(Policy), Salts, Water policy, Water pollution, United States, Mexico, Return flow, Water allocation(Policy).

In 1971 the United States delivered 1,562,000 acre-feet of water from the Colorado River to Mexico. Sixty-five percent of this water came from the Imperial Dam and the remaining thirty-five percent came from return flows to the river below the dam. Under the option provided in Minute 218, Mexico chose to receive no deliveries from the All American Canal. Minute 218 is an attempt by the United States and Mexico to solve the salinity problem of the Colorado River. This agreement consists of two operations which serve to reduce the salinity of the water delivered to Mexico. The first operation is the by-passing of a part of the Wellton-Mohawk drainage return waters. The second operation is selective pumping of the drainage wells to minimize the concentration of salts in deliveries to Mexico. Since Minute 218 became effective in 1965, the average annual salinity of water delivered to Mexico has been reduced from 1375 ppm to 1245 ppm. Some progress has therefore been made toward a solution to the salinity problem although new alternatives are still being examined by both countries. (Petruff-Florida)
W77-11172

UNITED STATES AND MEXICO: WEATHER TECHNOLOGY WATER RESOURCES AND INTERNATIONAL LAW,
Arizona Univ., Tucson, Coll. of Law,
R. J. Davis.
Natural Resources Journal, Vol 12, No 4, p 530-44, October 1972.

Descriptors: *Cloud seeding, *Weather modification, *Hurricanes, *Artificial precipitation, Weather, Precipitation(Atmospheric), Rain, Snow, Storms, International law, Treaties, Legal aspects, Projects, Water policy, Mexico, Snowpacks, Water yield improvement, Silver iodide, Rainfall, Snow management.

Weather modification technology has made important advances in recent years. Currently, the United States is involved in three types of projects which might have international ramifications. Project Skywater, an atmospheric water resources program, includes a snowpack augmentation program. Experiments show that an estimated 15% annual increase in snowmaking can result from the proper use of silver iodide. This increase will make approximately 1,870,000 acre-feet of water available for downstream users such as Mexico. Project Arid Lands has been experimenting in the Southwest and Florida with seeding summer cumulous clouds. Although there are fears that downwind precipitation may be inhibited by seeding, proof of loss is difficult to establish. Also in the experimental stage is hurricane treatment. At present it is unclear how weather modification will affect precipitation associated with these storms. Project Stormfury which deals with severe storm modification has recently been moved from the Atlantic to the Western Pacific because of a lack of storms and a fear of causing property damages. Although there are no international laws or treaties governing weather modification, as weather modification techniques move out of the experimental stages, the need for such agreements will increase. (Petruff-Florida)
W77-11173

A HISTORY AND INTERPRETATION OF THE WATER TREATY OF 1944,
K. J. Anderson.
Natural Resources Journal, Vol 12, No 4, p 600-14, October 1972.

Descriptors: *Mexican Water treaty, Water quality, *Droughts, *Salinity, Treaties, International law, Legal aspects, Governmental interrelationships, United States, Mexico, Political aspects, Water policy, Water quality standards, California, Colorado River Basin, Negotiations, Water allocation(Policy), Irrigation, Riparian rights.

The 1944 Water Utilization Treaty between the United States and Mexico was the result of over twenty years of negotiations. The most controversial aspect of the treaty relates to water quality, both nations being committed by the treaty to numerically precise quantities. Since there is no specific water quality clause included, the only opportunity either country has for improving water quality is through a favorable interpretation of the alleged water quality provisions in Articles III, IV, X, and XI. A literal interpretation of these provisions results in a situation so manifestly unfair to Mexico that the conditions under which the treaty was signed must be examined to determine Mexico's reason for signing. At the time of signing the relationship between the United States and Mexico was strained because of Mexican expropriation of American oil properties. Mexico was also experiencing a severe drought. Because of the drought, Mexico was forced to sacrifice water quality for water quantity provisions. As a result the treaty is not a useful device in settling water disputes between the two countries. To avoid further disputes and to settle the current ones, alternatives need to be developed. (Petruff-Florida)
W77-11174

LAW AT SEA,
Center for Law and Social Policy, Washington, D.C.
R. Frank.
NY Times Magazine, p 15, 60-63, May 18, 1975.

Descriptors: *Law of the sea, *United Nations, *Fishing, *Legal aspects, *Environmental effects, International law, Navigation, Water law, Oceans, Mining, Mining engineering, Manganese, Nickel, Copper, Water pollution, Oil pollution.

While oceans of the world are dying, the nations argue about how they are going to be economically divided. The task facing the Third United Nations Law of the Sea Conference is to rescue the ocean habitat and at the same time resolve international squabbles. For example, the search for oil in the proposed 200-mile economic zone will undoubtedly continue. With oil becoming more and more expensive, both poor nations and industrialized nations like the United States are unwilling to open up their shorelines to oil exploitation. Aside from oil, the ocean produces wealth in the form of fish and metals. Fishing rights have come increasingly important as worldwide catches dwindle. The trend seems to be towards licensing foreign nations for a certain limit on specific kinds of catches. With the discovery of manganese, copper and nickel nodules on the ocean floor, the conference will be trying to decide whether development should be private or multinational in nature. After economic issues, marine pollution is the most pressing problem with little hope for solution in the near future. (Frank-Florida)
W77-11175

ARKFELD V VOLK (DRAINAGE OF IMPOUNDED WATERS VIA DEEPENED ROAD DITCHES PERMISSIBLE ABSENT DAMAGE TO OTHER LANDS).
251 NW2d 720-22 (Neb. 1977).

Descriptors: *Nebraska, *Surface runoff, *Floods, *Impounded waters, *Drainage effects, *Ditches, *Standing waters, Tile drainage, Drainage practices, Judicial decisions, Water law, Legal review, Drainage water, Land management, Seepage, Drainage practices, Stagnant water, Damages, Conveyance structures, Open channels, Trenches, Excess water(Soils).

Plaintiff landowners sought an injunction against defendant, a neighboring landowner, to restrain the draining of impounded surface water through a deepened road ditch. Plaintiffs also sought to compel the county to fill the ditch to its previous elevation. The trial court granted the relief requested, however, the Supreme Court of Nebraska reversed. The Court based its decision upon plaintiffs' failure to show damage either presently or potentially in the future. Additionally, the Court recognized that a landowner may drain off his impounded waters so long as he does not damage or threaten others. Since plaintiffs' injunctive relief had been dissolved, the order requiring the county to refill the ditch was also reversed. (Moorhouse-Florida)
W77-11176

FLORIDA ENVIRONMENTAL PERMITTING AND WETLANDS PROTECTION ACT (PROPOSED LEGISLATION).
Fla. Senate Bill 728 (1977).

Descriptors: *Florida, *Legislation, *Permits, *Wetlands, Regulation, Administrative agencies, Penalties(Legal), Law enforcement, Governmental interrelations, Water districts, Water management(Applied), State jurisdiction, Water resources, Water quality, Water policy, Water users, Dredging, Riparian waters, Resources.

Criteria are set and procedures established for obtaining dredge and fill permits and air and water pollution permits. Provisions are made for permit renewals, revocations and suspensions. The E
vironmental Regulation Commission is granted e
clusive standard-setting authority and is made t
appellate body for actions of the Department
Environmental Regulation. Remedies for illeg
dredge or fill activities include requiring
abutting upland landowner to take restorati
measures. 'After-the-fact' permits are genera
prohibited. The Board of Trustees of the Inter
Improvement Trust Fund may require an abutti
landowner to remove illegal fill from sovereig
of state-owned lands. The Department of Envir
mental Regulation must approve water mana
ment district permitting programs. Environmen
permitting programs must be coordinated betw
the federal government and state agenci
(Denker-Florida)
W77-11177

URBAN RENEWAL AGENCY OF CITY MONTEREY V CALIFORNIA COASTAL ZO CONSERVATION COMMISSION (MUNICIP CORPORATION EXEMPT FROM COAST ZONE CONSERVATION ACT PERM REQUIREMENT).
125 Cal Rptr 485-91 (Cal Sup Ct 1975).

Descriptors: *Conservation, *Pacific Coast
gion, *Permits, *California, Legislation, Proje
Local governments, State governments, Planni
Project planning, Natural resources, Adminis
tive agencies, Legal aspects, Regulation, Coa
Cities, Regional development, Judicial decision

Plaintiffs, city and city urban renewal age
sought by writ of mandate to exempt a project
jacent to the waterfront from the requirement
the Coastal Zone Conservation Act. The lo
court granted the city relief but did not extend
relief to private developers. The defendant Coa
Zone Commission appealed. The Coastal Z
Conservation Act is designed to protect
restore the natural and scenic resources of
state's coastal areas. To attain this goal sec
27400 of the Act requires certain coastal
developers to obtain building permits from the
fendant commission. Plaintiffs claimed that by
ture of section 27404 they were exempted from
permit requirement. Section 27404 exempts
sons who, prior to the enactment of the Act,
in good faith and in reliance upon a city-is
building permit diligently commenced const
tion and performed substantial work on
development thus incurring substantial liabili
These persons are deemed to have vested ri
The trial court held that section 27404 applied
state supreme court affirmed, holding the
nicipal corporations may avail themselves of
vested right exemptions. However, the pr
developers were found not to have obtained
vested rights. (Petruff-Florida)
W77-11178

ENVIRONMENTAL DEFENSE FUND, INC EAST BAY MUNICIPAL UTILITIES DISTR (WATER DIVERSION CONFLICTS BETW UPPER AND LOWER RIPARIAN USERS).
125 Cal Rptr 601-19 (Cal App 1976).

Descriptors: *California, *Reclama
*Diversion, *Water contracts, *Federal-
water rights conflicts, *Riparian rights, Jud
decisions, Water demand, Riparian waters, W
law, Water utilization, Legal aspects, Water
tricts, Public rights, Public benefits, Public
ties, Public utility, Public utility districts.

Defendant, a water utility district, entered a
tract with the U.S. Bureau of Reclamation fo
purchase of water to be diverted from the A
ican River. The Bureau claims this water is e
tial to its projects. Plaintiffs, several nonprof
vironmental groups and individual
payers/landowners, claim that the federal
reclamation project's diversion of water i
upper river constitutes an unreasonable use w

would destroy the water use opportunities of the lower river parties. The County of Sacramento, which needs the water for recreational use, intervened. The applicable California law states that the state's water resources must be put to the most beneficial use for the general public welfare and that unreasonable waste must be prevented. Plaintiffs asked for declaratory and injunctive relief, claiming defendant's contract is illegal. The court held that traditional upper and lower riparian rights analysis was not sufficient to decide the case and that the law must be flexible to social change. Therefore, the court reasoned, environmental concerns may be considered the most beneficial use of water for the overall public good. The court also held that defendant's failure to recycle waste water is unreasonable. However, it concluded that the issue was within the ambit of federal law, and could not be decided by the state. (Denker-Florida)
W77-11179

LUMENFELD V SAN FRANCISCO BAY CONERVATION AND DEVELOPMENT COMMISION (CALIFORNIA STATUTES GRANTING URISDICTION TO CONSERVATION COMISSION SHOULD BE CONSTRUED SO AS OT TO DEFEAT THE INTENT OF THE EGISLATURE).
17 Cal Rptr 327-32 (Cal App 1975).

escriptors: *California, *Tidal waters, *Artificial atercourses, *Culverts, *Conveyance structures, idal effects, Bodies of water, Tides, Legislation, egal aspects, Judicial decisions, Regulations, Adinistrative agencies, Water levels, Bodies of ater, Environment, Natural resources, Conduits, ater conveyance.

aintiffs' application to fill marsh areas adjacent San Francisco Bay was denied by the Bay Conrvation and Development Commission. Plainfs sought review, alleging that the Commission d no jurisdiction over the property in question. he California Code section granting jurisdiction the Commission refers to all areas subject to al action; the plaintiffs contended that the oper interpretation of this provision should inde only areas subject to natural tidal action, hereas their property was affected by the tides a man-made culvert. This contention was comed with the argument that statutory language nveying a grant of power which might interfere th fundamental rights (such as property inests) should be strictly construed. The Californ First District Court of Appeal held that the islative history of the Code section revealed no ent that the words 'tidal action' should exclude al action resulting from flow through a made culvert. The court held further that a statute uld not be construed so strictly as to defeat the jective of the statute, which in this instance is preservation of the waters of San Francisco y as a valuable natural resource in which the blic has an interest. (Sloan-Florida)
7-11180

IADOR VALLEY INVESTORS V CITY OF VERMORE (THE ACTS OF A CITY ARE NOT IVILEGED WHEN PRIVATE PROPERTY MAGE RESULTS FROM INADEQUATE ANNING OF WASTE DISPOSAL).
Cal Rptr 749-56 (Cal App 1974).

criptors: *California, *Waste disposal, scharge(Water), *Sewage disposal, *Municipal tes, Reasonable use, Judicial decisions, Legal ects, Water law, Water management(Applied), vernments, Sanitary engineering, Sewage treatt, Waste water disposal, Water pollution, ter pollution sources.

ntiff landowners brought action against city damages resulting when the city discharged ted sewage water into a creek flowing across ntiffs' property. Defendant city argued that plaintiffs' claim was barred by failure to timely file; that the acts of the city are privileged; and that plaintiffs were estopped from asserting failure of the city to use alternative means to discharge the water by reason of plaintiffs' having accepted loans of city equipment to dissipate the excess water. The Court of Appeal of the First District of California held that California case law allows recovery for any damages which occur within one year prior to the filing of a claim; that a new and separate cause of action arises with each new subsidence; and that where there is a continuing injury, the starting point for the statute of limitations is the completion of the injury. The court also held that the acts of a city are not privileged or exempt from suit as an exercise of policy power unless the acts are reasonable, and that in this case the acts were not reasonable as the damage could have been prevented by proper planning. In addition the court found the plaintiffs' actions were reasonable, precluding estoppel as a defense. (Sloan-Florida)
W77-11181

FALLEN LEAF PROTECTION ASSOCIATION V SOUTH TAHOE PUBLIC UTILITIES DISTRICT (PROVISIONS OF CALIFORNIA WATER CODE REQUIRING SPECIFIC PROPERTY OWNERS TO CONNECT TO SEWER LINES UPHELD AGAINST CONSTITUTIONAL CHALLENGE).
120 Cal Rptr 538-47 (Cal App 1975).

Descriptors: *California, *Sewage districts, *Water quality control, *Administrative agencies, *Water management(Applied), Administrative decisions, Administration, Legal aspects, Judicial decisions, Governments, Sewage, Sewers, Septic tanks, Cesspools, Regulation, Water pollution, Environment, Legislation, State governments.

Plaintiff property owners challenged the validity of sections of the California Water Code by a cross-complaint alleging inverse condemnation. The plaintiffs' property was located in the Lake Tahoe Basin; plaintiffs disposed of waste through the use of cesspools and septic tanks. The Public Utilities District, in the course of constructing a sewer collector line through the property had sought to restrain plaintiffs from occupying any buildings on their property. In the cross-complaint plaintiffs claimed fair market value of their property, contending that the state lacked the power to compel them to connect to a sewer line, and that certain provisions of the California Water Code were arbitrary, unreasonable, and discriminatory. The California Third District Court of Appeal held that the actions of the state under the Water Code to be a valid exercise of police power in light of legislative determination that a clear and present danger to the environment exists in the Lake Tahoe Basin; that under the circumstances no invidious discrimination against specific property owners could be found; and that a statute based on a permissible legislative purpose is to be presumed valid unless plainly arbitrary. (Sloan-Florida)
W77-11182

UNITED STATES V FINCH (AUTHORITY OF CROW TRIBE TO DENY NON-MEMBERS ACCESS TO ITS LAND FOR FISHING UPHELD).
548 F2d 822-35 (9th Cir 1976).

Descriptors: *Montana, *Treaties, *Riparian rights, *Indian reservations, *Navigable waters, Trespass, Ownership of beds, Riparian land, Riparian waters, Public access, Easements, Fishing, Judicial decisions, Constitutional law, Public lands, Legal aspects, Water law, Water rights, Banks.

Defendant/appellee was charged by information with trespassing on Indian lands for fishing from the banks of a river that lay within the exterior boundaries of the Crow Indian Reservation, based on the fact that he was not a member of the tribe. The relevant federal statute prohibited entry for fishing upon Indian lands without permission, and tribal membership was required by tribal ordinance in order to fish on the reservation. The court first resolved the question of ownership of the river bed in favor of the Indians, holding that it had been ceded to them by treaty, subject to the retained power of the United States to exercise its right to control navigation on the river. Since the State of Montana owned by purchase the bank from which appellee fished, the second question was whether fishing was a riparian right of access which the state possessed as part of its right of access to the waters of the river. The court here held that the federal government had exercised regulatory power which was superior to any riparian right to fish held by Montana or its licensees. The court also upheld the authority of the Crow Tribe to control access of its own reservation as conferred by statute. The case was reversed and remanded to the district court for entry of judgment. (Jones-Florida)
W77-11183

ALABAMA POWER COMPANY V MARTIN (POWER COMPANY ESTOPPED FROM ASSERTING FLOOD EASEMENT RIGHTS).
341 So2d 695-99 (Ala Sup Ct 1977).

Descriptors: *Floods, *Easements, *Judicial decisions, *Water levels, *Construction, Legal review, River flow, Regulation, Discharge(Water), Prescriptive rights, River regulation, Water law, Legal aspects.

Plaintiff power company filed a bill against defendant property owners to enjoin them from building on certain property. The plaintiff claimed that this property was subject to a flood easement held by the company. The easement granted the power company the right to flood that portion of land above a datum plane of 466 feet and below a datum plane of 475 feet. The court found that the only way to extinguish the easement was by grant. Accordingly, the court found that the easement was not extinguished. However, the plaintiff was estopped from asserting its easement rights to the property in question because of oral representations made by one of its agents. The agent had represented that the easement would be extinguished if the property was built up above 475 feet. Defendant owners detrimentally relied on these assertions and filled in the land. The court found that the property would not be subject to the easement as long s the property in question was maintained at an elevation above 475 feet. (Petruff-Florida)
W77-11184

UNITED STATES V BROWN (STATE WATERS WITHIN NATIONAL PARKS SUBJECT TO FEDERAL REGULATIONS).
552 F2d 817-23 (8th Cir 1977).

Descriptors: *Minnesota, *Hunting, *National parks, *Federal-state water rights conflicts, Federal jurisdiction, State jurisdiction, Ducks, Public lands, Recreation facilities, Judicial decisions, Legal review, Law enforcement, Legal aspects, Penalties(Legal), Water fowl, Wildlife, Rivers, Federal government, State government, Administrative agencies.

Defendant was convicted for violation of national park regulations which prohibited possessing loaded firearms and hunting in national parks. Citation was served upon defendant while his boat was afloat within the national park confines. Defendant appealed, challenging the jurisdiction of the national park service. He claimed that although the state had deeded lands within the park boundaries to the federal government, it had not relinquished ownership of the waters. The United States Court of Appeals for the Eighth Circuit upheld the conviction but did not reach the issue of whether the state had ceded jurisdiction of such waters to the federal government. The court in-

stead reasoned that congressional power over federal lands included authority to regulate activities on nonfederal public waters in order to protect wildlife and visitors on the land. The court also found that the instant regulations were a constitutional exercise of congressional power under the property clause and that such regulations would, under the supremacy clause, override conflicting state laws allowing hunting in the park. (Moorhouse-Florida)
W77-11185

ATLANTIC CITY ELECTRIC COMPANY V BARDIN (STATE'S RIGHT TO GRANT AND SET CONSIDERATION FOR LANDS HELD IN PUBLIC TRUST).
368 A2d 366-71 (NJ Super Ct App Div 1977).

Descriptors: *New Jersey, *Navigable waters, *Ownership of beds, *Tidal waters, Electric cables, Legislation, Water resources development, Utilities, Non-structural alternatives, Water law, Environmental control, Protection, State governments, Political aspects, Legal aspects, Judicial decisions.

On January 13, 1975, plaintiff electric company filed an application with the Natural Resource Council (Council) for a permit to install a submarine cable and offered to pay a fee based on the estimated construction costs. Plaintiff also filed an application for a revocable license to use the State's underwater land for the cable installation. The Council authorized both licenses, setting as consideration for the revocable license a fee of $3.00 per lineal foot, or $40,851. At a hearing held on this charge, the Council reaffirmed its fee schedule. Plaintiff brought this suit to appeal that decision, alleging Council's lack of power to issue revocable licenses and that the fee was unreasonable and arbitrary. The court adopts the reasoning of earlier case law in holding that the state, as holder of tidal lands, possesses all attributes of ownership, including the right, subject to the demands of the public trust doctrine, to grant or alien the lands held and to set the consideration for the grant. The court also concludes that the statutes do provide sufficient standards to guide the Council in the exercise of its wide discretionary powers, which involve price determinations. (Jones-Florida)
W77-11186

HODGEN V KLIEWER (BOUNDARY CHANGES PROPER FOR ACCRETION BUT NOT AVULSION).
557 P2d 885-91 (Okla 1976).

Descriptors: *Oklahoma, *Accretion(Legal aspects), *Avulsion, *Boundaries(Property), Sediments, Floods, Erosion, Legal aspects, Bank erosion, Alluvial channels, Channels, Bodies of water, Land tenure, Adverse possession, Water law, State governments, Judicial decisions, Legal review, Real property, Land ownership.

The appellants and the appellees contested the ownership of certain land created by sedimentary and alluvial deposits from a river. The river had moved north by gradual and imperceptible processes of accretion adding land to the appellees' property. The river then moved south by a process of avulsion during a flood, cutting a channel through the land. The Supreme Court of Oklahoma held that the avulsive process did not affect the ownership of the land. In addition, since the appellants' possession was neither exclusive, hostile, notorious, open, absolute nor continuous, the appelllants failed to prove the elements of adverse possession necessary to divest the appellees of their ownership of the land. The dissenting justice referred to prior cases applying the 'reappearing riparian lands doctrine.' He felt that because of the changing nature of the river a better view would be to allow title to the appellees only to the center of the old channel. (Rieck-Florida)
W77-11187

CANADIAN RIVER COMPACT.
Tex. Water Code Ann sec 43.001 thru .006 (1972).

Descriptors: *Water rights, *Water allocation(Policy), *Texas, *Interstate compacts, New Mexico, Oklahoma, Water law, Interstate commissions, Interstate rivers, Construction, Reservoir storage, Water storage, Water management(Applied), Water sources, Water supply, Beneficial use, Municipal water, Domestic water, Irrigation water, State jurisdiction.

Texas has ratified the Canadian River Compact entered into with New Mexico and Oklahoma to promote interstate harmony and interests regarding the river. All rights to any of the waters of the river, perfected by beneficial use, are recognized and affirmed. New Mexico is given unrestricted use of all waters originating in the drainage basin of the river above Conchas Dam. The use of water below that point is subject to regulation under the compact. Texas shall also have free use of the waters subject to certain limitations upon the storage of water. Its right to impound waters of the North Canadian River is limited to storage for municipal, household and domestic uses, as well as for livestock watering and the irrigation of certain lands. Any excess quantity of water shall be released according to specific provisions of the compact. Oklahoma shall have unrestricted use of all waters of the river within the boundaries of the state. New Mexico and Texas may impound more water than the designated amount except that no state shall be deprived of water needed for beneficial use. (Rieck-Florida)
W77-11188

RIO GRANDE COMPACT.
Tex Water Code Ann secs 41.001 thru .009 (1972).

Descriptors: *Water allocation(Policy), *Texas, *Interstate compacts, *Rio Grande River, Colorado, New Mexico, Interstate commissions, Interstate rivers, Gaging stations, Control, Flow measurement, Water control, Construction, Reservoir storage, Water storage, Water management(Applied), Water sources, Water supply, Administrative agencies, Diversion structures, Appropriation.

The state of Texas joined with Colorado and New Mexico in a compact to remove all controversies between themselves with respect to the Rio Grande. The commission established by the compact is to maintain various stream gaging stations to measure the quantities of water the various states are obliged to deliver to each other as specified in the compact. The amounts of water that may be accrued in storage in reservoirs are also regulated. Colorado or New Mexico may relinquish at any time accrued credits of water, i.e., the amount by which actual delivery exceeded scheduled delivery. The state relinquishing may in turn store amounts of water equal to the amount relinquished. At specified times, Texas or New Mexico may demand the release of water from storage reservoirs up to the amount of accrued debits, i.e., amount by which actual delivery fell below scheduled delivery. However, these releases will only be made as practicable under the circumstances. Colorado consents to construction for diversion of the San Juan River, into the Rio Grande provided the prospective water uses in Colorado are protected. Imported water shall be credited to the state importing it. (Rieck-Florida)
W77-11189

REGIONAL WASTE DISPOSAL ACT.
Tex Water Code Ann secs 25.001 thru .106 (1972).

Descriptors: *Texas, *Waste disposal, *Waste treatment, *Treatment facilities, Costs, Economics, Water pollution, Construction, Administrative agencies, Local governments, Regional developments, Financing, Eminent domain, Water quality control, Water management(Applied), Water policy, Statutes, Legisla tion, Comprehensive planning, Management Coordination.

Public agencies in Texas are authorized t cooperate for the safe and economical collection transportation, treatment and disposal of waste i order to prevent and control pollution of water i the state. Provisions are made for the issuance o bonds, and the design, construction, acquisitio and approval of facilities used for waste disposa Districts are authorized to make operating agree ments, as well as contracts to purchase, sell o lease such facilities. Districts or river authoritie may make contracts with private or public age cies for waste disposal. Condemnation powers a given to the districts to effectuate the purposes o the chapter. However, the district is obligated t pay the costs of relocating any public facilities th must be moved. River authorities may prepare r gional plans for water quality management contr and pollution abatement. In doing so, they mu coordinate their efforts with other interest public planning agencies. (Rieck-Florida)
W77-11190

ARTESIAN WELLS.
Texas Water Code Ann sec 5.201 thru .207 (1972)

Descriptors: *Texas, *Artesian wells, *Wat wells, Subsurface waters, Water supply, Pressu Water sources, Irrigation water, Reasonable u Water management(Applied), Agriculture, A ministration, Governments, Water law, Leg aspects, Water policy, Regulation, Water contro

Texas defines an artesian well as an artificial wa well in which the water, when properly cased, w rise by natural pressure above the first impervio stratum below the surface of the ground. A pers may drill an artesian well on his own land f domestic purposes without complying with t general regulations of the Texas water code, bu the water contains substances injurous to agric ture, he must insure that the flow will not inj another's land. The person drilling the well m keep complete records of the depth, thickness a character of the strata penetrated, and send a co of the record to the Texas Water Commissi Failure to do so is a misdemeanor punishable b fine of not more than $100. Annual reports required, stating the amount of water used, the ture of the uses, the change in the water table, if the water was used for irrigation, the acre and yield of each crop. The statute also defin and provides penalties for, waste and requi proper casing and capping. (Sloan-Florida)
W77-11191

CRIMINAL PROSECUTION FOR WATER PO LUTION.
Tex Water Code Ann secs 21.551 thru .564 (1972

Descriptors: *Texas, *Waste water dispo *Permits, *Penalties(Legal), *Discharge, Wa pollution sources, Wastes, Waste water treatm Legal aspects, Water permits, State governme Regulation, Law enforcemet, Legislation, Judi decisions, Assessments, Administrative agenc Sewage, Farm wastes, Industrial wastes, Rec tion wastes.

Discharging, or causing the discharge of, waste into or adjacent to any water so as to ca water pollution is a criminal offense in Texas unless the waste is discharged in compliance wi permit. Permits are issued by the state's w quality board, development board or railroad c mission. Once a permit is obtained the dischar may not violate the requirements of the per Any such violation or any discharge without a p mit is a misdemeanor subject to a penalty betw $10 and $1,000 for each day of the ill discharge. Agents of the parks and wildlife dep ment are authorized to enforce the provision the statute. If a corporation is found guilty

discharge violation, the fine shall have the same force and effect as if the judgement were recovered in a civil, rather than criminal, action. (Rieck-Florida)
W77-11192

RIGHTS IN STATE WATER (APPROPRIATION PLAN).
Tex Water Code Ann secs 5.001 thru .052 (1972).

Descriptors: *Texas, *Prior appropriation, *Water permits, *Appropriation, *Water management(Applied), Riparian rights, Water rights, Water law, Preferences, Dams, Reservoirs, Condemnation, Water policy, Irrigation, Easements, Water conservation, Water control, Water allocation(Policy), Administration, Canals.

The water of the ordinary flow, underflow and tide of every natural waterway and waterbody is the property of the state. The right to its use may be acquired by appropriation as prescribed by this statute. Allowable purposes for appropriation are stated, and an order of preferences named. As between appropriators, first in time is first in right. An appropriator having used a source under the terms of a filing for three years acquires title. If he abandons the appropriation during three successive years the right to use is forfeited and the water again subject to appropriation. Any person taking water except for domestic or livestock purposes must file an annual report with the Texas Water Commission. Rights of way over private land may be obtained by condemnation. A permanent water right is an easement and passes with title to the land; a conveyance of a ditch, canal or reservoir must be executed as a conveyance of real estate. A person who takes or diverts water from a running stream shall return surplus water to the stream by gravity flow if it is reasonably practicable to do so. (Sloan-Florida)
W77-11193

CONSERVATION OF WATER FOR IRRIGATION PURPOSE.
Idaho Code Ann secs 42-1501 thru -1504 (1948).

Descriptors: *Idaho, *Irrigation, *Water conservation, *Water management(Applied), Water policy, Water resources development, Water supply development, Water transfer, Water distribution(Applied), Planning, Construction costs, Reservoir sites, Reservoir storage, Water utilization, Surveys, Droughts, Water storage, Water shortage, Cisterns, Wells, Legislation.

The policy of the state of Idaho is to conserve, develop and utilize water for irrigation purposes. The department of reclamation is created to achieve these goals. The department shall: make surveys to determine how and where water may best be stored; assess feasibility of various projects; formulate plans of construction for dams and specify construction sites; estimate costs of proposed projects; determine where dams may be constructed to serve the dual purposes of water storage and flood prevention; devise plans to provide water for livestock and domestic purposes during non-irrigation seasons by means of wells, reservoirs and ponds; and to perform all other necessary acts in pursuit of state conservation policies. The department is authorized to cooperate with state and federal agencies in exercising its powers. (Josepher-Florida)
W77-11194

WATER RIGHTS (CONSTITUTIONAL PROVISIONS).
Idaho Const Ann art XV, secs 1 thru 6.

Descriptors: *Idaho, *Prior appropriation, *Water distribution(Applied), *Water permits, Preferences(Water rights), Water management(Applied), Water demand, Priorities, Water allocation(Policy), Water rights, Water districts, Water utilization, Public rights, Beneficial use, Water rates, Water policy, Agriculture, Water shortage, Rent, Legislation.

The use of all appropriated waters for sale, rental or distribution is a public use subject to state regulation and control. The collection of rates or compensation for the use of water supplied to a local governmental unit is a franchise, and is probibited unless otherwise allowed by law. The right to appropriate and divert unappropriated waters of natural streams may not be denied except where the state imposes regulations for power purposes. Although prior appropriation gives better rights to competing users, an order of use preference is established in case of water shortages. Sale, rental or distribution of waters appropriated or used for agricultural purposes is considered an exclusive dedication to such use. Persons who settle or improve land for agricultural purposes relying on receiving waters so dedicated may not, have the annual use of these waters taken from them without their consent. The legislature shall determine the manner for setting the maximum rates charged for the use of appropriated water. (Josepher-Florida)
W77-11195

FOREST AND WATER RESERVE ZONES.
Hawaii Rev Stat sec 183-41 (Supp 1975).

Descriptors: *Hawaii, *Land use, *Zoning, *Watershed management, *Forest management, Recreation, Forest watersheds, Land management, Local governments, Regulation, Legal aspects, Water law, Planning, Penalties(Legal), Boundaries(Property), Legislation.

Hawaii has established forest and water reserve zones in each of its counties. The zones shall include all land within the 1957 forest reserve boundaries; however, the department of land and natural resources shall have the power to redefine zone boundaries and establish subzones within them. Upon full consideration of all available data on soil classification and physical use capabilities, the department shall establish use restrictions for each subzone. Such regulations shall seek to conserve necessary forest growth, adequate water resources, and open space areas for public use. Full public hearings are to be provided to ascertain the views of affected landowners concerning proposed restrictions. Thereafter the department shall adopt the regulations as proposed or amended giving them the force of law. No use, except a nonconforming use, shall be made of such areas unless in compliance with the zoning regulations. Violations are punishable by fines not greater than 500 dollars. The legislature has defined non-conforming exempt uses as the continuance of any lawful use for any trade, industrial, residential or other purpose established as of 1957, or at the time any regulation adopted under authority of this part takes effect. In addition, any parcel of 10 acres or less held for farming or residential use upon which taxes have been paid since 1957 is also deemed nonconforming and capable of such use. (Moorhouse-Florida)
W77-11196

PROCEDURE FOR DETERMINING OR ESTABLISHING WATER RIGHTS IN STATE STREAMS.
Ore Rev Stat Secs 539.010 thru .220 (1973).

Descriptors: *Oregon, *Water rights, *Appropriation, *Relative rights, *Competing uses, Riparian rights, State governments, Administrative agencies, Water allocation(Policy), Water utilization, Judicial decisions, Legal aspects, Legal review, Water law, Streams, Legislation, Economic impact, Permits, Reasonable use, Water policy.

Oregon has established a procedure to determine the relative rights of water users along any stream. The State Engineer is charged with filing a notice of determination of water rights to be published for at least 10 days in the newspapers of any county through which the stream runs. All interested parties then submit data forms detailing their uses of water from the stream. Such data forms are then made available for public examination where any claim submitted can be contested. Formal hearings are undertaken to resolve contested claims. The State Engineer then proceeds with a full scale investigation of the streams, the amount of water available, and the proper beneficial uses of all interested parties. The findings are certified and filed in a circuit court. If challanged, the court operating as a court of equity will proceed to resolve any problems. Upon completion of any proceedings, water rights certificates are awarded. Such certificates are recorded with the clerk of court as proof of the water rights appurtenant to a particular tract of land. Appeal from the circuit courts findings is to be made to the Supreme Court. Special provisions deem any water rights initiated prior to February 24, 1909 as vested provided such rights have not abandoned for a period of two years. (Moorhouse-Florida)
W77-11197

WATER CONTROL DISTRICTS.
Ore Rev Stat secs 553.010 thru .110 (1973).

Descriptors: *Oregon, *Water management(Applied), *Drainage districts, *Water control, *Legislation, State governments, Local governments, Appropriation, Water allocation(Policy), Water works, Rivers, River regulation, Management, Taxes, Assessments, Legal aspects, Water distribution(Applied), Drainage systems, Water spreading.

Oregon has recognized the creation of water control districts to improve the public health, safety and welfare. Such districts shall have the power to: (1) have and use a seal; (2) sue and be sued; (3) have perpetual succession; (4) acquire and hold real and personal property; (5) contract with other entities for operation and maintenance of any works; (6) build and acquire necessary works; (7) contract and employ agents, engineers and attorneys; (8) appropriate and acquire water and water rights; (9) create special assessment districts to levy taxes; (10) levy assessments against lands benefited by any works; (11) borrow money and issue certificates of indebtedness; and (12) do any other acts necessary to carry out the district's powers. The water control districts are forbidden from altering boundaries without the written consent of parties to whom they are under contract. All districts organized before July 16, 1949 are deemed to be valid districts. Additionally, a water control district is created coterminous with each water control district existing on June 16, 1969. (Moorhouse-Florida)
W77-11198

SAVE OUR INVALUABLE LAND, INC V NEEDHAM (APPLICABILITY OF FWPCA AMENDMENTS TO PROJECTS ALREADY FUNDED).
542 F2d 539-43 (10th Cir 1976).

Descriptors: *Dam construction, *Federal Water Pollution Control Act, *Federal government, *Water supply, *Legal review, Governmental interrelations, Local governments, Water pollution control, Water supply, Water storage, Planning, Water policy, Administrative agencies, Regulation, Water resources development, Dams, Kansas.

Plaintiff organization of landowners sought to enjoin construction of the Hillsdale Dam in Kansas, alleging failure to comply with provisions of the Federal Water Pollution Control Act (FWPCA) and other legislation. The trial court had found provisions of the 1972 Amendments to the FWPCA inapplicable to the dam since its planning had been completed and funding authorized before

the Amendments became law. The court noted that the 1972 Amendments were only applicable to projects which were in the planning or preauthorization stages, and added weight to this view by citing a similar interpretation by the Environmental Protection Agency. The trial court had also found the Environmental Impact Statement (EIS) submitted adequate since it had apparently been made in good faith and included a reasonable discussion of mandated areas. Allegations of lack of reasonable evidence of future demand of water from the dam were dismissed by the court as unsupported. The project was found to comply with all applicable legislation; thus no injunction was issued. (Molloy-Florida)
W77-11199

SNAKE RIVER RANCH V UNITED STATES (OWNERSHIP OF LAND OMITTED BY MEANDER LINE).
542 F2d 555-58 (10th Cir 1976).

Descriptors: *Boundary disputes, *Meanders, *Rivers, *Surveys, *Accretion(Legal aspects), Boundaries(Property), High water mark, Patents, Federal government, Land tenure, Real property, Riparian land, Banks, *Wyoming.

Plaintiff sought to quiet title to land between a meander line survey and the west bank of the Snake River. The lots having the meander lines had been patented to plaintiff's predecessor in title; also, the original 1893 plat showed the land as bordered by the Snake River. A resurvey in 1974 showed the disputed lands as omitted on the original plat, thereby giving title to the United States. The court initially noted that reference to a plat incorporates that material into the conveyance; therefore, the showing of the Snake River boundary would control over a computation of acreage. However, a large departure from the proper location for the meander line, sufficient to show a gross mistake or fraud, makes the meander line a fixed boundary. Whether the meander line was fixed or represents the bank of a river was a question of fact to be determined by available evidence. The trial court found the stream had been properly meandered. No reason for disturbing that finding was noted on appeal. (Molloy-Florida)
W77-11200

E I DUPONT DE NEMOURS AND COMPANY V TRAIN (REVIEW OF EFFLUENT LIMITATIONS FOR CHEMICAL INDUSTRY).
541 F2d 1018-39 (4th Cir 1976).

Descriptors: *Standards, *Chemical wastes, *Federal government, *Water pollution sources, *Administrative decisions, Administrative agencies, Permits, Chlorine, Regulation, Sodium, Acids, Chemical industry, Nitrates, Water pollution, Industrial wastes, Water pollution control, Judicial review, Planning.

Petitoner chemical companies sought review of various regulations promulgated by the Administrator of the Environmental Protection Agency (EPA) under the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. Petitioners alleged lack of proper notice, challenged EPA's power to establish effluent limitations, and alleged that the regulations did not comply with procedural and factual guidelines of the authorizing act. The court determined that notice had been adequate and that EPA had authority to promulgate the regulations. Examining the individual standards, the court applied the review standard of whether the administrative actions were arbitrary, capricious, or an abuse of discretion. The court confined its review to a determination of whether the record disclosed a reasonable basis for believing that new technology would be available and economically feasible for compliance with future guidelines. Standards relating to production of chlorine, hydrochloric acid, hydrofluoric acid, hydrogen peroxide, nitric acid, sodium carbonate, sodium dichromate, sodium, sodium silicate, sulfuric acid, and titanium dioxide were remanded to the EPA for reconsideration, as were the definitions for effluent limitations and process waste water. (Molloy-Florida)
W77-11201

CHAPMAN V UNITED STATES (TORT LIABILITY FOR SUBMERGED DAM IN NAVIGABLE STREAM).
541 F2d 641-46 (7th Cir 1976).

Descriptors: *Illinois, *Dams, *Federal government, *Damages, *Navigable rivers, Navigable waters, Navigation, Recreation, Boating, Fly fishing, Federal jurisdiction, United States, Legal aspects, Hazards, Negligence, Safety, Accidents, Judicial decisions.

Plaintiff sought damages for the death of her husband against the United States under the Suits in Admiralty Act. Plaintiff's spouse was killed when the small boat in which he was fishing was swept over a submerged dam. Plaintiff alleged that the United States negligently and wrongfully permitted the dam to exist as a menace and hindrance to navigation. The United States contended admiralty jurisdiction was inapplicable as the stream was not navigable and that no duty was owned with respect to the unmarked dam. After examining the long history of use of the stream, the court determined that it was in fact navigable despite the lack of evidence that it consituted a route or highway for interstate commerce. Jurisdiction under the Admiralty Act was determined by whether a waterway is capable of beng used for purposes of commerce. Evidence also indicated that the United States actively participated in the construction of the dam. The fact that the United States has renounced the supervision it has claimed for a century was ineffective to relieve it of responsibility. Therefore admiralty jurisction was exercised, and the plaintiff was permitted to recover. (Molloy-Florida)
W77-11202

UNDERGROUND WATERS.
NM Stat Ann secs 75-11-1 thru -40 (1968), as amended, (Supp 1975).

Descriptors: *New Mexico, *Appropriation, *Underground streams, *Water permits, *Well permits, Water supply, Water rights, Well regulations, Application methods, Underground, Underwater, Underflow, Water policy, Water resources, Water management(Applied), Wells, Beneficial use, Irrigation permits, Regulation.

New Mexico's underground waters having reasonably ascertainable boundaries are public waters and are subject to appropriation based upon beneficial use. Persons desiring rights to the use of underground water must file a permit application with the state engineer. Applicants must designate the particular source from which the desired water will be appropriated, the intended beneficial use, the amount of water applied for, and, if the water is to be used for irrigation, the location and owner of the land to be irrigated must also be specified. Applicants may reserve rights to water in undeclared basins. Emergency application procedures allow use of replacement and supplemental wells drilled into the same source as is used by the originally permitted wells prior to compliance with normal application procedures. Nonpotable water at a depth of twenty-five hundred feet or more is excluded from underground basins regulated by the state engineer. Users of underground water may be required to meter their water use and file water analysis reports with the state engineer. (Josepher-Florida)
W77-11203

PEOPLE V TEXACO, INC (COUNTY REGULA
TION OF TIDEWATER BORDERING ON O
LYING WITHIN ITS BOUNDARIES).
383 NYS2d 788-89 (App T 1976).

Descriptors: *Judicial decisions, *Local gover
ment, *New York, *Oil spills, *Tidal water
Water pollution, Legal aspects, Oil industry, O
Oil pollution, Negligence, Penalties(Legal), J
risdiction.

Defendant oil company was convicted for viol
ing a county fire prevention ordinance provisi
relating to spill containment protection. Upon a
peal the Appellate Term of the Supreme Cou
upheld the conviction and found that the coun
was authorized to regulate tidewaters bordering
and lying within its boundaries. The defenda
failed to establish that the ordinance in questi
was unreasonable. (Rieck-Florida)
W77-11204

AGRICULTURAL LEGISLATION'S POTE
TIAL IN REDUCING DISCHARGE OF POLL
TANTS,
Agricultural Stabilization and Conservation Se
vice, Washington, D.C. Environmental Qual
and Land Use Staff.
For primary bibliographic entry see Field 5G.
W77-11395

THE CLASS ONE EQUIVALENCY FOR CE
TAIN RECLAMATION PROJECTS (HEARING
ON H.R. 13101, WHICH PROVIDES FOR CO
SIDERATION OF THE COMPARATI
PRODUCTION POTENTIAL OF IRRIGAB
LANDS IN DETERMINING NONEXCESS ACR
AGE UNDER FEDERAL RECLAMATIO
LAWS).
For primary bibliographic entry see Field 4B.
W77-11446

INDIAN WATER RIGHTS.
Hearings--Subcomm on Administrative Pract
and Procedure--Comm on the Judiciary,
Senate, June 22-23, 1976. 175 p.

Descriptors: *Indian reservations, *Water righ
*Prior appropriation, *Reservation doctri
Federal reservations, Adjudication procedu
Public lands, Withdrawn lands, Water law, Ju
cial decisions, Beneficial use, Irrigation wat
Administrative agencies, Jurisdiction, Colora
New Mexico, Washington, Federal governme
Public water rights, Water districts.
Identifiers: *Winters doctrine, *Reserved rights

In a 1976 decision, Colorado River Water Con
vation District v United States, the United Sta
Supreme Court held that state courts may en
tain and adjudicate Federal claims for federa
reserved Indian water rights. Shortly thereaf
Senate hearings were held to determine the pot
tial consequences of the decision on affected In
an tribes. The concern of the administrative pr
tice subcommittee of the Senate judiciary comm
tee was that the adjudication of Indian water rig
in state forums throughout a large number
states would result in a lack of uniformity of
terpretation of those rights. Representatives of
Justice and Interior Departments expressed
prehension that state courts may not possess
essential experience or knowledge to deal with
federal reserved rights doctrine, and also tha
some instances state courts may be hostile to
water rights of Indian tribes. This was disputed
the general counsel for the New Mexico interst
stream commission. Testimony was also he
from members of the Native American Nat
Resource Development Federation, the Natio
Congress of American Indians, the Mescal
Apache Indian Tribe and the Yakima Indian
tion. (Sloan-Florida)
W77-11447

OCKS ISLAND DEAUTHORIZATION HEARINGS ON S 3106, WHICH WOULD EAUTHORIZE TOCKS ISLAND RESERVOIR ROJECT FROM PARTICIPATION IN THE ELAWARE RIVER BASIN PROJECT).
earings--Subcomm on Water Resources--Comm Public Works, July 23, 26, 1976, Serial No 94-52. 535 p.

escriptors: *Reservoir construction, *Dams, Vildlife conservation, *Legislation, Impound-ents, Reservoir sites, Reservoirs, Multiple-pur-se reservoirs, Electric power, Lakes, Recrea-n, Reservoir design, Water supply, Water urces, Federal government, State governments, st-benefit analysis, Flood control, Water pol-.
entifiers: *Delaware River Basin Project, ocks Island Reservoir Project, *Project authorization, *Congressional hearings, Dam fects, Environmental policy.

earings were held before the Senate Subcommit-on Water Resources to consider legislation that uld deauthorize the Tocks Island Reservoir oject as part of the Delaware River Basin Pro-t, and for various other purposes. Testimony s given by numerous federal, state, and local of-ials. The original purpose of the Tocks Island oject was to meet flood control and water pply problems in Pennsylvania, New York and w Jersey. Subsequently, however, the laware River Commission voted to withhold nstruction funds and the Corps of Engineers ed Congress to deauthorize the project. The mmittee considered divergent views over the ure of the Tocks Island Reservoir Project. ose opposed to the project indicated that con-ction of the reservoir dam would be disad-ntageous both environmentally and fiscally. In ition, historic land sites would be destroyed as y became engulfed by a lake subject to rapid l growth. Proponents of the project disagreed to the lack of value of the new lake and hlighted the needs of those within the Delaware er Basin for both flood and drought protection. orhouse-Florida)
7-11448

TOMAC RIVER (HEARINGS ON THE ATE OF THE POTOMAC RIVER AS TO TER SUPPLY AND WATER POLLUTION).
rings--Subcomm on Bicentennial Affairs, the ironment, and the International Community--m on the District of Columbia, US H Rep, e 2-25, Sept 9, 16, 1976. Serial No 94-20. 815 p.

criptors: *District of Columbia, *Water pollu-sources, *Water rates, *Potomac River, er costs, Water shortage, Water supply, Water and, Cometing uses, Dependable supply, ntial water supply, Water allocation(Policy), er conservation, Water delivery, Water pol-Water supply development, Federal govern-t, Local governments, Regions, Suburban s.

rings were held jointly before the House Com-e on the District of Columbia and the House committee on Bicentennial Affairs, the En-ment, and the International Community to ider both the state of the Potomac River and lation to provide equitable water rates and en-ge water conservation within the District of mbia. Testimony was given by numerous al, state and local officials detailing water y and consumption problems within the ington Metropolitan area. Emphasis was d primarily upon the kinds of water shortages could occur, the capability of the current ju-tional setup to cope with such problems, and npact such shortages would have on day-to-iving. Testimony was also elicited dealing the quality of the Potomac River. Pollution ems were considered unique due to the fact ining, agriculture and forestry, rather than try, posed the greatest handicap to pollution abatement. The committee also addressed its attention to the widely unequal water rate structure between the District of Columbia and its Virginia and Maryland suburbs. (Moorhouse-Florida)
W77-11449

DEEP SEABED HARD MINERALS ACT (TO PROVIDE THE SECRETARY OF THE INTERIOR WITH AUTHORITY TO PROMOTE THE CONSERVATION AND ORDERLY DEVELOPMENT OF DEEP SEABED HARD MINERAL RESOURCES PENDING ADOPTION OF AN INTERNATIONAL REGIME).
Hearings--Comm on Commerce--Comm on Foreign Relations--Comm on Armed Services, US Senate, May 17 and 19, 1976, Serial No 94-85, 195 p.

Descriptors: *Law of the sea, *Mineral industry, *International law, *International waters, Treaties, Mining, Insurance, Foreign trade, Foreign waters, Manganese, Metals, Nickel, Cobalt, Copper, Heavy metals, Titanium, Federal government, Legislation, Exploration, Exploitation, Mineralogy.

Senate bill 713 is aimed at promoting the development of the mineral resources of the deep seabed by providing a transition from the current no-regulation stage to a system of licensing and regulation of U.S. nationals. The bill's main provisions are for: (1) insurance protection of mining investments; and (2) compensation to licensees in the event a future international treaty differs from the requirements of the Act. The area regulated lies outside the territorial waters, and it is the international implications of such regulation which take up a major portion of the hearings. Of central concern to the legislators is the fact that the United Nations Law of the Sea Conference is attempting to negotiate a multi-lateral treaty that would deal with the problems of deep seabed mining. Among the range of subjects discussed by the various witnesses are: (1) whether passage of the bill would jeopardize the treaty negotiations; (2) which United States interests would be served under the bill, and laternatively, under the treaty; (3) the advisability of supporting the ocean-mining industry at the present time; and (4) whether the marine environment would be sufficiently protected under the bill. (Jones-Florida)
W77-11450

OCEAN DUMPING--PART 3 (OVERSIGHT OF THE MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972, AND INVESTIGATING THE WASTE DISPOSAL IN THE NEW YORK AREA),
Hearings--Subcomm on Fisheries and Wildlife--Oceanography--Comm on Merchant Marine and Fisheries, US House of Representatives, July 24, September 30, 1976, Serial No 94-41. 296 p.

Descriptors: *Waste disposal, *Public health, *Federal Water Pollution Control Act, *Oceans, *Beaches, New York, Legislation, Sewage, Recreation, Sewage bacteria, Fish kill, Water pollution sources, Sewage treatment, Sewage sludge, Dredging, Sewage disposal, Water pollution effects, Water quality control, Coast Guard, Regulations, Water policy.
Identifiers: *Environmental policy, *Ocean dumping, Hazardous substances(Pollution), Marine environment.

The washup on the beaches of Long Island of filth, debris and garbage necessitated the closing of 70 miles of beaches in the summer of 1976. The subcommittees met to determine the origin of the washup and whether defects in the current law were responsible for such incidents, since controls had been placed on the dumping of sewage sludge and other materials in the New York Bight. Responsibility in this area had been allocated among the Environmental Protection Agency (EPA), the Corps of Engineers, the US Coast Guard, and the National Oceanic and Atmospheric Administration. Testimony was received from these agencies and from state and local officials and environmental groups. The nature and source of the washups were discussed, as well as the dangers they presented to public health. Several of the findings pertained to the inadequate processing of some of the material dumped and the need for the New York area to build additional treatment plants. The EPA reported that the new technologies of pyrolysis and composting would allow phasing out of ocean dumping of sludge by 1981. New EPA regulations to cure the defects were reviewed. (Jones-Florida)
W77-11451

ANALYSIS OF THE IMPACT OF DELAYING COMPLIANCE WITH 1977 WATER QUALITY STANDARDS,
Mathematica, Inc., Philadelphia, Pa. Regional and Environmental Studies Group.
For primary bibliographic entry see Field 5G.
W77-11453

CRITERIA FOR DEVELOPING POLLUTION ABATEMENT PROGRAMS FOR INACTIVE AND ABANDONED MINE SITES,
For primary bibliographic entry see Field 5G.
W77-11454

DEVELOPMENT OF COUNTY AND LOCAL ORDINANCES DESIGNED TO PROTECT THE PUBLIC INTEREST IN FLORIDA'S COASTAL BEACHES,
Spessard L. Holland Law Center, Gainesville, Fla.
F. E. Maloney, and D. Fernandez.
Available from Eastern Water Law Center, University of Florida, Gainesville, 32611, for $5.90. March 1977, 100 p.

Descriptors: *Public access, *Legislation, *Beaches, *Shore protection, Local governments, Common law, Permits, Public rights, Regulation, Zoning, Right-of-way, Governments, Beach erosion, Dunes, Recreation, Recreation facilities, Intertidal area, Condemnation, Eminent domain, Coastal structures, *Florida.
Identifiers: *Model ordinances, *Coastal zone management.

Model ordinances are proposed to deal with public beach access and coastal construction and excavation setback and permit requirements. The public beach access ordinance is designed to provide adquate public beach recreation ares and public access ways despite increasing develomental demands. The authors' approach to this problem includes elements of common law theory, purchase, eminent domain, and mandatory dedication of land by developers. The model is preceded by a delineation of the problems involved and the legal principles currently employed in securing public beach access. The Model Coastal Construction and Excavation Setback and Permit Ordinance is designed to minimize the adverse environmental effects of coastal development. The regulation seeks to strike a balance between the competing interests of a landowner's right to determine the use to which his property will be put, and the state's right to regulate unreasonable land use. The juxtaposition of developmental interests with ecological considerations is considered. The ordinance represents a comprehensive approach toward regulating coastal development. Extensive references are provided for both models. (Brightman-Florida)
W77-11455

STATE WATER CONTROL BOARD V TRAIN (STATE COMPLIANCE WITH EFFLUENT LIMITATION DEADLINE MANDATORY UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS).
424 F. Supp. 146-57 (E D Va 1976).

Descriptors: *Virginia, *Federal Water Pollution Control Act, *Waste treatment, *Cities, Sewage effluents, Water pollution, Water pollution treatment, Water quality, Federal government, Federal budget, Law enforcement, Sewage treatment, Water pollution control, Treatment facilities, Penalties(Legal), Judicial decisions, Legislation, Regulation.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Plaintiff state agency sought an extension from the Environmental Protection Agency for compliance with deadlines for effluent limitations set by the Federal Water Pollution Control Act Amendements of 1972. Sections of the Act provided 75% funding by the federal government and a July 1, 1977, effluent limitation deadline. The plaintiff argued the second condition was contingent upon the federal money being dispersed. A spending cap and impoundment of funds made inadequate monies availables to states and municipalities. Such money shortages prevented Virginia from completing sewage treatment plants and from complying with the effluent limitation deadline. Since Congress had established the compliance deadlines with knowledge of potential funding problems the United States District Court for the Eastern District of Virginia felt that it must adhere strictly to congressional intent. The court held that it could not extend a deadline set forth in mandatory language. The court noted that the question of what measures it would take against a municipality for violation of the Act caused by impossibility of compliance was not being litigated in this case. (Cocheu-Florida)
W77-11456

UNITED STATES V JOSEPH G MORETTI, INC (COURT APPROVED COMPROMISE FOR RESTORATION OF AREA DAMAGED BY DEVELOPMENT).
423 F Supp 1197-1204 (S D Fla 1976).

Descriptors: *Florida, *Canals, *Environmental effects, *Bays, Drainage effects, Aquatic habitats, Feasibility, Swimming, Fishing, Ecology, Boating, Topography, Birds, Fish, Water quality standards, Dredging, Navigable waters, Rivers and Harbors Act, Federal jurisidiction, Federal government.

The United States brought suit against defendant developer under the Rivers and Harbors Act to enjoin him from conducting dredge and fill work in Florida Bay in the Keys. After the appeallate court remand of the case for an evidentary hearing on a plan to restore the topography of a small island, the United States District Court approved the government plan. The defendant had dredged upland canals, damaging fish and bird habitats and disrupting the recreational areas nearby. The plan was designed to insure that minimum federal and state water quality standards would be met without placing any more burdens on the defendant than was absolutely necessary. Restoration was confined to those areas found by the court to be within the jurisdiction of the government. The court further found that the restoration plan would not interfer with the recreation of lot owners in the developed area or with access to Florida Bay. (Cocheu-Florida)
W77-11457

REGULATION OF FORESTRY RELATED NON-POINT SOURCE POLLUTION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Debevoise and Liberman, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-11458

LOUISIANA PACIFIC CORPORATION AND CROWN SIMPSON PULP COMPANY (REQUESTS FOR VARIANCES FROM BPCT-CA).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-11459

AQUACULTURE PROJECTS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-11460

POLLUTION PREVENTION--VESSEL AND OIL TRANSFER FACILITIES.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-11461

EFFECT OF WASTE DISCHARGE REGULATIONS ON REAL PROPERTY DEVELOPMENT,
Indiana Univ. at Bloomington. School of Law.
For primary bibliographic entry see Field 5G.
W77-11462

TITLE TO FORESHORE--GEORGIA TIDELANDS ACT OF 1902 GRANTS RIGHT TO CULTIVATE AND HARVEST SHELLFISH IN FORESHORE AREA, FEE SIMPLE RESERVED IN THE STATE (COMMENT ON STATE V ASHMORE).
Georgia Law Review, Vol 10, p 1051-58, 1976.

Descriptors: *Georgia, *Intertidal areas, *Boundaries(Property), *Commercial shellfish, *Harvesting, Judicial decisions, State jurisdiction, Land development, High water mark, Low water mark, Seashores, Public rights, Public access, Land development, Shores, Beaches, State government, Constitutional law, Oysters, Clams, Shellfish.

In 1976 the Georgia Supreme Court settled a title dispute between the state and coastal real estate developers. The state claimed that common law had given the government title to the foreshore, the area between the high and low water marks. The Tidelands Act of 1902, relied upon by developers, gave certain rights to owners of lands adjacent to navigable tidewaters. The supreme court held the Act only granted a limited right to cultivate and harvest shellfish in the foreshore with title to the foreshore reserved to the state. In reviewing the legislative intent of the Act, the court decided its purpose was twofold: (1) to protect rights of fishing, passage, and transportation in the foreshore area for the public; and (2) to grant title to oyster beds used in planting, cultivation, and harvesting to restore a sagging industry. Clearly landowners never gained any property rights to the foreshore. They may merely harvest shellfish in the area. The author agrees with the ultimate holding of the court but takes issue with the reasoning used by the majority. (Cocheu-Florida)
W77-11463

WHO OWNS THE BEACH. MASSACHUSETTS REFUSES TO JOIN THE TREND OF INCREASING PUBLIC ACCESS,
W. A. Fairbank.
Urban Law Annual, Vol. 11, p 283-93, 1976.

Descriptors: *Massachusetts, *Public access, *Coasts, *Beaches, *Public rights, Legislation, Constitutional law, Easements, Recreation, Adverse possession, State jurisdiction, Judicial decisions, Boundaries(Property), Boundary disputes, Florida, Texas, Oregon, New Jersey, Riparian land.

Although many coastal states favor opening beaches to the public at the expense of the private owner, Massachusetts has refused to join the majority. The author discusses liberal access theo ries adopted by other states. They includ prescriptive easements in which persons continu ously cross anothers land to the shore; implie dedication in which the owner had knowledge o the public's trespass but took no significant effo to keep people out; and public trust in which stat lands seaward of the mean high tide would be hel by the state for the benefit of the public. Relyin on a colonial ordinance allowing private ownersh to the mean low tide, Massachusetts did not fin recreational use of the beach to be a public righ Although suggesting that implied dedication cou be used to open small beach areas to the publi the author feels that tax incentives for dedicatio compulsory dedication of beaches or beach a cesses, outright purchase of public beaches, shoreline zoning restrictions are methods of beac acquisition that are more likely to be successfu (Cocheu-Florida)
W77-11464

RIPARIAN RIGHTS REVISITED: LEGAL BAS FOR FEDERAL INSTREAM FLOW RIGHTS,
International Paper Co., Washington, D.C.
W. Kiechel, Jr., and M. Green.
Natural Resources Journal, Vol. 16, No. 4, p 9 74, October 1976.

Descriptors: *Federal-state water rights conflic *Reservation doctrine, *Federal reservatio *River flow, *Prior appropriation, Public lan Riparian rights, Space jurisdiction, Federal risdiction, Streams, Water rights, Constitutio law, National forests, Natural flow, Ecosysten Water law, Legal aspects, Water allo tion(Policy), Natural resources, Water utilizatio

The problem of whether creation of a natio forest carries with it the reservation of enou water to keep streams in the forest physically existence has been the subject of recent litigati States have contended that federal minimum stream flow regulation was not necessarily a rig Under the Commerce Clause and the Prope Clause of the Constitution, the Supreme Co ruled that the government, had by implicati reserved unappropriated water rights as of date of federal land reservation. Since m western lands were reserved by the United Stat most western water rights first vested in federal government. In the Nineteenth Century Supreme Court held such vested rights might construed as riparian rights. The states recently gued that courts must look to the purpose of reservation to determine how much water need supplied to the forests. The author concludes t the purpose of the reservation is to be used determine the quantity of water needed in exc of that required to maintain the natural fl (Cocheu-Florida)
W77-11465

INSTITUTIONS FOR WATER MANAGEME IN A CHANGING WORLD,
British Columbia Univ., Vancouver. Westw Research Centre.
I. K. Fox.
Natural Resources Journal, Vol. 16, No. 4, p 7 58, October 1976.

Descriptors: *Water management(Applic *Institutions, *Organizations, *Water resour development, Resources development, Mana ment, Resources allocation, Political constrai Political aspects, Social aspects, Water law, Wa resources, Water supply development, Wa utilization, Regional development, Regional an sis, Research and development, Resources.

The development of suitable institutions for w resources management requires reconciling co peting uses between sectoral, organizational regional groups and setting up overall environm tal policies to meet social goals. The following formance criteria should be established as a me

or implementing social policy values in water anagement institutions: representation of legiti- nate interest groups; adequate information rameworks; and efficient and effective decision- naking and implementation processes. Factors to e taken into account when designing an institu- ional system are the physical characteristics of vater resources, the general structure of govern- nent, and a recognition of federal versus unitary ystems. The institutional design must allow for ertain features of political behavior such as the elationships between agencies and their clientele nd the power of organized interests. A good vater management system will meet the per- ormance criteria and balance the competing in- erests. The author concludes that the major defi- iencies in current institutional designs stem from failure to consider the interactions among the en- ities concerned with water management and the ature of organizational and political behavior. Denker-Florida)
V77-11466

IATIONAL AND INTERNATIONAL EFFORTS O PREVENT TRAUMATIC VESSEL SOURCE OIL POLLUTION,
Coast Guard District (13th), Seattle, Wash.
For primary bibliographic entry see Field 5G.
W77-11467

RACTICAL LEGAL REMEDIES TO THE UBLIC BEACH SHORTAGE,
. F. Lafargue.
Environmental Affairs, Vol. 5, No. 3, p 447-76, Summer 1976.

Descriptors: *Beaches, *Recreation facilities, Seashores, *Public access, Eminent domain, Coasts, Recreation, Land use, State governments, Local governments, Legal aspects, Constitutional law, Public rights, Regulation, Right-of-way, Trespass, Easements, Taxes, Regional economics.

Shoreline areas are an increasingly important ecreational resource. However, in many regions he inability of the public to gain access to these reas has lead to a shortage of public beaches. Nu- erous legal remedies are available to open more eaches; the selection of remedy depends on the aw of the jurisdiction and the facts of the particu- ar case. Custom and public trust are available emedies. However, custom generally requires roof of a detailed set of facts, and public trust ill yield a right to use coastal waters but not each areas. Dedication entails a lighter evidentia- y burden than custom but can only be proven gainst individual parcels of land. It also runs the isk of forcing landowners to completely close off heir land to public access in order to rebut any fu- ure claim of dedication. Eminent domain provides he easiest remedy in terms of proof but poses dif- cult valuation problems. Additionally, the price f shoreline property is high making this alterna- ve cost-prohibitive. Statutes and constitutional rovisions are limited by the takings clause of the ourteenth Amendments. Regulatory methods for btaining public access to private beach areas in- ude subdivision exactions and tax incentives. Moorhouse-Florida)
W77-11468

CEAN DUMPING,
Health Effects Research Lab., Cincinnati, Ohio.
Water Quality Div.
For primary bibliographic entry see Field 5G.
W77-11469

ECTIONS 9 AND 10 OF THE RIVERS AND ARBORS ACT OF 1899: POTENT TOOLS FOR NVIRONMENTAL PROTECTION,
alifornia Univ., Berkeley. School of Law.
. J. Barker.
cology Law Quarterly, Vol 6, No 1, p 109-59, 976.

Descriptors: *Rivers and Harbors Act, *Federal jurisidiction, *Permits, *Navigable waters, Legislation, Environmental effects, Construction, Projects, Navigation, Harbors, Rivers, Ecology, Water resources, Water law, Natural resources, Conservation, Structures, Administrative agencies, Regulation, Legal aspects, Judicial decisions.

Sections 9 and 10 of the Rivers and Harbors Act of 1899 were originally enacted to protect commercial navigation, but have become potent tools for environmental protection. This comment examines the expanding application of these sections to environmental protection by tracing their legislative, judicial, and administrative history. The thrust of Sections 9 and 10 is to vest in the Corps of Engineers (Corps) tremendous power to regulate development in and around navigable waters by requiring Corps permits for structures in or over water, and Corps approval for excavating, filling, or modifying any navigable water. The courts have broadly applied these statutes to an impressive range of activities. However, the Corps' performance in regulating that range is not favorably rated. The strength of sections 9 and 10 has been reinforced by: (1) Congressional action which requires the Corps to consider environmental factors in issuing permits; (2) liberal judicial interpretation; and (3) allowing private litigants to challenge the legality of environmentally damaging projects constructred without a permit. Failure of the Corps to use these sections to the fullest extent is viewed as a limiting factor in their power. (Jones-Florida)
W77-11470

SUPERTANKERS AND THE LAW OF THE SEA,
N. Mostert.
Sierra Club Bulletin, Vol 61, No 6, p 13-16, June, 1976.

Descriptors: *Oil spills, *Oil pollution, *Oceans, *Disasters, *Ships, Law of the sea, Oil industry, United Nations, International waters, Treaties, Oily water, International law, Water pollution, Oil wastes, Environmental effects, Water pollution sources, Navigation, Legal aspects, Navigable waters, Transportation.
Identifiers: *Supertankers.

Oil tanker disasters have caused severe environmental damage to oceans and coasts. In recent years sinking tankers have destroyed fishing industries in entire regions and have upset marine ecosystems. In the early 1970's a shipbuilding boom led to more and larger oil tankers. Since these larger tankers were more difficult to maneuver, the likelihood of accidents rose. Greater safety standards, thicker hulls, and smaller vessels could all be utilized to lessen the incidence of environmental harm. Tanker discharge, i.e., flushing tanks with seawater, then flushing that water back into the oceans, remains a major problem. Both discharges and accidents are often a result of bad management and bad shipboard practice which usually stem from registry under flags of convenience. As the major oil companies take a larger share of the tanker market, their concern for their public image may make oil tankers safer. The author feels that stringent unilateral national action may be the best answer to the supertanker and oil pollution since international laws have not yet resolved the problem. (Cocheu-Florida)
W77-11472

CORPS GAMES IN MID-AMERICA,
J. Ela.
Sierra Club Bulletin, Vol 59, No 9, p 11-13, October 1974.

Descriptors: *Mississippi River, *Inland waterways, *Transportation, *Dredging, *Channel improvement, Public rights, Rivers, Navigation, Environmental effects, Barges, Channels, Navigable rivers, Recreation, Federal jurisdiction, Economics, Railroads, Civil engineering, Wildlife conservation, Multiple-purpose projects, Water law.

The Army Corps of Engineers has slowly developed the Upper Mississippi River between St. Louis and Minneapolis for transportation. Dredging and channeling the river over the years has severely damaged the environment. Industrial developments by the river have increased pollution. Because of the emphasis on commerce, the river's value as a recreation area, wildlife refuge, and natural habitat has almost vanished. Although the author concedes that navigation is a necessary use of the river, he suggests that other uses should be considered before unspoiled areas of the river are also destroyed. The greatest danger to the upper river, is the Corps' plans to quadruple the shipping capacity by deepening channels and building larger locks and dams. The author feels that construction can be economically feasible only if river traffic is vastly increased. However, such an increase will then require an entire new waterway system. The author also questions these benefits going cost-free to the barge companies at the expense of rail traffic, an alternative transportation method. Construction efforts have been temporarily curtailed because further congressional authorization was necessary. Environmentalists will have a fierce political battle to stop the project. (Cocheu-Florida)
W77-11473

INTERNATIONAL LAW, WORLD ORDER AND HUMAN PROGRESS,
Department of State, Washington, D. C.
H. Kissinger.
Department of State Bulletin, Vol 73, p 353-62, September 8, 1975.

Descriptors: *International waters, *Law of the sea, *Oceans, *Mining, *Fishing, Treaties, Legal aspects, International law, Foreign waters, Foreign trade, Commercial fishing, Energy, Natural resources, Environment, Environmental effects, Water pollution, Water law, Governments, Foreign countries, Oil industry.

The Law of the Sea was one of the major topics addressed by Secretary of State Kissinger in a speech before the American Bar Association convention. The Law of the Sea Conference is an international effort to devise rules to govern the domain of the oceans. In future decades man will have to turn more to the seas for food, minerals, and energy sources. Ninety-five percent of international trade is transported on the seas. The environmental integrity of the oceans has become a critical international problem. Critical issues requiring international agreement include reasonable territorial water limits, deep seabed rights, and pollution control. Economics will increasingly depend on free trade, free access to mineral rights, and coopration in extracting ocean resources. The United States has proposed establishment of an international orgaization to regulate deep seabed mining and has suggested certain powers and duties for the organization. The Secretary also discussed the establishment of a 200-mile zone for fishing. International cooperation in all areas of the oceans is considered a necessity. (Cocheu-Florida)
W77-11474

6F. Nonstructural Alternatives

PRESCRIPTIVE MODELS FOR NONSTRUCTURAL FLOODPLAIN PLANNING,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
W. F. Bialas, and D. P. Loucks.
Computers and Operations Research, Vol 3, No 2/3, p 113-125, August 1976. 7 fig, 2 tab, 14 ref. OWRT C-7183(6226)(1).

Descriptors: *Flood plains, *Planning, *Land use, Computers, Computer programs, Optimization, Evaluation, Decision making, Management, Benefits, Economics, Constraints, Methodology, Flood damage, Equations, Mathematical models, Systems analysis.
Identifiers: Flood losses, Nonlinear programming.

A mathematical programming model is developed to assist in selecting those floodplain management plans which will reduce the damage due to inundation, and, at the same time, be economically prudent. These techniques are intended to be used for relatively inexpensive screening of floodplain management alternatives before carrying out a plan-by-plan search with more detailed and expensive methods of analysis. Viewing the floodplain as a land use allocation problem in three dimensions, this formulation permits a direct assessment of expected flood damage on the basis of location and elevation. The model discretizes time, flood losses, topography, and building heights. Decision variables include changes in the land use allocation on the floodplain. Hence, in addition to determining which activities should be located in undeveloped regions, shifts in the activity schema of developed basins can be handled, a situation probably encountered with greater frequency than the undeveloped case. In addition, the effects of the floodwater displaced by various activities can be explicitly measured and, if desired, included as a component of flood risk. (Bell-Cornell)
W77-10847

FLOOD PLAIN INFORMATION REPORT, PRAIRIE CREEK, LINN COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-10909

WAPSINONOC CREEK FLOOD PLAIN INFORMATION, MUSCATINE COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-10910

WINNEBAGO RIVER AND TRIBUTARIES, FLOOD PLAIN INFORMATION, FOREST CITY, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-10911

FLOOD PLAIN INFORMATION: BAYOU PLAQUEMINE BRULE, CHURCH POINT, LOUISIANA.
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 4A.
W77-10912

DES MOINES RIVER FLOOD PLAIN INFORMATION, DES MOINES, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-10914

SOUTH BRANCH KISHWAUKEE RIVER FLOOD PLAIN INFORMATION, DE KALB COUNTY, ILLINOIS.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-10915

FLOOD PLAIN INFORMATION: BULL CREEK, AUSTIN, TEXAS.
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W77-10918

FLOOD PLAIN INFORMATION: COLORADO RIVER-ONION CREEK TO MONTOPOLIS BRIDGE, AUSTIN, TEXAS.
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W77-10919

FLOOD PLAIN INFORMATION: BARTONS AND SINKING CREEKS, LEBANON, TENNESSEE.
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 4A.
W77-10920

FLOOD PLAIN INFORMATION: BAYOU FOUNTAIN, BATON ROUGE, LOUISIANA.
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 4A.
W77-10921

NORTH FORK MAQUOKETA RIVER AND TRIBUTARIES FLOOD PLAIN INFORMATION, CITY OF DYERSVILLE, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-10929

THE NATIONAL FLOOD INSURANCE PROGRAM AND COASTAL REAL ESTATE DEVELOPMENT: THE EXPERIENCE OF WESTERLY, CHARLESTOWN, AND SOUTH KINGSTOWN, RHODE ISLAND,
New England River Basins Commission, Boston, Mass.
H. C. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 784, Price codes: A03 in paper copy, A01 in microfiche. Report NERBC-31, July 1975, 17 p, 4 tab.

Descriptors: *Flood plain insurance, *Flood protection, *Financing, *Coasts, *Seashores, *Rhode Island, Financial feasibility, Construction costs, Building codes, Zoning, Land development.
Identifiers: *National Flood Insurance Program, *Real estate development, *Lending regulations, *Westerly(RI), *Charlestown(RI), *Kingstown(RI), Flood hazard areas, Beach property, Flood plain management, Mortgage financing, Federal Insurance Administration, Coastal zone management.

The predominant force influencing sales and development of beach properties in the study area is the availability of direct financing as a result of flood insurance through the National Flood Insurance Program. People who purchased property before the Program financed the investment themselves and acted as self insurers. The availability of flood insurance and relatd financing of properties in flood hazard areas acts as a strong economic counterforce to efforts of the Rhode Island Coastal Resources Management Council, the flood plain management regulations of the Federal Insurance Administration (FIA), and the building permit and zoning regulations in the study area. The current leading regulations of FIA and the Federal agencies that supervise, regulate and insure financial institutions are not adequate to regulate lending in coastal flood hazard areas to assure greater coordination between financing and flood plain management goals. The low cost of flood insurance in the coastal high hazard areas bears little relation to the risks involved. The cost is not an economic disincentive to sales and development. (Nessa-NC)
W77-10931

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL MODELING AND DECISION MAKING: THE UNITED STATES EXPERIENCE.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 6A.
W77-10839

WATER RESOURCE MODELING.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 6A.
W77-10840

ECOLOGICAL MODELING.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 6A.
W77-10841

REGIONAL ENVIRONMENTAL MANAGEMENT MODELING.
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 6A.
W77-10842

ENVIRONMENTAL STUDIES OF AN ARCTIC ESTUARINE SYSTEM - FINAL REPORT.
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10893

INTRODUCTION: RATIONALE, OBJECTIVES AND LOGISTICS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10894

STUDIES OF PRIMARY PRODUCTIVITY AND PHYTOPLANKTON ORGANISMS IN THE COLVILLE RIVER SYSTEM,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-10900

THE NEARSHORE BENTHOS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10901

COLVILLE RIVER DELTA FISHERY RESEARCH,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10902

A SUMMARY OF OBSERVATIONS OF BIRDS AT OLIKTOK POINT AND NOTES ON BIRDS OBSERVED ALONG THE COLVILLE RIVER SUMMER 1971,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-10903

ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CT. FIRST YEAR'S STUDIES JULY 19 JULY 1975.
National Marine Fisheries Service, Highlan N.J. Middle Atlantic Coastal Fisheries Center.
Available from the National Technical Infor tion Service, Springfield, VA 22161 as AD-A

063, Price codes: A20 in paper copy, A01 in microfiche. Naval Facilities Engineering Command, Volume 3 of Supplement to Final Environmental Impact Statement, 'Dredge River Channel: Naval Submarine Base, New London, Groton, CT', October 1975. 504 p, append.

Descriptors: *Dredging, *Baseline studies, Environmental effects, *Connecticut, Ecosystems, Water pollution effects.
Identifiers: Spoil disposal, New London(CT), Environmental Impact Statements.

Four quarterly reports on the first year's studies (July 1974 - July 1975) are collected in one volume which is used to complement both the draft and final volume of the supplement to the Final Environmental Impact Statement. The reports are designed to monitor the effects of dredging and spoil disposal at New London, Connecticut, and to establish detailed baselines for dredging and spoiling sites. The reports deal primarily with activities of the Middle Atlantic Coastal Fisheries Center but reports from subcontractors, the University of Connecticut and the New York Ocean Science Laboratory are included as appendices. (Sinha-OEIS)
W77-10906

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE. SPEC. REPT. III: A METHODOLOGY FOR INVESTIGATING FRESH WATER INFLOW REQUIREMENTS OF TEXAS ESTUARY, VOLUME II--APPENDICES,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 2L.
W77-10908

OIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 9D.
W77-10917

NATIONAL ENVIRONMENTAL POLICY: COORDINATION OR CONFUSION,
North Texas State Univ., Denton.
For primary bibliographic entry see Field 6E.
W77-10927

REVIEW OF PCB LEVELS IN THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5B.
W77-10935

DREDGED MATERIAL AS A NATURAL RESOURCE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W77-10962

TIME-STRESSED COASTAL ENVIRONMENTS: ASSESSMENT AND FUTURE ACTION.
Coastal Society, Arlington, Va.
For primary bibliographic entry see Field 5G.
W77-11022

THE ROLE OF GOVERNMENT IN REAL ESTATE DEVELOPMENT,
Louisiana State Planning Office, Baton Rouge. Coastal Resources Program.
For primary bibliographic entry see Field 6E.
W77-11029

RECREATIONAL DEVELOPMENT AND COASTAL ECOLOGY - SEEKING THE RIGHT BALANCE,
Wallace, McHarg, Roberts and Todd, Philadelphia, Pa.
J. S. Sutton.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976. p 158-177, 9 ref.

Descriptors: *Barrier islands, *Coasts, *Ecosystems, *Recreation, *Resources development, Ecology, Water pollution.
Identifiers: *Outer Continental Shelf, *Coastal zone.

The search for the right balance between man's utilization of vulnerable coastal areas and their environmental stability can be addressed on many scales from the regional to the local, to the site-specific. The three case studies (all executed projects) from the work of Wallace, McHarg, Roberts and Todd (WMRT), Architects and Planners of Philadelphia, which are summarized in this paper represent this search for the right balance on a site-specific scale but with an acute awareness of the relationship of a particular site to the overall coastal ecosystem. (See also W77-11022) (Sinha-OEIS)
W77-11030

ENVIRONMENTAL CONSIDERATIONS OF THE OIL AND GAS PRODUCTION INDUSTRY IN THE COASTAL ZONE,
Texaco Inc., New Orleans, La.
For primary bibliographic entry see Field 5G.
W77-11032

FIELD STUDIES ON MARINE LIFE INHABITING AREAS OF CHRONIC LOW LEVEL EXPOSURE TO PETROLEUM,
Chevron Research Co., Richmond, Calif.
For primary bibliographic entry see Field 5C.
W77-11033

OIL IN SOUTHERN CALIFORNIA MARSHES,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5C.
W77-11034

IMPACT OF THE MARSH BUGGY ON THE WETLANDS,
Nicholls State Univ., Thibodaux, La. Dept. of Earth Science.
For primary bibliographic entry see Field 4C.
W77-11035

CHANGES IN MARSH ENVIRONMENTS THROUGH CANALIZATION,
Nicholls State Univ., Thibodaux, La. Dept. of Earth Science.
For primary bibliographic entry see Field 5C.
W77-11036

THE GALVESTON BAY SYSTEM - A MULTI-STRESSED ENVIRONMENT,
Moody Coll. of Marine Sciences and Maritime Research, Galveston, Tex.
For primary bibliographic entry see Field 5C.
W77-11037

EROSION DEFENSE STRUCTURES ON THE PUGET SOUND SHORELINE,
Western Washington State Coll., Bellingham. Dept. of Geography and Regional Planning.
For primary bibliographic entry see Field 4D.
W77-11038

EDIZ HOOK: PAST, PRESENT, AND FUTURE,
Western Washington State Coll., Bellingham. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-11039

INFORMATION, CRITERIA, AND GUIDELINES TO IMPROVE COASTAL WETLAND MANAGEMENT,
Chesapeake Research Consortium, Inc., Baltimore, Md.
W. H. Queen.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976, p 289.

Descriptors: *Wetlands, Water resources, *Chesapeake Bay, *Resources development, *Monitoring, *Baseline studies, Coasts, *Maryland, Land use, Erosion, Environmental effects.
Identifiers: *Outer Continental Shelf, *Coastal zone management.

The Chesapeake Research Consortium has undertaken a multi-year study of the development activity problem in the Chesapeake Bay shore zone. Sub-projects of this effort include: (1) use of Corps of Engineer permits to map patterns, trends and rates of development activity, and to identify key development issues, (2) development of a granted permit data bank that can be employed to monitor development activity in the bay, and (3) preparation of shoreline situation reports that contain baseline information on land use, morphological type, and erosion of the bay's shore zone. Both methodology and results of these three sub-projects are reviewed. (See also W77-11022) (Sinha-OEIS)
W77-11043

ENVIRONMENTAL IMPLICATIONS OF MAN-MADE LINEAR ELEMENTS IN COASTAL WETLANDS,
Coastal Environments, Inc., Baton Rouge, La.
S. M. Gagliano, D. W. Earle, R. E. Emmer, and J. L. van Beek.
In: Time-Stressed Coastal Environments: Assessment and Future Action, Proceedings of 2nd Annual Conference of The Coastal Society, held New Orleans, LA, November 17-20, 1976, p 290.

Descriptors: *Coasts, *Wetlands, *Resources development, *Management, *Land use, Baseline studies, Environmental effects, Water resources.
Identifiers: *Outer Continental Shelf, *Coastal Zone management.

The impact assessment and environmental planning processes in coastal wetlands areas usually include consideration of man-made linear features such as railroads, highways, canals, levees, and utility lines. Such elements may segment ecological units, become barriers to natural movements of plants and animals, alter hydrologic regime, alter water quality, change land use, change aesthetic values, and become permanent landscape boundaries. Over the years planners and developers have evolved strategies for using such features to accelerate and enhance development. Likewise, in recent years environmental scientists and planners have devised strategies for minimizing detrimental environmental impacts of linear elements and for using them effectively in the geometry of multiuse management schemes. Conflicts often arise between the objectives of the former group and the latter group. Recognizing these different strategies and objectives aids in impact analysis and becomes an important tool in multi-use planning of coastal wetlands and other environmentally sensitive areas. (See also W77-11022) (Sinha-OEIS)
W77-11044

PROGRESS REPORT. DEEP OCEAN MINING ENVIRONMENTAL STUDY--PHASE I.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5C.
W77-11053

ENVIRONMENTAL IMPACT ANALYSIS: THE CENTRAL ARIZONA PROJECT AS AN EXAMPLE,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. D. Bradley.
College of Business and Public Administration, Report PW-76-9, 1976. 53 p, 133 ref.

Descriptors: *Environmental effects, *Ecosystems, *Colorado River, *Legislation, Colorado River Compact, Arizona, Southwest US, Environment, Conservation, Land management, Water resources, Water resources development, Water conservation, Water supply, Water supply development, Planning.
Identifiers: *Central Arizona Project, *Environmental Impact Statement.

The purpose of this study is to review and clarify the legislative and administrative requirements for sound environmental impact analysis, offer suggested primary sources pertinent to the impact assessment of large scale public works projects, and analyze the guidelines generated by the Federal Government by a case study of the Central Arizona Project Environmental Impact Statement. An outline of an impact assessment seminar and suggested supplemental materials and bibliography are included. The basic idea presented is that the environmental impact statement has an information generating role; but information is not neutral, its generation changes the substance of decision making and creates organizational uncertainty, requiring long range resources planning. The Central Arizona Project Environmental Impact Statement as an example of this basic thesis is investigated. A history of the CAP and the relationship between the CAP and the Bureau of Reclamation are discussed. An overview and critique of the CAP Environmental Impact Statement is presented. The conclusion reached is that the CAP statement is an attempt to legitimize a project rather than analyze it for environmental impacts. (Jamail-Arizona)
W77-11082

THE KRUMME-RHINE PROJECT AS AN EXAMPLE OF ECOLOGIC LANDSCAPE PLANNING, (IN GERMAN),
Innsbruck Univ. (Austria). Inst. of Botany.
H. Gams.
Decheniana Vol 129, p 179, 1976.

Descriptors: *Ecology, Environment, Forests, Landscaping, Planning, Natural resources, Forests, Soils, Vegetation effects, Birds.
Identifiers: Krumme-Rhine Project(Netherlands).

The project area is 300 km2 in size and was sponsored by the Dutch Foundation for Nature and Environment. The ecological planning highlights were charted for cartographers and other experts. Maps show the division of the protected area by soil types, depths of ground water, present-day vegetation, and the ecological value of forested areas, protected bird life and opportunities for future research and planning projects.--Copyright 1977, Biological Abstracts, Inc.
W77-11083

LAND AND WATER RESOURCES FOR ENVIRONMENTAL RESEARCH ON THE OAK RIDGE RESERVATION,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
R. C. Dahlman, J. T. Kitchings, and J. W. Elwood.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-TM-5352, Price codes: A05 in paper copy, A01 in microfiche. Report ORNL/TM-5352, January 1977, 83 p, 5 fig, 8 maps, 5 tab. W-7405-eng-26, AT-40-1-GEN-242.

Descriptors: Research facilities, Sites, *Environment, Aquatic environment, Resources development, Water resources development, Land resources, Ecosystems, Tennessee, Land use.
Identifiers: Oak Ridge Reservation(Tenn).

This comprehensive description of land and water resources gives particular consideration to the following factors: guarantees for long-term human health within the boundaries of the reservation; the maintenance of long-term environmental quality in ecosystems in proximity to developing energy technology; assuring the integrity of field facilities; the development of ecological information for establishing availability, needs, and priorities of land use; and education and training of environmental scientists. Sections of the report are devoted to the geology and seismic characteristics of the reservation, the agricultural and forest resources, aquatic environments, aquatic biota, vegetation resources, animal habitats, and important natural areas and archaeological sites of the reservation. Future resource requirements for programmatic research in environmental sciences is discussed. (Chilton-ORNL)
W77-11130

RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIVISION ANNUAL REPORT, ECOLOGY, JANUARY-DECEMBER 1975.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W77-11132

PALMER LAKE SANITATION DISTRICT, PALMER LAKE, COLORADO (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5D.
W77-11452

SECTIONS 9 AND 10 OF THE RIVERS AND HARBORS ACT OF 1899: POTENT TOOLS FOR ENVIRONMENTAL PROTECTION,
California Univ., Berkeley. School of Law.
For primary bibliographic entry see Field 6E.
W77-11470

CORPS GAMES IN MID-AMERICA,
For primary bibliographic entry see Field 6E.
W77-11473

7. RESOURCES DATA

7A. Network Design

WATERLO, A DATA BANK AND COMPUTER SYSTEM FOR RIVER CHANNEL NETWORKS AND RIVER BASINS IN BELGIUM,
Vrije Universiteit Brussels (Belgium). Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-10827

HOURLY CUMULATIVE TOTALS OF RAINFALL, BLACK HILLS FLASH FLOOD JUNE 9-10, 1976,
National Weather Service, Rapid City, S.D.
For primary bibliographic entry see Field 2B.
W77-10986

ON DETERMINING DISTANCES THROUGH STREAM NETWORKS,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 4A.
W77-11225

7B. Data Acquisition

AN INTEGRATED APPROACH TO THE REMOTE SENSING OF FLOATING ICE,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 2C.
W77-10866

AN ANALYSIS AND COMPARISON OF LANDSAT-1, SKYLAB (S-192) AND AIRCRAFT DATA FOR DELINEATION OF LAND-WATER COVER TYPES OF THE GREEN SWAMP, FLORIDA,
Geological Survey, Miami, Fla. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-10871

THE DELAWARE RIVER BASIN LANDSAT DATA COLLECTION SYSTEM EXPERIMENT,
Geological Survey, Reston, Va. Water Resources Div.
R. W. Paulson.
National Aeronautics and Space Administration Contract Report CR-146030, November 1975. 38 p, 15 fig, 4 tab, 2 ref.

Descriptors: *Hydrologic data, *Data transmission, *Data processing, *Satellites(Artificial), *Telemetry, Methodology, Data collections, Computers, Evaluation, *Delaware River, River basins.
Identifiers: *Real-time data, Experimental system, *LANDSAT data.

The Delaware River basin LANDSAT Data Collection System (DCS) experiment was designed as an attempt to integrate a satellite system for relaying resources data with existing Geological Survey systems of hydrologic data collection and computer processing. The integration of these systems was structured as a simulated operational system and water-resources data were processed daily and provided to water-resources agencies. Although the LANDSAT-DCS is inadequate as a large scale operational data-relay system, the successful use of the experimental system in the simulation demonstrated that space satellite relay of resources data can be accomplished using existing technology. (Woodard-USGS)
W77-10877

APPARATUS FOR COLLECTING DEEP-SEA SEDIMENT PORE WATER,
Office of Naval Research, Arlington, VA.
R. O. Barnes.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-D 862, Price codes: A02 in paper copy, A01 in microfiche. Patent Application, Serial No 464,6 April 26, 1974. 22 p, 2 fig.

Descriptors: *Pore water, *Instrumentation, *Patents, Sampling, Deep water, Sediments.
Identifiers: *Collectors(Sampling).

The collector filters and encapsulates pore water in-situ, from unconsolidated sediments. A pressure casing mounts a collection cylinder having valved inlet opening for receiving the sediment pore water through a 1 micron filter. The valve is spring pressed to a closed position and opens in response to hydrostatic pressure. A second valve closes the inlet to the spring-pressed poppet valve. Trigger means initiate the opening of the second valve to expose the poppet vale to the hydrostatic pressure. Preferably, the exposure is accom-

lished in a delayed manner to assure proper posi-
ning of the sampler before admission of the
re water to the cylinder. (Sinha-OEIS)
77-10881

EMOTE SENSING STUDY OF ELECTRIC
ENERATING STATION THERMAL
ISCHARGES TO BARNEGAT BAY AND
REAT EGG HARBOR, NEW JERSEY.
nvironmental Protection Agency, Denver, Colo.
ational Field Investigations Center.
r primary bibliographic entry see Field 5A.
77-10892

VO-DIMENSIONAL SEARCHES FOR HIGH-
ELD WELL SITES,
r primary bibliographic entry see Field 8B.
77-10967

TEGRATED AUTOMATIC WATER SAMPLE
OLLECTION SYSTEM,
chigan State Univ., East Lansing. Dept. of
ectrical Engineering and Systems Science.
D. Fisher, and J. E. Siebert.
rnal of the Environmental Engineering Divi-
n, American Society of Civil Engineers, Vol.
, No. EE4, p 725-728, August 1977. 3 fig.

scriptors: *Water sampling, *Data collections,
quipment, Stream gages, Sampling, Water
emistry, Water pollution, Hydrologic data, Au-
nation, Electrical equipment, Electronic equip-
nt, Hydrographs, Hydrology.
ntifiers: *Water sampling systems, Electronic
trols.

ported in this paper were the organization,
ration, and utility of an automatic water sam-
collection system composed of a commercially
ilable automatic water sample collector, a
dified hydrographic recorder, and a specially
igned auxiliary electronic controller. The in-
ated water sampling system expands the nor-
operating capabilities of the conventional au-
atic water sampler and hydrographic recorder.
ns-ISWS)
7-10972

MOTE MEASUREMENT OF 'TURBIDITY'
D OTHER WATER QUALITY PARAME-
RS,
ional Aeronautics and Space Administration,
enbelt, Md. Goddard Space Flight Center.
primary bibliographic entry see Field 5A.
7-10985

THE USE OF MICROWAVE RADIATION
GREAT LAKES ICE SURVEILLANCE,
onal Oceanic and Atmospheric Administra-
Ann Arbor, Mich. Great Lakes Environmen-
esearch Lab.
primary bibliographic entry see Field 2C.
-11052

TER RESOURCES RESEARCH PROGRAM -
RSHORE CURRENTS AND WATER TEM-
ATURES IN SOUTHWESTERN LAKE
HIGAN, (JUNE-DECEMBER 1975),
nne National Lab., Ill. Energy and Environ-
al Systems Div.
primary bibliographic entry see Field 5A.
11131

LOAD SAMPLER FOR STREAMS WITH
OY BED,
nion-Israel Inst. of Tech. Haifa. Faculty of
ultural Engineering.
rimary bibliographic entry see Field 2J.
11208

A COMPARISON OF IN SITU EXTRACTORS FOR SAMPLING SOIL WATER,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 2G.
W77-11235

MINIATURE AQUARIUM SYSTEM FOR REARING SMALL NUMBERS OF FISH LARVAE,
Icthyological Associates, Inc., Berwick, Pa.
W. F. Gale.
The Progressive Fish Culturist, Vol. 39, No. 1, 1977, p 10-13. 1 tab, 1 fig, 8 ref.

Descriptors: *Freshwater fish, *Methodology, *Bioassay, Aquiculture, Laboratory equipment, *Aquaria, *Juvenile fish, Fish eggs, Fish farming, Fish hatcheries, *Channel catfish, Bass, Sunfish.
Identifiers: Miniature aquarium system.

Eggs of 19 species of river fish were hatched and the larvae reared in small aquariums flushed with swimming-pool water. The simple construction of the aquarium system kept costs low and allowed the use of simplified feeding methods. Size and structure of the system can easily be altered to meet changing needs. (Katz)
W77-11260

SOME PROBLEMS IN SAMPLING STREAM FAUNA, WITH PARTICULAR REFERENCE TO THE VARIABILITY OF SAMPLES, (IN JAPANESE),
Hyogo Prefecture Environmental Science Inst. (Japan).
For primary bibliographic entry see Field 5A.
W77-11292

MAPPING.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-11363

EVAPORATION AND RADIATION MEASUREMENTS AT SALTON SEA, CALIFORNIA,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 2D.
W77-11365

RESOURCES AND LAND INVESTIGATIONS (RALI) PROGRAM.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-11368

WATER-MANAGEMENT MODEL IN FLORIDA FROM LANDSAT-1 DATA,
Geological Survey, Tampa, Fla.; Geological Survey, Miami, Fla. Water Resources Div.; and Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 4A.
W77-11370

REAERATION COEFFICIENTS OF STREAMS--STATE-OF-THE-ART,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-11382

ARCTIC CONTINENTAL SHELF PROCESSES AND MORPHOLOGY RELATED TO SEA ICE ZONATION, BEAUFORT SEA, ALASKA,
Geological Survey, Menlo Park, Calif. Geologic Div.
For primary bibliographic entry see Field 2C.
W77-11383

PERFORMANCE OF THE SILVER-PSYCHROMETER FOR MEASURING LEAF WATER POTENTIAL IN SITU,
Agricultural Research Service, Riverside, Calif. Western Region.
For primary bibliographic entry see Field 2I.
W77-11388

EVALUATION OF RESISTANCE AND MASS TRANSPORT EVAPOTRANSPIRATION MODELS REQUIRING CANOPY TEMPERATURE DATA,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering; and Nebraska Univ., Lincoln. Inst. of Agricultural and Natural Resources.
For primary bibliographic entry see Field 2D.
W77-11396

SOIL SOLUTION CONCENTRATIONS: EFFECT OF EXTRACTION TIME USING POROUS CERAMIC CUPS UNDER CONSTANT TENSION,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2G.
W77-11397

TIMING OF GROUND TRUTH ACQUISITION DURING REMOTE ASSESSMENT OF SOIL-WATER CONTENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W77-11433

OPERATION CONTROL.
For primary bibliographic entry see Field 5D.
W77-11498

7C. Evaluation, Processing and Publication

AUTOCORRELATION CHARACTERISTICS OF HYDROMETEOROLOGICAL DATA OF THE UNITED STATES,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
For primary bibliographic entry see Field 2B.
W77-10805

COMPUTER SIMULATION IN WATER RESOURCES SYSTEMS.
Brussels Univ. (Belgium); and Ghent Rijksuniversiteit (Belgium).
For primary bibliographic entry see Field 2A.
W77-10806

A RECURSIVE APPROACH TO TIME-SERIES ANALYSIS FOR MULTIVARIABLE SYSTEMS,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 5B.
W77-10807

DESIGNING SIMULATION MODELS FOR OPTIMIZATION STUDIES,
Lancaster Univ., Bailrigg (England). Dept. of Operational Research.
For primary bibliographic entry see Field 6A.
W77-10808

WATERLO, A DATA BANK AND COMPUTER SYSTEM FOR RIVER CHANNEL NETWORKS AND RIVER BASINS IN BELGIUM,
Vrije Universiteit Brussels (Belgium). Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-10827

WATER RESOURCES DATA BANK IN NEW JERSEY AND COMPUTATIONS OF EXTREME FLOWS,
Columbia Univ., New York. Seminars on Pollution and Water Resources.
G. J. Halasi-Kun.
In: Proceedings of the IFIP Working Conference on Computer Simulation of Water Resources Systems. G.C. Vansteenkiste (Ed.), Ghent, Belgium, July 30-Aug. 2, 1974. American Elsevier Publishing Company, Inc., New York, N.Y., p 641-650, 1975. 7 ref.

Descriptors: *Water resources, *Data collections, *Surface waters, *Streamflow, *New Jersey, Water availability, Runoff, Water quality, Computer programs, Evaluation, Drainage, Basins.
Identifiers: *Extreme flows.

The conditions of New Jersey in terms of interdisciplinary data gathering concentrated in water interaction in the natural environment, including its quantity and quality, are described. Surface water data collecting for drainage basins of an area less than 250 km presents inadequate information for peak or lowest flow computations in planning because the data are collected for a shorter period and at random. Since the various empirical formulas, unit hydrographs, and flood frequency methods are computations based on probability, the constructed flow curves furnish trustworthy average flow diagrams that forecast reliable extreme values of peak (100-year flow) or lowest flows for practical planning purposes. Despite its shortcomings, the data collecting can be efficiently evaluated and utilized with the help of the local geologic survey and meteorologic conditions establishing correlation and similarities between permeability of the geologic subsurface and extreme values of the meteorologic records on one side and the extreme flows from smaller watersheds on the other. This approach uses the statistical data of over 90,000 well records (1945-1974) and 101 selected stream gaging stations (1882-1974). The formulas were developed with data from New Jersey, Central Europe, the Soviet Union, and others. Finally, a partial but detailed description is given of the Data Bank. The advantages and disadvantages of storing data by computer, microfilm and magnetic tape/selectric typewriter's (MT/ST) method are also discussed. (See also W77-10806) (Bell-Cornell)
W77-10830

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1975.
Geological Survey, Trenton, N.J. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 802, Price codes: A21 in paper copy, A01 in microfiche. Water-Data Report NJ-75-1, June 1976. 474 p, 9 fig, 5 tab, 37 ref.

Descriptors: *New Jersey, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.

Water resources data for the 1975 water year for New Jersey consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water quality in wells and springs. This report contains discharge records for 85 gaging stations; tide summaries for 11 stations; stage and contents for 31 lakes and reservoirs; water quality for 25 gaging stations, 87 partial-record flow stations, and 164 wells. Also included are 75 crest-stage partial-record stations and 58 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in New Jersey. (Woodard-USGS)
W77-10854

WATER RESOURCES DATA FOR MISSOURI, WATER YEAR 1975.
Geological Survey, Rolla, Mo. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 765, Price codes: A17 in paper copy, A01 in microfiche. Water-Data Report MO-75-1, August 1976. 357 p, 1 fig, 4 tab, 12 ref.

Descriptors: *Missouri, *Hydrologic data, *Surface waters, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.

Water resources data for the 1975 water year for Missouri consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs. This report contains discharge records for 138 gaging stations; stage and contents for 6 lakes and reservoirs, and water quality for 53 gaging stations. Also included are data for 103 crest-stage partial-record stations, 30 partial-record water quality stations and 25 miscellaneous sampling sites. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Missouri. (Woodard-USGS)
W77-10855

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1975.
Geological Survey, Richmond, Va. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 196, Price codes: A16 in paper copy, A01 in microfiche. Water-Data Report VA-75-1, September 1976. 346 p, 4 fig, 4 tab, 25 ref.

Descriptors: *Virginia, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.

Water resources data for the 1975 water year for Virginia consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells and springs. This report contains discharge records for 194 gaging stations; stage only for 1 gaging station; stage and contents for 9 lakes and reservoirs; water quality for 23 gaging stations; and water levels for 54 observation wells. Also included are data for 160 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Virginia. (Woodard-USGS)
W77-10856

HYDROLOGIC MAPS AND DATA IN THE MIMBRES BASIN, NEW MEXICO,
Geological Survey, Albuquerque, N.M. Water Resources Div.
J. S. McLean.
Open-file report 77-314, April 1977. 531 p, 8 fig, 6 tab, 104 ref.

Descriptors: *Groundwater resources, *Basic data collections, *Water levels, *Water yields, *Chemical analysis, Well data, Specific capacity, Aquifers, Springs, *Maps, Water level fluctuations, Irrigation.
Identifiers: *Mimbres River basin(N Mex).

This basic data report for the Mimbres River basin, New Mexico, lists well and spring data including well locations, water levels, well yields, and chemical analyses of well and spring water. Maps, scale 1:250,000, show well locations, water-level contours, and water-level declines. (Woodard-USGS)
W77-10858

THE BIG THOMPSON RIVER FLOOD OF JULY 31-AUGUST 1, 1976, LARIMER COUNTY, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.; and Colorado Water Conservation Board, Denver.
For primary bibliographic entry see Field 2E.
W77-10859

GROUND-WATER CONDITIONS IN UTAH SPRING OF 1977,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-10864

AN ANALYSIS AND COMPARISON OF LANDSAT-1, SKYLAB (S-192) AND AIRCRAFT DATA FOR DELINEATION OF LAND-WATER COVER TYPES OF THE GREEN SWAMP, FLORIDA,
Geological Survey, Miami, Fla. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-10871

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN A PART OF CURRY COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1976,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
J. D. Hudson.
New Mexico State Engineer Map CU-17, 1977, 1 sheet.

Descriptors: *Groundwater, *Drawdown, *Water levels, *Irrigation, *New Mexico, Taxes, Income, *Maps, Aquifers.
Identifiers: *Water-depletion losses, *Southeastern Curry County(N Mex), *Tax-depletion, Internal Revenue Service, New Mexico State Engineer Cooperator.

A map at the scale of 0.5-inch per mile shows area in southeastern Curry County, New Mexico where values of decline of water level, in feet, have been assigned for the year 1976. This is a guideline map approved for tax-depletion purposes of water used of irrigation by the U.S. Internal Revenue Service. Copies of the map are available to taxpayers from the Office of the New Mexico State Engineer. The map number is CU-17.
(Woodard-USGS)
W77-10873

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN CENTRAL (MAP LC-19) AND NORTHERN (LN-19) LEA COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1976,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
J. D. Hudson.
New Mexico State Engineer Maps LC-19 and LN-19, 1977. 2 sheets.

Descriptors: *Groundwater, *Drawdown, *Water levels, *Irrigation, *New Mexico, Taxes, Income, Aquifers, *Maps.
Identifiers: *Water-depletion losses, *Northern and central Lea County(N Mex), *Tax-depletion, Internal Revenue Service, New Mexico State Engineer Cooperator.

Maps of northern and central Lea County, New Mexico, showing areas assigned values of decline of water level for the year 1976 in aquifers used for irrigation, have been prepared cooperatively by the New Mexico State Engineer and the U.S. Geological Survey. These are guidelines maps, approved by the U.S. Internal Revenue Service, to be used by landowners in irrigated areas of Lea County to calculate water-depletion losses for income tax purposes. The maps are numbered LC-19 and LN-19 (central part and northern part). Copies of the maps may be obtained from the Office of the New Mexico State Engineer. (Woodard-USGS)
W77-10874

ROUND-WATER DEPLETION, IN FEET, ALOWED IN PORTALES VALLEY, ROOSEVELT OUNTY, NEW MEXICO, BY U.S. INTERNAL EVENUE SERVICE FOR CALENDAR YEAR 976,
eological Survey, Albuquerque, N. Mex. Water esources Div.
D. Hudson.
ew Mexico State Engineer Map RO-20, 1977. 1 eet.

escriptors: *Groundwater, *Drawdown, *Water vels, *Irrigation, *New Mexico, Taxes, Income, aps, Aquifers.
entifiers: *Water-depletion losses, *Roosevelt ounty(N Mex), *Tax-depletion, Internal evenue Service, New Mexico State Engineer operator.

map at the scale of 0.5-inch per mile shows areas the Portales valley, Roosevelt County, New exico, where values of decline of water level, in et, have been assigned for the year 1976. This is guideline map approved for tax-depletion purses of water used for irrigation by the U.S. Inal Revenue Service. Copies of the map are ailable to taxpayers from the Office of the New exico State Engineer. The map number is RO-20. oodard-USGS)
7-10875

ROUND-WATER RESOURCES OF BENSON D PIERCE COUNTIES, NORTH DAKOTA,
ological Survey, Bismarck, N. Dak. Water sources Div.
primary bibliographic entry see Field 4B.
7-10876

E DELAWARE RIVER BASIN LANDSATTA COLLECTION SYSTEM EXPERIMENT,
ological Survey, Reston, Va. Water Resources
primary bibliographic entry see Field 7B.
7-10877

OOD PLAIN INFORMATION REPORT, AIRIE CREEK, LINN COUNTY, IOWA.
ny Engineer District, Rock Island, Ill.
primary bibliographic entry see Field 4A.
7-10909

PSINONOC CREEK FLOOD PLAIN INFORTION, MUSCATINE COUNTY, IOWA.
y Engineer District, Rock Island, Ill.
primary bibliographic entry see Field 4A.
-10910

NEBAGO RIVER AND TRIBUTARIES, OD PLAIN INFORMATION, FOREST Y, IOWA.
y Engineer District, Rock Island, Ill.
primary bibliographic entry see Field 4A.
-10911

FLOOD PLAIN INFORMATION: BAYOU PLAQUEMINE BRULE, CHURCH POINT, LOUISIANA.
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 4A.
W77-10912

DES MOINES RIVER FLOOD PLAIN INFORMATION, DES MOINES, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-10914

SOUTH BRANCH KISHWAUKEE RIVER FLOOD PLAIN INFORMATION, DE KALB COUNTY, ILLINOIS.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-10915

FLOOD PLAIN INFORMATION: BULL CREEK, AUSTIN, TEXAS.
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W77-10918

FLOOD PLAIN INFORMATION: COLORADO RIVER-ONION CREEK TO MONTOPOLIS BRIDGE, AUSTIN, TEXAS.
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W77-10919

FLOOD PLAIN INFORMATION: BARTONS AND SINKING CREEKS, LEBANON, TENNESSEE.
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 4A.
W77-10920

FLOOD PLAIN INFORMATION: BAYOU FOUNTAIN, BATON ROUGE, LOUISIANA.
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 4A.
W77-10921

NORTH FORK MAQUOKETA RIVER AND TRIBUTARIES FLOOD PLAIN INFORMATION, CITY OF DYERSVILLE, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-10929

MATERIAL TRANSPORT THROUGH POROUS MEDIA: A FINITE-ELEMENT GALERKIN MODEL,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 2F.
W77-10981

ASSESSING THE ACCURACY OF SUSPENDED SEDIMENT RATING CURVES FOR A SMALL BASIN,
Exeter Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W77-11210

DETERMINATION OF REGIONAL EVAPOTRANSPIRATION FROM UPPER AIR METEOROLOGICAL DATA,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2D.
W77-11211

ADVANCES IN BOX-JENKINS MODELING, 1. MODEL CCONSTRUCTION,
Waterloo Univ. (Ontario). Dept. of Systems Design.
For primary bibliographic entry see Field 2A.
W77-11214

ADVANCES IN BOX-JENKINS MODELING, 2. APPLICATIONS,
Waterloo Univ. (Ontario). Dept. of Statistics.
For primary bibliographic entry see Field 2A.
W77-11215

STORM DEPTH-AREA RELATIONS FROM DIGITIZED RADAR RETURNS,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W77-11226

MAPPING.
Geological Survey, Reston, Va.
Cartographic Research Annual Report, June 1976. 75 p, 40 ref.

Descriptors: *Mapping, *Photogrammetry, *Remote sensing, *Satellites(Artificial), Bathymetry, Terrain analysis, Topography, Vegetation, Geology, Watersheds(Basins), Methodology, Research and development.
Identifiers: *Cartographic research, *U S Geological Survey, *Mapping techniques.

This report summarizes the activities in cartographic research and development by the U.S. Geological Survey for the year ending June 1976, and covers work carried out at the several facilities of the Topographic Division: the Western Mapping Center at Menlo Park, Calif., the Rocky Mountain Mapping Center at Denver, Colo., the Mid-Continent Mapping Center at Rolla, Mo., and the Eastern Mapping Center, the Special Mapping Center, and the Office of Research and Technical Standards, all at Reston, Va. Among the new instruments and technological developments covered in this report, the following seem particularly important to the future of cartography: (1) An advanced image correlation instrument that simultaneously produces orthophotographs and a magnetic tape record of digital terrain data, (2) inertial surveying systems that automatically establish horizontal positions and elevations while being carried in a truck, helicopter, or light airplane, (3) digital cartographic data, (4) digital processing of imagery, and (5) digirally controlled differential rectifiers (orthophoto printers). (Woodard-USGS)
W77-11363

STATUS OF PROJECTS IN MINNESOTA, FISCAL YEARS 1976 AND 77.
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 9D.
W77-11367

RESOURCES AND LAND INVESTIGATIONS (RALI) PROGRAM.
Geological Survey, Reston, Va.
RALI Program report, April 1977. 7 p.

Descriptors: *Publications, *Natural resources, *Land use, *Mining, *Environmental effects, Economic feasibility, Energy, Land development, Water resources, Mineralogy, Coal mines, Drilling, Oil wells, Offshore platforms, Water pollution control, Planning.

The Resource and Land Investigations (RALI) Program was established by Secretarial Order in 1972 to provide in Interior Department mechanism that would improve technical communications between the collectors and analysts of natural resources and land information and the users of

such information. This list includes about 80 RALI sponsored publications. (Woodard-USGS)
W77-11368

WATER RESOURCES DATA FOR MAINE, WATER YEAR 1975.
Geological Survey, Augusta, Maine. Water Resources Div.
Water-Data Report ME-75-1, May 1976. 172 p, 2 fig, 19 ref.

Descriptors: *Maine, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for Maine consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; 65 gaging stations; stage only records for 1 gaging station; contents for 17 lakes and reservoirs; water quality for 33 gaging stations and 11 wells; and water levels for 12 observation wells. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies. (Woodard-USGS)
W77-11371

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1975--VOLUME 2. COLORADO RIVER BASIN.
Geological Survey, Lakewood, Colo. Water Resources Div.
Water-Data Report CO-75-2, May 1977. 538 p, 4 fig, 5 tab, 39 ref.

Descriptors: *Colorado, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.
Identifiers: *Colorado River basin(Colo).

Water resources data for Colorado for the 1975 water year consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs, and water levels and water quality of wells and springs. This report (Volumes 1 and 2) contains discharge records for 367 gaging stations, stage and contents of 22 lakes and reservoirs, 5 partial-record flow stations, 77 crest-stage partial-record stations, and 4 miscellaneous sites; water quality for 91 gaging stations and 15 miscelllaneous sites; and water levels for 49 observation wells. A few pertinent stations in bordering States are also included in this report. The records were collected and computed by the Water Resources Division of the U.S. Geological Survey under the direction of J. W. Biesecker, district chief. These data represent that portion of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Colorado. (Woodard-USGS)
W77-11372

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1975.
Geological Survey, Towson, Md. Water Resources Div.
Water-Data Report MD-75-1, June 1976. 311 p, 4 fig, 3 tab, 29 ref.

Descriptors: *Maryland, *Delaware, *Hydrologic data, *Surface waters, *Groundwater, Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for Maryland and Delaware consist of records of stage, discharge, and water quality of streams; stage, and contents of lakes and reservoirs; and water levels and water quality in wells. This report contains discharge records for 107 gaging stations; stage and contents for 1 reservoir; water quality for 41 gaging stations, and 126 wells; and water levels for 28 observation wells. Also included are data for 54 low-flow partial-record stations, 61 crest-stage partial-record stations, and 4 tidal crest-stage partial record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Maryland and Delaware. (Woodard-USGS)
W77-11373

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1976.
Geological Survey, Lawrence, Kans. Water Resources Div.
Water-Data Report KS-76-1, January 1977. 395 p, 8 fig, 5 tab, 32 ref.

Descriptors: *Kansas, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Lakes, Reservoirs, Water wells, Water levels, Chemical analysis, Water analysis, Sampling, Sites.
Identifiers: Annual State report(Kans).

Water resources data for the 1976 water year for Kansas consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells. This report contains discharge records for 148 gaging stations; stage and contents for 20 lakes and reservoirs; water quality for 67 gaging stations and 2 lakes; and water levels for 451 observation wells and water quality for 22 wells. Also included are data for 122 crest-stage partial-record stations and 23 low-flow partial-record stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Kansas. (Woodard-USGS)
W77-11374

FLOWING WELLS IN MICHIGAN 1974,
Geological Survey, Lansing, Mich. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-11375

POTENTIOMETRIC SURFACE OF FLORIDAN AQUIFER MAY 1975, AND CHANGE OF POTENTIOMETRIC SURFACE 1969 TO 1975, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT AND ADJACENT AREAS,
Geological Survey, Tampa, Fla. Water Resources Div.
L. R. Mills, and C. P. Laughlin.
Water-Resources Investigation 76-80 (open-file report), 1976. 1 sheet, 2 ref.

Descriptors: *Aquifers, *Potentiometric level, *Observation wells, *Mapping, *Water level fluctuations, Contours, Hydrogeology.
Identifiers: *Southwest Florida, *Floridan aquifer, Color illustrations.

Maps showing the potentiometric surface of the Floridan aquifer for May 1975, and changes of potentiometric surface from 1964 to 1975 were prepared for areas in southwest Florida. Contours and color codes describe water-level changes. The larger map, scale 1:500,000, reflects the water-level changes from 1969-75. The smaller map shows the changes from January 1964 to May 1969. (Woodard-USGS)
W77-11376

POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT MAY 1976,
Geological Survey, Tallahassee, Fla. Water Resources Div.
J. C. Rosenau, and P. E. Meadows.
Water-Resources Investigation 77-2 (open-file report), 1977. 1 sheet.

Descriptors: *Potentiometric level, *Groundwater, *Water table, *Water well, *Florida, Maps, Observation wells.
Identifiers: *Floridan aquifer, *Florida Panhandle.

This map shows the potentiometric surface of the Floridan aquifer in the Florida Panhandle. Contour intervals of 10 feet show altitude at which water level would have stood in tightly cased wells. Datum is mean sea level. Locations of observation wells also are shown. (Woodard-USGS)
W77-11377

ACTIVITIES OF THE WATER RESOURCES DIVISION OF THE U.S. GEOLOGICAL SURVEY IN THE CARIBBEAN AREA IN 1976,
Geological Survey, San Juan, Puerto Rico. Water Resources Div.
For primary bibliographic entry see Field 9D.
W77-11380

AQUATIC ENVIRONMENTAL QUALITY PROBLEMS AND PROPOSALS,
Fisheries and Marine Service, Ottawa (Ontario). Oceanography Branch.
For primary bibliographic entry see Field 5A.
W77-11421

SURVEILLANCE IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W77-11478

8. ENGINEERING WORKS

8B. Hydraulics

MEAN ENERGY IN GRADUALLY DIVERGI FLOW,
Washington State Univ., Pullman. Dept. of C and Environmental Engineering.
A. F. Babb, and J. Amorocho.
Journal of the Hydraulics Division, Proceeding the American Society of Civil Engineers, Vol No HY5, Proceedings paper No 12097, p 581-5 May 1976. 12 fig, 2 tab, 10 ref. OWRT B-0 CAL(12).

Descriptors: *Energy equation, *Hydrau *Turbulent flow, *Turbulence, Steady flow, flow, Transition flow, Energy losses, Fluid fl Fluid mechanics, Closed conduit flow, Anemo ters.
Identifiers: *Diffusers, *Shear flow, Hot anemometers.

A 6 degree conical diffuser connecting two straight circular pipes was used to determine mean energy characteristics in gradually expa ing air flow. Mean pressures, mean velocities, bulent shear stresses, and longitudinal, transve and circumferential velocity fluctuations measured not only in the diffuser but fo distance of 50 downstream pipe diame downstream from the end of the diffuser detailed analysis of the flow was made using differential and integrated mean energy equati

Particular emphasis was placed on determining the process of uniform flow reestablishment in the downstream pipe. (Bell-Cornell)
W77-10851

WAVE INDUCED OSCILLATIONS IN HARBORS WITH CONNECTED BASINS,
California Inst. of Tech., Pasadena. W.M. Keck Lab. of Hydraulics and Water Resources.
J. J. Lee, and F. Raichlen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 589, Price codes: A07 in paper copy, A01 in microfiche. Report No KH-R-26, August 1971. 148 p, 39 fig, 25 ref, append. DA-22-079-CIVENG-64-11.

Descriptors: *Harbors, *Water waves, *Seiches, Water resources, Estuaries, Resonance.
Identifiers: *Resonance oscillations.

A linear, inviscid theory, termed the coupled basins theory, has been developed to analyze the response to periodic incident waves of an arbitrary shape harbor containing several interconnected basins. The region of consideration is divided into an open-sea region and several inner-basin regions (the number depending on the harbor geometry). The solution in each region is formulated as an integral equation in terms of the normal velocity at the entrance and/or at the common boundaries between regions. An approximate method is used to solve the integral equation by converting it to a matrix equation. The initially unknown boundary condition at the entrance is determined by matching the wave amplitudes and their normal derivatives at the harbor entrance and at all the common boundaries. The solution for the response and the amplitude distribution within the complete harbor can then be obtained. It has been found that the coupled-basins theory gives results which agree well with experiments both for an irregular shape harbor as well as for a harbor composed of two connected circular basins. Various aspects of the response of harbors composed of several types of circular connected basins as well as circular harbors with rectangular entrance channels have been investigated. It is found that to a first approximation the response of a coupled harbor system can be constructed by superposed the response of the individual harbors. Certain aspects of the effect of viscous dissipation on harbor resonance are discussed. Some attention is given to problems of scaling model results to the prototype harbor. (Sinha-OEIS)
W77-10884

NONUNIFORM FLOW IN AGGRADING CHANNELS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
S. P. Soni, R. J. Gerde, and K. G. Ranga Raju.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 103, No WW3, Proceedings Paper 13151, p 321-333, August 1977. 9 fig, 1 tab, 6 ref, 2 append.

Descriptors: *Aggradation, *Alluvial channels, Non-uniform flow, Resistance, River beds, Sediment transport, Sedimentation, Rivers, Hydraulics, Profiles.
Identifiers: *Aggrading channels, Rigid bed channel, Recirculation tilting flume, Transient beds.

The problem of resistance to flow and sediment transport rate under nonuniform flow conditions obtained in aggrading channels was investigated experimentally. Manning's roughness coefficient for the aggrading reach was seen to be generally smaller than its value for uniform flow. The resistance law under nonuniform flow conditions was seen to be the same as for uniform flow, provided the local friction slope is used instead of bed slope in the former case. However, the sediment transport formulas for steady uniform flows cannot be directly applied to the nonuniform flow conditions obtained in aggrading streams. (Lee-ISWS)
W77-10963

STUDIES OF PRESSURE AND ENERGY OF STANDING WAVES,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR).
D. D. Lappo, and N. N. Zagryadskaya.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 103, No WW3, Proceedings Paper 13137, p 335-347, August 1977. 4 fig, 2 tab, 9 ref, 2 append.

Descriptors: *Dispersion, *Energy, *Standing waves, *Pressure, Waves(Water), Walls, Hydraulics, Equations, Mathematical studies, Foreign research, Hydraulic structures, Structures.
Identifiers: *Probability theory, Wave pressure, High standing waves.

In light of prominent needs of practice, great attention in the Soviet Union is concentrated on investigation of standing waves. Numerical values of irregular wave action on a rigid vertical wall are shown not to differ markedly from those of the regular waves, which is supported by field investigation data. Similarly, of great interest is the problem concerning elaboration of more sophisticated methods of computation of regular wave pressure upon a vertical wall. The equations of third-order approximation obtained by the deterministic wave theories are proved to be most suitable for the design purposes. A comparative analysis of calculation values and experimental results was made for 79 wave regimes, data by other researchers being used. The integral and differential energy characteristics of high standing waves were studied in great detail. (Lee-ISWS)
W77-10964

TRANSVERSE MIXING IN PARTIALLY STRATIFIED FLOW,
California Univ., Berkeley. Dept. of Civil Engineering.
S. M. Sumer, and H. B. Fischer.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY6, Proceedings Paper 12989, p 587-600, June 1977. 15 fig, 2 tab, 9 ref, 2 append.

Descriptors: *Density currents, *Dispersion, *Estuaries, *Stratified flow, *Turbulence, Tracers, Mixing, Laboratory tests, Water pollution, Non-uniform flow.
Identifiers: *Density flow, Transverse mixing, Irregular channels, Richardson number.

The results of a laboratory study on the rate of transverse mixing in oscillatory estuary-type flow with density gradients typical of those found in real estuaries were presented. Two sets of experiments were performed: one in a uniform channel with a trapezoidal cross section, and one in a channel with an irregular cross section. It was shown that if the cross section of the channel is uniform and the channel is straight, the transverse mixing coefficient is reduced in approximately the same proportion that the vertical mixing coefficient is reduced. A relationship was developed between the dimensionless transverse mixing coefficient and a Richardson number based on the vertical density difference and the mean velocity. The result of the channel irregularities is to generate local vertical mixing, even though the flow is stratified and mixing is reduced in most of the section. Vertical mixing in one part of the channel cross section induces transverse pressure gradients that drive transverse circulations. The circulations increase the rate of transverse mixing and distribute the effect of the local vertical mixing. (Singh-ISWS)
W77-10965

TWO-DIMENSIONAL SEARCHES FOR HIGH-YIELD WELL SITES,
G. Turk.
Ground Water, Vol. 15, No. 4, p 269-275, July-August 1977. 6 fig, 2 tab, 8 ref.

Descriptors: *Well spacing, *Drilling, *Exploration, Test wells, Costs, Aquifer characteristics, Transmissivity, Optimization, Sampling, Depth, Water yield, Analytical techniques.
Identifiers: *Fibonacci search, Two-dimensional problem, Unimodality, Convexity, Simplex.

In areas where bedrock is irregular, greater saturation thickness of aquifer will associate with the depression in the bedrock formation. Wells located upon the depressions can yield significantly higher amounts of water. Hence, finding the bottom of depression the area will be of interest, and this can be facilitated by drilling test holes. The test holes can be drilled at the nodes of a regular grid; however, more efficient search techniques are available. Fibonacci search in one dimension was proposed recently, and potential saving in drilling cost was demonstrated. But the problem is essentially two-dimensional in nature. This paper described some two-dimensional search procedures and showed that potential saving in drilling cost can be dramatic. (Visocky-ISWS)
W77-10967

FLOW OF SLURRIES IN PIPELINES,
Syracuse Univ., Syracuse, N.Y. Dept. of Chemical Engineering and Materials Science.
R. M. Turian, and T.-F. Yuan.
American Institute of Chemical Engineers Journal, Vol. 23, No. 3, p 232-243, May 1977. 9 fig, 7 tab, 35 ref.

Descriptors: *Slurries, *Flow resistance, *Pipelines, *Head loss, Fluid mechanics, Reynolds number, Density, Laboratory tests, Data, Design criteria, Transportation, Dimensional analysis.
Identifiers: *Materials transport, *Flow regimes, Slurry concentrations, Empirical analysis.

Pressure drop correlations for flow of slurries in pipelines were developed for each of the following four flow regimes: flow with a stationary bed, saltation flow, heterogeneous flow, and homogeneous flow. A total of 2,848 data points, comprised of 1,912 collected from the published literature together with 936 taken using our own test pipelines and relating to ranges of the pertinent variables extensive enough to span all four flow regimes, were used as the basis of the correlations. Also, the data were used in developing an associated quantitative regime delineation scheme. The correlations provide an improved predictive capability over previously available procedures and also are broader in scope. The delineation procedure developed here permits straightforward classification of the data according to the flow regime prevailing, and moreover, it is inclusive of all the data and is self-consistent. (Adams-ISWS)
W77-10970

A UNIVERSAL FORM FOR SHORELINE RUN-UP SPECTRA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-10973

DEVELOPMENT OF BED CONFIGURATIONS IN COARSE SANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
W. R. Costello.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-a000 288, Price codes: A07 in paper copy, A01 in microfiche. Report 74-2, October, 1974. 132 p, 40 fig, 5 tab, 103 ref, 1 append.

Descriptors: *Streambeds, *Coarse sediments, *Flumes, Sediment transport, Sediment load, Sands, Sediments, Waves(Water), Shear stress, Beds, Sand waves.
Identifiers: *Bed configurations, *Flume experiments, Kinematic waves, Transverse bars.

Flume experiments were conducted with five coarse sands of different sizes to investigate the development of bed configurations. For fixed depth and increasing velocity, the bed configurations are no movement, flat bed, ripples, bars, and dunes. For sand sizes coarser than about 0.70 mm, ripples are replaced by a flat bed. By introducing an irregularity on the sediment bed, ripples can be initiated in the no-movement and flat-bed phases. Ripples develop because of the effect of turbulence on the bed in the reattachment zone. The resulting strong instantaneous shear stresses initiate a maximum in sediment transport, which generates a ripple. Bars, a newly defined bed configuration, form because of the merging of kinematic waves of bed height and sediment transport to form a kinematic shock wave. At higher velocities, flow acceleration over the bars is strong enough to affect the bed downstream of reattachment so that a maximum in mean shear stress and sediment transport is established; therefore dune development is initiated. The sequence ripples, bars, and dunes observed in the experiments match those observed in rivers and in the ocean. Sand waves and transverse bars in natural environments are large-scale bars with similar mechanics and occupying the same stability field as the experimental bars reported here. (Lee-ISWS)
W77-10980

GENERAL SCOUR AND FILL ALONG A STREAM REACH,
California Inst. of Tech., Pasadena.
M. G. Foley, and R. P. Sharp.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 771, Price codes: A02 in paper copy, A01 in microfiche. Final Report, June 7, 1976. 4 fig, 1 ref. P-11908-GS, DAHC04-74-G-0189.

Descriptors: *Sediment transport, *Scour, *Reach(Streams), Bed load, Channels, Flumes, Hydraulics, Aggradation, Degradation(Stream), Sedimentation, Beds, Stream erosion, Streambeds.
Identifiers: Bedform amplitude, Bedforms.

A series of field and laboratory experiments showed that bed reworking by moderate floods in uniform reaches of steep, sand-bed ephemeral streams is predominantly by bedform development and migration, not by general scour and fill. In two floods in the field experiment, maximum scour was 24 cm in the first and 66 cm in the second. Bedform amplitudes, estimated using well-established theoretical techniques and measurements of channel parameters, were 28 to 64 cm and 48 to 97 cm, respectively. In the laboratory experiment, maximum general scour and fill, calculated from the difference between measured sediment input and output rates in the flume, was about that of two sand grain diameters and less than 3% of the amplitude of bedforms in the channel. Similar calculations showed that scour and fill data reported in the literature also are compatible with bed reworking by bedforms. (See also W77-00827) (Lee-ISWS)
W77-10982

A PROGRAM FOR THE STABILITY ANALYSIS OF PIPE POISEUILLE FLOW,
Naval Postgraduate School, Monterey, Calif.
R. H. Johnston, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 927, Price codes: A04 in paper copy, A01 in microfiche. Masters thesis, March 1976. 75 p, 3 fig, 5 tab, 1 ref.

Descriptors: *Pipe flow, *Vortices, *Analytical techniques, *Fluid mechanics, *Boundary processes, Reynolds number, Computer programs, Laminar flow, Mathematics, Numerical analysis.
Identifiers: *Poiseuille flow, Finite difference approximation, Vorticity transport equation.

Solutions obtained using the theory and computer program developed by a previous investigator indicated decreasing flow stability with decreasing Reynolds number, a result which is clearly inconsistent with theory and experimental data. This study reported the attempt to isolate sources of error causing incorrect computer solutions for the three-dimensional linearized vorticity transport equation for pipe Poiseuille flow. The problem was analyzed in three phases. The first phase consisted of ensuring accurate expression of the vorticity transport equation in terms of complex velocity vector potential. In the second phase, an extensive examination of the conditions required to satisfy the vorticity transport equation at the singular point on the axis of symmetry of the pipe was made. The third phase entailed establishing a finite difference approximation of the equation and its boundary conditions for adaptation of the problem to a standard form for computer solution. (Singh-ISWS)
W77-10984

HYDRAULIC CHARACTERISTICS OF RETICULAR INLET GRATES,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W77-10990

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT: VOLUME 8, RESERVOIR YIELD,
Hydrologic Engineering Center, Davis, Calif.
A. J. Fredrich.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A007 107, Price codes: A07 in paper copy, A01 in microfiche. Report HEC-IHD-800, January 1975. 131 p, 17 fig, 6 tab, 31 ref, 2 append.

Descriptors: *Hydrologic data, *Water resources development, *Reservoir yield, Reservoir storage, Streamflow, Flow, Streamflow forecasting, Reservoirs, Climatology, Storage, Conservation.
Identifiers: *Hydrologic engineering methods, *Streamflow data, Reservoir losses, Flow demands, Conservation effects, Storage tolerances, Shortage index.

Volume 8 of a 12-volume report described procedures which can be used to determine the relationship between reservoir storage capacity and reservoir yield for a single reservoir. Nonsequential and sequential methods for reservoir yield analysis were described in detail. Other topics included: guidelines for selection of technical procedures; data requirements; use of generalized and simulated data; establishment of study criteria; and development and use of rule curves. Advantages and limitations of the various methods were discussed. A description of the generalized computer program entitled 'Partial Duration-Independent Low Flow Events' was included as an appendix. (See also W77-00169 and W74-11231) (Roberts-ISWS)
W77-10991

WAVE AND CURRENT OPERATED POWER GENERATING DEVICE,
E. D. Kurtzbein.
U.S. Patent No. 4,001,596, 6 p, 8 fig, 19 ref; Official Gazette of the United States Patent Office, Vol 954, No 1, p 430, January 4, 1977.

Descriptors: *Patents, *Waves(Water), Currents(Water), Water wheels, Hydraulic structures, Energy transfer, Electric power production.

A wave and current power generating device employs a pair of parallel longitudinal hull portions having air chambers which can make the device buoyant for easy transport to the working site and forming a water passageway between for driving a water wheel supported on the hull portions. The device also has vertically extendable legs capable of supporting it at the proper level at the working site. Gates at the inlet end of the water passageway control the flow of water. Vanes on the water wheel are adjustable to vary the driving power and speed of the wheel. Water discharge nozzles on projecting portions of the vanes provide boosting power for rotation of the water wheel. A drive connection between the water wheel and generators comprises peripheral gear teeth on the water wheel to be engaged with gears on the shafts of the generators. Brake means regulate the speed of the wheel or stop it. (Sinha-OEIS)
W77-10994

BREAKWATER SYSTEM,
J. Hulsemann.
U.S. Patent No. 4,006,598, 7 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 955, no 2, p 411, February 8, 1977.

Descriptors: *Patents, *Breakwaters, *Engineering structures, *Coastal structures, Waves(Water), Ocean waves, Shore protection, Water control.
Identifiers: False sea floor.

A breakwater system for damping the energy of incoming waves to prevent damage and erosion along a shoreline is comprised of an array of separate, unconnected, rigid, non-buoyant, stationary, disc-shaped, horizontal, space-apart platforms each supported above the natural sea floor by a single, centered, vertical pile. Incoming waves are crested offshore over the breakwater where there is little or no damage caused by the cresting and subsequently formed waves are smaller because of the reduced water depth afforded by the false sea floor of the breakwater. Open spaces are provided in the upper face of the breakwater so that water pressure is equalized thereby minimizing the structural requirements. Because the breakwater is raised off the bottom there is no interference with the normal tidal and other near shore currents. (Sinha-OEIS)
W77-11009

HUMAN INDUCED STRESS ON THE CAUCASIAN COAST OF THE BLACK SEA,
Illinois Univ. at Urbana-Champaign. Dept. of Geography; and Akademiya Nauk Gruzinskoi SSR, Tiflis.
For primary bibliographic entry see Field 4D.
W77-11040

SHORELINE PROTECTION IN JAPAN,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 4D.
W77-11041

OSCILLATIONS IN HARBORS CONTAINING ISLANDS,
University of Southern California, Los Angeles. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-11046

PULSING FLOW IN STEEP ALLUVIAL STREAMS,
Missouri Univ., Columbia. Dept. of Geology.
M. G. Foley, and V. A. Vanoni.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No HY5, Proceedings Paper 13114, p 843-850, August 1977. 5 fig, 2 tab, 9 ref, 2 append. Army DAHCO4-74-G-0189, NSFGK 31802.

Descriptors: *Alluvial channels, *Streams, *Bores, Dunes, Hydraulics, Channel flow, Channels, Sediment transport, Sedimentation, Waves(Water), Laboratory tests.
Identifiers: *Alluvial streams, Bed forms, Pulsing flow, Roll waves, Antidunes, Alluvial-bed channels.

Channel bores observed in laboratory simulated floods in alluvial-bed channels resemble roll waves, but apparently they are related to the existence and quasiperiodic breaking of trains of antidune waves assoicated with antidunes that in the experiments moved downstream. Experiments with rigid-wall and alluvial bank channels, rigid-bed channels, and varied inlet conditions showed that the bores are not artifacts of the apparatus, and in these experiments, bores always occurred in the antidune flow regime in which the antidunes migrated downstream. Release by sequential breaking from the upstream end of water stored in trains of antidune waves over antidunes apparently both initiates and nurtures the bores. Field observations of pulsing flow under comparable flow conditions suggested that the bores are a bona fide natural phenomenon and not a laboratory curiosity. (Lee-ISWS)
W77-11206

MATHEMATICAL MODELING OF SCOUR AND DEPOSITION,
Hydrologic Engineering Center, Davis, Calif.
W. A. Thomas, and A. L. Prasuhn.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 103, No. HY8, Proceedings Paper 13132, p 851-863, August 1977. 7 fig, 2 tab, 9 ref, 2 append.

Descriptors: *Backwater, *Deposition(Sediments), *Mathematical models, Scour, Inland waterways, Reservoirs, Rivers, Sediment transport, Hydraulics, Sedimentation, Streams, Streambeds.
Identifiers: *Sedimentation engineering, Movable streams, Hydraulic sorting, Armor.

Electronic computers are opening up the field of sedimentation engineering by permitting the analysis of problems which heretofore have required too much time and effort. Movable stream bed profiles are being calculated in addition to water surface profiles. The initial gradation of sediment material in the stream bed may be prescribed to facilitate the calculation of an armor layer. The gradation is continually changed by the computer program in response to sediment particles being deposited on the stream bed and material on the stream bed being removed to satisfy transport capacity. Hydraulic sorting of sediment by grain size is accommodated. The stream bed does not have to be represented by a single grain size. Resistance of motion because of armor layer is calculated. (Lee-ISWS)
W77-11207

SED LOAD SAMPLER FOR STREAMS WITH SANDY BED,
Technion-Israel Inst. of Tech. Haifa. Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W77-11208

AN ANALYSIS OF FLOOD LEVEE RELIABILITY,
Princeton Univ., Princeton, N. J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-11224

ASSESSMENT OF THE IMPACT OF WATER IMPOUNDMENT AND DIVERSION STRUCTURES ON VEGETATION IN SOUTHERN ARIZONA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 4A.
W77-11429

8C. Hydraulic Machinery

HYDRAULIC CHARACTERISTICS OF RETICULAR INLET GRATES,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. M. Ragan, T. E. Gingrich, and T. J. Jackson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 158, Price codes: A06 in paper copy, A01 in microfiche. Report No. FHWA-MD-R-76-11, January 1976. 97 p, 59 fig, 15 tab, 9 ref, 1 append. AW-076-168-046.

Descriptors: *Storm drains, *Hydraulics, *Hydraulic models, *Hydraulic similitude, *Flow, Model studies, Sumps, Slopes, Hydraulic structures.
Identifiers: *Reticular inlet grates, *Hydraulic efficiency, Cross slope.

The design and construction of inlet grates are controlled by hydraulic efficiency, resistance to clogging, an ability to safely support motor vehicular traffic, economics, and safety to the bicyclist and the pedestrian. Model experiments showed that the efficiency of the grates was a maximum at the intermediate longitudinal and cross slopes. The efficiency decreased at both flat and steep longitudinal and cross slopes. The reduction in efficiency at the flat slopes is created by a wide width of flow in the gutter approaching and grate. The decrease at the high slopes is caused by the structural members canted perpendicular to the direction of flow in the reticular grates, creating disturbances which in some instances cause splashing out and away from the inlet, thus preventing flow from reaching the inlet. (Singh-ISWS)
W77-10990

WAVE AND CURRENT OPERATED POWER GENERATING DEVICE,
For primary bibliographic entry see Field 8B.
W77-10994

AUTOMATIC CLOSURE VALVE FOR WATER SPRINKLER,
Fujiki Denki Kabushiki Kaisha, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 3F.
W77-10999

BRAKE MEANS FOR AN AIR-POWERED SPRINKLER SYSTEM,
For primary bibliographic entry see Field 3F.
W77-11000

REVERSIBLE SELF-PROPELLED CENTER PIVOT SPRINKLER SYSTEM,
For primary bibliographic entry see Field 3F.
W77-11001

DESIGN AND PERFORMANCE OF A SIMPLE SOLAR PUMP FOR LIFT IRRIGATION PURPOSES,
Societe Francaise d'Etudes Thermiques et d'Energie Solaire, Sofretes (France).
For primary bibliographic entry see Field 3F.
W77-11086

DEVELOPMENT OF A SOLAR PUMP FOR LIFT IRRIGATION PURPOSES,
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Dept. of Solar Energy.
For primary bibliographic entry see Field 3F.
W77-11428

ARIZONA PUMP WATER BUDGETS, 1977. (MARICOPA, PIMA, PINAL, COCHISE AND GREENLEE COUNTIES),
Arizona Univ., Tucson. Coll. of Agriculture.
S. Hathorn, Jr.
Department of Agricultural Economics, May 1977. 270 p, 36 fig, 84 tab, 8 ref, 3 append. (5 reports, one for each country).

Descriptors: *Arizona, *Pumping, *Pumping plants, *Cost analysis, *Cost comparisons, Energy, Water management, Economic efficiency, Electric power, Natural gas, Water costs, Efficiencies.
Identifiers: Pumping lifts.

Separate reports cover topics related to pumping costs in each of five Arizona counties. Topics include costs for various pumping lifts and break-even pumping cost comparisons by energy source (electricity, natural gas, diesel and liquiefied petroleum gas), and efficiency considerations. Three variables that significantly affect pumping cost for acre-foot of water are depth of water, unit cost of energy and overall efficiency of the pumping plant. Increased energy costs since 1973 have caused pumping costs to rise, and some types of energy may not be available in the future because of scarcities and possible curtailments. Information in these reports should aid water management and farm operations involving utilization of pumped water. Budgets for the cost of pumping water have been developed for five major cropping areas in the county, with specifications and investments required for typical wells and the pumping cost under four energy sources. Natural gas is the most economical energy source in terms of pumping costs per acre-foot; the advantage of the lowest cost energy source over each competing source increases with lift. (Jahns-Arizona)
W77-11431

KEEP MAINTENANCE IN MIND WHEN DESIGNING OR USING PUMPS.
For primary bibliographic entry see Field 5D.
W77-11488

8D. Soil Mechanics

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR BURAS, LOUISIANA (NEW ORLEANS TO VENICE, LOUISIANA, HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 8G.
W77-10865

AN ANALYSIS OF FLOOD LEVEE RELIABILITY,
Princeton Univ., Princeton, N. J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-11224

PRELIMINARY STUDY; THE INFLUENCE OF CONSTRUCTION STEP SEQUENCE AND NON-LINEAR MATERIAL BEHAVIOR ON CRACKING OF EARTH AND ROCK-FILL DAMS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Embankment and Foundation Branch.
W. E. Strohm, Jr., and S. J. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 145, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper S-71-10, May 1971. 31 p, 14 fig, 3 tab, 2 ref.

Descriptors: *Dams, *Earth dams, *Rockfill dams, *Model studies, Mathematical models,

Earthworks, Embankments, Cracks, Failure(Mechanics), Structures, Dam construction, Computer models, Computer programs, Analytical techniques, Elasticity(Mechanical), Elastic deformation, Structural behavior, Civil engineering.

The WES-Palmerton finite element computer program was used to make a preliminary study of the effects of construction sequence and nonlinear modulus on cracking in earth dams. Results of the nonlinear analysis were compared with linear elastic one-step analyses with linear elastic construction step analyses, including low tension modulus. Linear elastic, one-step analyses gave the largest tension zone, and no tension zone occurred in the nonlinear analyses. No provisions were included for tensile strength of the soil. (Sims-ISWS)
W77-11240

8F. Concrete

COMPARISON OF 4-1/2-AND 7-IN. (6-IN. NOMINAL) MAXIMUM SIZE AGGREGATE MIXTURES FOR NEW LOCK AND DAM NO. 26, MISSISSIPPI RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Concrete Lab.
W. O. Tynes.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A023 968, Price codes: A02 in paper copy, A01 in microfiche. Miscellaneous Paper C-76-1, April 1976. 17 p, 4 tab, 1 ref.

Descriptors: *Concretes, *Aggregates, *Dams, *Mississippi River, Coarse aggregates, Construction materials, Concrete testing, Concrete mixes, Concrete additives, Pozzolans, Fly ash, Air entrainment, Concrete technology, Testing, Laboratory tests, Strength, Compressive strength, Strength of materials.
Identifiers: *Lock and Dam No. 26(Mississippi River).

Three sets of concrete mixtures were proportioned with each of the three water-cement (W/C) ratios: 0.5, 0.7, and 0.8 by weight of cement plus pozzolan. Each set consisted of two mixtures, one containing 4-1/2-in. and the other one 7-in (6-in. nominal) maximum size aggregate (MSA). The slump of each mixture was 1-1/2 + or - 1/2 in, and the air content was 5.0 + or - 1% on the minus 1-1/2-in portion of the mixtures. Two batches of concrete were made for each mixture with a 0.7 and 0.8 W/C ratio, and one batch was made for each mixture with a 0.5 W/C ratio by weight. Six- by twelve-in cylindrical specimens were cast and tested for strength at 28, 90, and 365 days age, and block specimens 3 by 3 by 1.5 ft were made to compare workability. The results indicated that there are no significant differences in compressive strength of concrete containing 4-1/2- and 7-in MSA when the tests are made on concrete of equal W/C ratio after the aggregate larger than the 1-1/2-in sieve had been removed. The 4-1/2-in MSA concrete mixtures on the average required 7.33 lb more portland cement and 3 lb more fly ash than the 7-in MSA concrete. The time required to consolidate the 4-1/2-in MSA concrete in the 3- by 3- by 1.5-ft container was about 70 sec as compared with 155 sec for the concrete containing 7-in MSA. (Sims-ISWS)
W77-10978

8G. Materials

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR BURAS, LOUISIANA (NEW ORLEANS TO VENICE, LOUISIANA, HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, La. Water Resources Div.
H. L. Leone, Jr.
Open-file report 77-310, April 1977. 14 p, 1 fig, 1 plate, 5 tab, 8 ref.

Descriptors: *Flood control, *Baseline studies, *Environmental effects, *Levees, *Water analysis, Sediments, Cores, Sampling, Chemical analysis, Nutrients, Metals, Pesticides, Data collections, Flood protection, Hurricanes.
Identifiers: *Buras area(La).

Eight core-material-sampling sites were chosen by the U.S. Army Corps of Engineers as possible borrow areas for fill material to be used in levee contruction near Buras, La. Eleven receiving-water sites also were selected to represent the water that will contact the porposed levees. Analyses of selected nutrients, metals, pesticides, and other organic constitutents were performed upon these bed-material and native-water samples as well as upon elutriate samples of specific core material-receiving water systems. The results of these analyses are presented without interpretation. (Woodard-USGS)
W77-10865

ACOUSTIC METHOD FOR DETECTING LEAKS FROM SUBMERGED PIPELINES,
Exxon Production Research Co., Houston, Tex. (Assignee).
For primary bibliographic entry see Field 5G.
W77-10995

SEALING MATERIAL FOR PREVENTING WATER-LEAKAGE AND METHOD OF MANUFACTURING SAME,
Toray Industries, Inc., Tokyo (Japan). (Assignee).
Y. Kosaka, M. Kounosu, and M. Kondo.
U.S. Patent No. 4,007,152, 7 p, 4 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 955, No 2, p 591, February 8, 1977.

Descriptors: *Patents, *Sealants, *Leakage, *Seepage, Polymers, Organic compounds, Water conservation, Watertight.
Identifiers: Melt shaping.

A sealing material is used for the prevention of water-leakage, for example, in joints of building or construction materals , U-shaped concrete water supply or drain ditches, Hume water supply or drain concrete pipes and cast steel water supply and drain pipes. A sealing material which can be advantageously produced by a melt-shaping procedure and which possesses a degree of swelling with water of 50 to 300% by weight is disclosed. It consists essentially of: (1) at lease one polymer selected from the group consisting of a water-insoluble partially saponified polyvinyl alcohol, a water-insoluble ethylenically unsaturated compound-copolymerized polyvinyl alcohol and a water-insoluble polyvinyl alcohol at least partially cross-linked with novolak resin, and (2) a plasticizer in an amount of 5 to 100 parts by weight based on 100 parts by weight of the polymer. (Sinha-OEIS)
W77-11015

PROCESS FOR SCALE INHIBITION,
Nalco Chemical Co., Oak Brook, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W77-11021

PRELIMINARY STUDY; THE INFLUENCE OF CONSTRUCTION STEP SEQUENCE AND NONLINEAR MATERIAL BEHAVIOR ON CRACKING OF EARTH AND ROCK-FILL DAMS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Embankment and Foundation Branch.
For primary bibliographic entry see Field 8D.
W77-11240

HYDROGEN PEROXIDE CONTROLS ODOR, CORROSION IN COLLECTION SYSTEMS,
Corpus Christi Dept. of Public Utilities, Tex.
For primary bibliographic entry see Field 5D.
W77-11487

SEWER MAINTENANCE AND REHABILITATION.
For primary bibliographic entry see Field 5D.
W77-11499

COLLECTION SYSTEMS.
For primary bibliographic entry see Field 5D.
W77-11500

8I. Fisheries Engineering

SURVEY OF FISH IMPINGEMENT AT POWER PLANTS IN THE UNITED STATES, VOLUME I. THE GREAT LAKES,
Argonne National Lab., Ill. Div.of Environmental Impact Studies.
R. K. Sharma, and R. F. Freeman, III.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/ES-56, Vol. I., Price codes: A10 in paper copy, A01 in microfiche. Report ANL/ES-56, Vol. I, March 1977, 218 p, 116 fig, 37 tab, 33 ref. W-31-109-Eng-38.

Descriptors: *Surveys, *Monitoring, Fish, Power-plants, *Great Lakes.
Identifiers: *Impingement(Fish).

The report covers 20 power plants located on the Great Lakes. Site characterisitcs, plant description, intake design and operation, inpingement sampling, data availability, and design and operational features to minimize fish impingement are described for each of the plants. An impingement-data summary for each plant is presented in a summary table and in a yearly histogram format in each report. Information is not presented in a standardized format because the fish-impingement monitoring program and availability of related information varied widely. No conclusions are drawn from the information presented. Interplant comparisons of fish-impingement data within and among various ecosystems are presented in Vol IV of this series. (See also W77-11126 and W77-11127) (Chilton-ORNL)
W77-11125

SURVEY OF FISH IMPINGEMENT AT POWER PLANTS IN THE UNITED STATES, VOLUME II. INLAND WATERS,
Argonne National Lab., Ill. Div. of Environmental Impact Studies.
R. F. Freeman, III, and R. K. Sharma.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/ES-56, Vol. II, Price codes: A14 in paper copy, A01 in microfiche. Report ANL/ES-56, Vol. II, March 1977, 328 p, 168 fig, 68 tab, 97 ref. W-31-109-Eng-38.

Descriptors: *Surveys, *Monitoring, Fish, Power-plants, *Inland waterways.
Identifiers: *Impingement(Fish).

The report covers 33 power plants located on inland waters other than the Great Lakes. Site characteristics, plant description, intake design and operation, impingement sampling, data availability, and design and operational features to minimize fish impingement are described for each of the plants. An impingement-data summary for each plant is presented in a summary table and in a yearly histogram format in each report. Information is not presented in a standardized format because the fish-impingement monitoring program and availability of related information varied widely. No conclusions are drawn from the informatio

presented. Interplant comparisons of fish-impingement data within and among various ecosystems are presented in Vol. IV of this series. (See also W77-11125 and W77-11127) (Chilton-ORNL)
W77-11126

SURVEY OF FISH IMPINGEMENT AT POWER PLANTS IN THE UNITED STATES, VOLUME III. ESTUARIES AND COASTAL WATERS,
Argonne National Lab., Ill. Div. of Environmental Impact Studies.
R. C. Stupka, and R. K. Sharma.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/ES-56, Vol. III, Price codes: A14 in paper copy, A01 in microfiche. Report ANL/ES-56, Vol. III, March 1977, 310 p, 166 fig, 50 tab, 87 ref.

Descriptors: *Surveys, *Monitoring, Fish, Powerplants, *Estuaries, *Coasts.
Identifiers: Impingement(Fish).

The report covers 32 power plants located on estuaries and coastal waters. Site characteristics, plant description, intake design and operation, impingement sampling, data availability, and design and operational features to minimize fish impingement are described for each of the plants. An impingement-data summary for each plant is presented in a summary table and in a yearly histogram format in each report. Information is not presented in a standardized format because the fish-impingement monitoring program and availability of related information varied widely. No conclusions are drawn from the information presented. Interplant comparisons of fish-impingement data within and among various ecosystems are presented in Vol. IV of this series. (See also W77-11125 and W77-11126) (Chilton-ORNL)
W77-11127

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

SUMMARY STATEMENTS OF WATER RESOURCES INVESTIGATIONS 1976-77,
Geological Survey, Tallahassee, Fla. Water Resources Div.
Florida District report, January 1977. 119 p.

Descriptors: *Water resources, *Investigations, *Programs, *Projects, *Florida, Data collections, Water supply, Water quality, Water pollution sources, Surface waters, Groundwater resources, Aquifer characteristics, Flood control, Urban hydrology, Water utilization, Saline water intrusion, Cooperatives, Federal Government, State government.
Identifiers: Local cooperating agencies.

This report contains summary statements for cooperative water resources investigations in Florida during 1976-77. These investigations are by the Water Resources Division of the U.S. Geological Survey in cooperation with State, Federal and local agencies are part of the Federal program of appraising the nation's water resources. In Florida, water resources appraisals are highly diversified, ranging from hydrologic records networks to interpretative appraisals of water resources and applied research to develop investigative techniques. The interpretative reports, maps, diagrams, and records that are products of the investigations are a principal hydrologic foundation upon which the plans and development of Florida's water resources may be based. Preceding the summaries is a list of agencies which cooperated in the statewide water resources program; a map showing location of areal investigations; a list classifying investigations by topics; and a numerical list of investigations. (Woodard-USGS)
W77-10863

9D. Grants, Contracts, and Research Act Allotments

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, D.C.
1975, 197 p, append.

Descriptors: *Research and development, On-site investigations, Analytical techniques, *Model studies, *Resources development, *Projects, *Technology, *Water resources development, Groundwater recharge, Water supply development, Irrigation efficiency, Drainage practices, Salts, Fertility, Energy, Biological control, Land treatment, Animal wastes, Pesticides, Nutrient removal, Sedimentation rates, Sediment control, Stream stabilization, Erosion control, Wind erosion, Soil management, Reclamation, Revegetation, Runoff forecasting, Remote sensing, Water control.
Identifiers: Soil decontamination, Pesticide control.

An overview is presented of recent research aimed at development of cultural practices and cropping systems that assure efficient use of soil, water and air resources while providing adequate protection for sustained use. The topical areas covered include: recharging groundwater; increasing and conserving water supplies; efficient irrigation and water use; improved drainage systems; reduction of salt damage; maintenance of soil fertility; methods to make beneficial changes in energy use in the soil-plant-atmosphere continum; biochemical control over plants' nutritional quality; movement of minerals in the food chain; land recycling of wastes; managment of animal wastes; control of pesticides; plant protection from air pollutants; techniques for decontamination of polluted soils; control of fertilizer pollution; prediction of sediment quantities and sources in watersheds; control of reservoir sedimentation; water erosion control and stream stabilization; wind erosion control; improved tillage and soil structure; reclamation and revegetation; predicting runoff and streamflow from agricultural watersheds; remote sensing for animal improvement, crop conditions, insect infestations, and soil-water-plant conditions; and improved structures for water control and measurement. The research highlights are identified by location, and a map of research locations and a list of addresses are included to help readers obtain additional information. (Nessa-NC)
W77-10917

STATUS OF PROJECTS IN MINNESOTA, FISCAL YEARS 1976 AND 77.
Geological Survey, St. Paul, Minn. Water Resources Div.
Minnesota District report, September 1976. 36 p, 5 fig.

Descriptors: *Water resources, *Projects, *Minnesota, *Data collections, Surface waters, Groundwater, Water yield, Water quality, Water utilization, Flood plains, Bridge construction, Sediment transport, Mining, Environmental effects, Land resources, Tunneling, Highways, Irrigation, Water resources development.

This report outlines the status of water resources projects in progress in Minnesota at the close of the 1976 fiscal year, and ongoing activities during the 1977 fiscal year by the Minnesota District, Water Resources Division, U.S. Geological Survey. (Woodard-USGS)
W77-11367

ACTIVITIES OF THE WATER RESOURCES DIVISION OF THE U.S. GEOLOGICAL SURVEY IN THE CARIBBEAN AREA IN 1976,
Geological Survey, San Juan, Puerto Rico. Water Resources Div.
E. D. Cobb.
Open-file report, 1977. 35 p 6 fig, 4 tab, 15 ref.

Descriptors: *Puerto Rico, *Virgin Islands, *Water resources, *Projects, *Reviews, Streamflow, Groundwater resources, Water quality, Sediment transport, Surface waters, Flood profiles, Mapping, Evaluation, Project planning, Publications.
Identifiers: *Annual activities.

The program of the Caribbean District, Water Resources Division, of the U.S. Geological Survey during 1976 included the collection of streamflow, ground-water, water-quality and sediment records, flood mapping, studies in lakes and lagoons, water resources studies, ground-water modeling and appraisals, ground-water recharge studies, and special water-quality studies. The progress made on 24 different projects is briefly reviewed. Fourteen reports were published during the year. Future data needs include a continued need for basic water data, flood studies, streamflow data analysis, sediment studies, reservoir and lagoon studies, and additional water-resources studies. Items relative to cooperation, study reports and other related items also are discussed. (Woodard-USGS)
W77-11380

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

SYSTEMS ANALYSIS, (LITERATURE REVIEW),
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 06A.
W77-10832

OIL SPILL AND OIL POLLUTION REPORTS, FEBRUARY 1975 - APRIL 1975,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 05G.
W77-10891

STRIP MINING (CITATIONS FROM THE NTIS DATA BASE).
National Technical Information Service, Springfield, Va.
For primary bibliographic entry see Field 05G.
W77-10939

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 10, NUMBER 23
DECEMBER 1, 1977

W77-11501 -- W77-12250
CODEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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Some documents abstracted in this journal can be purchased from NTIS. Price codes are given in the entries and a current code-price conversion table is attached to the outside back cover. Other documents are available from originating organizations or authors as indicated in the citation.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 23
DECEMBER 1, 1977

W77-11501 -- W77-12250

e Secretary of the U.S. Department of the Interior has de-
mined that the publication of this periodical is necessary in the
nsaction of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
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ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

A STOCHASTIC MODEL FOR THE SIMULATION OF DAILY FLOWS,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 2E.
W77-11603

THE MONTE CARLO APPROACH TO OPTIMIZATION OF THE OPERATION RULES FOR A SYSTEM OF STORAGE RESERVOIRS,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-11604

CONNECTIONS BETWEEN CLIMATE AND DESERTIFICATION,
Toronto Univ. (Ontario). Inst. for Environmental Studies.
For primary bibliographic entry see Field 2B.
W77-11629

EXPERIMENTAL EVALUATION OF A CROP CLIMATE SIMULATION MODEL FOR INDIAN CORN (ZEA MAYS L.),
Agricultural Univ., Wageningen (Netherlands). Dept. of Physics and Meteorology.
For primary bibliographic entry see Field 3F.
W77-11631

OPTIMAL PREDICTION OF PONDING,
Agricultural Research Service, Fort Collins, Colorado.
For primary bibliographic entry see Field 2G.
W77-11798

THE INTEGRATED HYDROLOGICAL CATCHMENT MODEL EGMO,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
A. Becker.
Hydrological Sciences Bulletin, Vol 22, No 1, p 145-151, March 1977. 3 fig, 4 ref.

Descriptors: *Hydrologic data, *Model studies, *Watersheds(Basins), Flow, Structure, Programs, Storms, Mountains, Overland flow, Storm runoff, Base flow, Foreign countries, Foreign research.
Identifiers: *Catchment models, *Flow components, Hypodermic flow, Impervious areas.

It has proven reasonable to consider 3 runoff components for the complex modelling of runoff in basins, especially in the mountainous areas of the German Democratic Republic. The 3 components are: a quick response component, considered as overland flow occurring only during intense storm rainfall or snowmelt; a delayed response direct runoff component; and a gradually varying component, considered as baseflow mainly fed by the groundwater systems of the basin and representing the stable component of river flow during dry periods. The consideration of the 3 components required three corresponding runoff levels: the surface overland and channel flow system; the soil horizons of higher hydraulic conductivity; and the groundwater system aquifers. A short description was given of the structure of the integrated catchment model EGMO, the flow components considered, the basic principles of the sub-models, and the procedure of the main program. (Roberts-ISWS)
W77-11815

ESTIMATION OF PARAMETERS OF A UNIFORMLY NONLINEAR SURFACE RUNOFF MODEL,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W77-11985

EFFECT OF RAINFALL-EXCESS DETERMINATION ON RUNOFF COMPUTATION,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2B.
W77-11986

DIGITAL SIMULATION OF A DRAINAGE BASIN,
Madras Univ., Guindy (India). Dept. of Hydraulics and Water Resources.
V. C. Kulandaiswamy, and T. B. Rao.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 443-454, 1974. 6 fig, 1 tab, 18 ref.

Descriptors: *Watersheds(Basins), *Model studies, *Mathematical models, *Storm runoff, Hydrology, Hydrographs, Runoff, Surface runoff, Computer models, Hydrologic systems, Equations, Analytical techniques, Precipitation(Atmospheric), Base flow, Hydrograph analysis, Hydrologic aspects, Rainfall.
Identifiers: *Beech River(Tenn).

The drainage basin was treated as a hydrological system that converts rainfall into abstractions and surface runoff. The basin system was represented by a nonlinear mathematical model and was simulated on a digital computer. The model makes use of the methods developed in earlier studies for predicting abstractions and the system parameters. Given precipitation data, antecedent conditions, and certain basin parameters for baseflow and surface runoff, the mathematical model helps to predict the resulting runoff from the basin. The model was applied to a number of basins. The details of the basins and the number of storms analyzed in each basin were given, and the results obtained for Beech River, Tennessee, were presented. The proposed model reproduced the observed runoff hydrographs fairly satisfactorily and lends itself to application for flood studies from actual basins. (See also W77-06708) (Humphreys-ISWS)
W77-12082

LINEAR AND NONLINEAR MODELS FOR PEAK FLOW FORECASTING,
Slovenska Akademie Vied, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 4A.
W77-12083

DESIGNING CONCEPTUAL CATCHMENT MODELS FOR AUTOMATIC FITTING METHODS,
Ministry of Works, Wellington (New Zealand).
R. P. Ibbitt, and T. O'Donnell.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 461-475, 1974. 10 fig, 13 ref.

Descriptors: *Watersheds(Basins), *Model studies, *Mathematical models, Precipitation(Atmospheric), Storage, Surface waters, Groundwater, Groundwater storage, Soil moisture, Runoff, Infiltration, Discharge(Water), Evaporation, Evapotranspiration, Hydrology.
Identifiers: *Watershed models, Fitting methods.

Problems arise when optimum parameter values for a catchment model are sought with the aid of automatic optimization techniques. Some of the problems are inherent to the techniques themselves, others to the particular nature of catchment models. The several problems were examined, their causes were explained, and, where possible, recommendations for their solution (or avoidance) were made. (See also W77-06708) (Sims-ISWS)
W77-12084

A SWAMPLAND MODEL,
Ministerio do Interior, Rio de Janeiro (Brazil). Departmento Nacional de Obras de Saneamento.
For primary bibliographic entry see Field 2E.
W77-12085

DETERMINATION OF INSTANTANEOUS UNIT HYDROGRAPHS BY LEAST SQUARES POLYNOMIALS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-12086

PROBLEMS OF APPLYING THE CONCEPTUAL MODEL DEVELOPED FOR THE FLAT CATCHMENTS OF HUNGARY,
Research Inst. for Water Resources Development, Budapest (Hungary).
G. Kienitz.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 504-510, 1974. 2 fig, 4 ref.

Descriptors: *Watersheds(Basins), *Runoff, *Model studies, Precipitation(Atmospheric), Rainfall, Precipitation excess, Water balance, Mathematical models, Computer models, Storage, Simulation analysis, Depression storage, Hydrology.
Identifiers: *Hungary.

A conceptual model was described for simulating runoff phenomena in flat catchments where processes are governed totally by man-made structures. The model was tried with cases observed in experimental watersheds, and the model was found to describe well the character of the processes. In order to render the model available for practical use in planning and forecasting, methods were sought to determine in given cases the involved parameters described by certain physical characteristics. Physical hydrological experimentations therefore were carried out concerning the parameters. Greatest progress was made in connection with determining the amounts of excess precipitation which concentrate in depressions and thus provide the supply of water feeding the canal system. The purpose of the paper was to demonstrate the lines of present investigations and their results so far. (See also W77-06708) (Sims-ISWS)
W77-12087

REPRESENTATION OF A CATCHMENT BY A NETWORK OF RESERVOIRS,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
S. Chander.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 527-539, 1974. 15 fig, 1 tab, 8 ref.

Descriptors: *Watersheds(Basins), *Runoff, *Model studies, Mathematical models, Storage, Inflow, Foreign countries, Discharge(Water), Foreign research, Networks, Reservoirs, Computer models, Hydrographs, Simulation analysis, Precipitation(Atmospheric), Rainfall, Hydrology.

Identifiers: *Harlow(England).

A reservoir attenuates and delays the peak of an inlet hydrograph - a property similar to that of a catchment, the difference being that the attenuation and delay are larger in magnitude for a catchment than those for a corresponding reservoir, given the same recession curve. In this paper, a network of reservoirs was evolved which exhibited the properties of a catchment in that the peak was attenuated and was delayed in time, and the recession side of the hydrograph was repeated for different inputs. A mathematical model based on the above physical concept was derived for the Cannon Brook catchment at Harlow (England). The parameters of the model were computed from a random input-output even on the catchment and then they were used for calculating the outputs for other events. It was shown in conclusion that the observed hydrographs can be predicted by the model with a remarkable accuracy. (See also W77-06708) (Sims-ISWS)
W77-12088

A MULTIPLE INPUT SYSTEM MODEL FOR THE HYDROLOGICAL BASIN,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
S. Ramaseshan, and R. S. Anant.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 540-547, 1974. 4 fig, 3 tab, 11 ref.

Descriptors: *Watersheds(Basins), *Model studies, *Surface runoff, *Mathematical models, Hydrologic aspects, Hydrographs, Computer models, Hydrology, Precipitation(Atmospheric), Floods, Data processes, Analytical techniques, Hydrologic systems.

The effective rainfall-direct surface runoff process was represented by a multiple input system model. Such a model can use the available spatially sampled data of precipitation with fewer approximations and no interpolation in comparison to lumped and distributed parameter models. The components are non-interacting and are represented by Nash models. The parameters of the system were estimated by the principle of least squares using the steepest gradient technique. A linear model with parameters estimated as the geometric mean of calculated values seems to be a satisfactory representation of the system. The model also facilitates a parametric approach to station weights. The suggested model can be improved by considering interacting components. (See also W77-06708) (Humphreys-ISWS)
W77-12089

RAINFALL-DISCHARGE TRANSFORMATION MODELS MAY BE DIVIDED INTO TWO CATAGORIES (LES MODELES DETERMINISTES DE TRANSFORMATION DES PRECIPITATIONS EN DEBIT),
Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).
J. M. Dujardin, and P. Jouhet.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 558-569, 1974. 4 fig.

Descriptors: *Watershed(Basins), *Model studies, *Floods, *Mathematical models, Surface runoff, Flood forecasting, Base flow, Infiltration, Evaporation, Hydrological aspects, Hydrology, Rainfall-runoff relationships, Water balance, Storage, Precipitation(Atmospheric), Rainfall, Equations, Analytical techniques, Hydrographs.

Rainfall-discharge transformation models may be divided into two categories. Overland runoff models, in which attention is given only to the runoff phase of meteorology water, so that a rational storm/flood equation may be extracted. Both infiltration and evaporation are considered as losses, and the losses are allowed for in aggregate by application of a subtractive parameter or a runoff coefficient The Previk model, belonging to the overland runoff category, includes a production function (calculation of net supply rainfall) and a modulation function (calculation of discharge). The overland runoff type of model is adequate for flood study and forecasting. When hydraulic balance models are used, an attempt is made to reproduce the real physical balance of hydraulic exchanges and the underground paths followed by water. A water balance is compiled in an orthodox manner by outlining the transfer of water from one level to another in the matrix. The Bilik model, which falls within the hydraulic balance category, may be operated using data which are generally accepible and which include a reasonable number of parameters, facilitating its adjustment. The model is suitable for reproducing river behavior throughout the hydrological cycle and for studying seasonal variations and water resource problems. (See also W77-06708) (Humphreys-ISWS)
W77-12090

THE MODEL OF THE WATER BALANCE AND NUTRIENT UPTAKE AS A BASIS FOR HYDROLOGICAL, AGRO-HYDROLOGICAL AND OTHER PROJECTS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
W. C. Visser.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 580-597, 1974. 9 fig, 15 ref.

Descriptors: *Mathematical models, *Water balance, *Plant growth, *Model studies, Discharge(Water), Streamflow, Evaporation, Rainfall, Infiltration, Growth stages, Growth rates, Nutrient requirements, Soil moisture, Withdrawal, Groundwater, Analytical techniques, Hydrology, Equations.
Identifiers: Agro-hydrological models.

Hydrological science can be summarized in hydrological and agro-hydrological models. The hydrological model can be based best on the water balance, which is a consequence of the law of conservation of matter. The agro-hydrological model is based on the diffusion equation, which leads to the law of limiting factors. The importance of the models is that the underlying principles are accepted generally. Further, a wide range of processes can be described by the two physical relations. The model can be used to check new scientific results for processes participating in the water balance or in plant growth. The model also can result in indications for practical design, and it may result in a description of capillarity or evaporation. But also, the model may result in an indication to carry out sprinkling irrigation. The models both for the water balance and for plant growth were discussed, and the state of affairs with respect to the least developed part of the adjustment technique was explained. (See also W77-06708) (Humphreys-ISWS)
W77-12091

CONVECTIVE STORM FIELD SIMULATION FOR DISTRIBUTED CATCHMENT MODELS,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-12092

A MULTI-LAYER MODEL FOR GRAVITY DRAINAGE OF UNSATURATED SOIL,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 2F.
W77-12093

BEHAVIOUR AND PHYSICAL STABILITY OF SHEETFLOW IN SURFACE RUNOFF MODELS,
Prague Agricultural Univ. (Czechoslavakia). Dept. of Water Resources.
For primary bibliographic entry see Field 2E.
W77-12094

A MATHEMATICAL MODEL FOR FLOOD WAVE SIMULATION USING SYNTHETIC RAINFALL DATA FOR A VAST WATERSHED,
Institute for Water Resources, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2E.
W77-12095

NATURAL CATCHMENT REPRESENTATION BY A SERIES MODEL OF LINEAR CHANNELS-PART 1,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
B. S. Mathur.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 634-642, 1974. 4 fig, 7 ref.

Descriptors: *Watersheds(Basins), *Channels, *Model studies, Mathematical models, Precipitation(Atmospheric), Rainfall, Runoff, Discharge(Water), Floods, Flood peak, Surface runoff, Surface drainage, Hydrology.
Identifiers: Linear channels.

In this paper, a natural catchment was represented conceptually by a set of linear channels arranged in series. The translational action of the catchment was discussed in the light of the inherent properties of linear channels. But storage effects were explained through a distributive input scheme for various sub-watersheds which are functionally related to linear channels. An analytical approach was discussed for getting the sub-watersheds through a time invariant catchment distribution. In Part 2 of the paper, the author successfully applied the conceptual model theory to a natural catchment for analyzing uneven spatial distribution of rainfall and resulting runoff. (See also W77-12097 and W77-06708) (Sims-ISWS)
W77-12096

NATURAL CATCHMENT REPRESENTATION BY A SERIES MODEL OF LINEAR CHANNELS-PART 2,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
B. S. Mathur.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 643-656, 1974. 9 fig, 2 tab, 4 ref.

Descriptors: *Watersheds(Basins), *Channels, *Hydrographs, *Model studies, Mathematical models, Precipitation(Atmospheric), Rainfall, Runoff, Surface runoff, Unit hydrographs, Floods, Surface drainage, Hydrologic data, Hydrology.
Identifiers: Linear channels.

Various procedural steps involved in the application of a conceptual series model of linear channels to a natural test catchment were discussed in detail. The steps include: distribution of catchment area into arranged groups of sub-watershed areas termed as 'mean delay-time areas', representation of the 'areas' through a series arrangement of linear channels, analysis of rainfall for obtaining time distribution of weighted effective precipitation, and lastly, evolution of a genetic runoff scheme utilizing the physiographical and meteorological details. The computed runoff

hydrographs were compared with the measured hydrograph at the gage and computed from traditional unit graph approaches to prove the effectiveness of the suggested technique in dealing with unevenness of spatially distributed rainfall. (See also W77-12096 and W06708) (Sims-ISWS)
W77-12097

A NEW METHOD OF COMPUTATION OF THE SUSPENDED SEDIMENT LOAD,
Freiburg Univ. (West Germany). Geographisches Institut.
For primary bibliographic entry see Field 2J.
W77-12098

A DETERMINATE MODEL FOR RUNOFF AS A NONLINEAR SYSTEM,
Gatehouse Farm, Essex (England).
For primary bibliographic entry see Field 2E.
W77-12099

PHYSICO-STATISTICAL MODEL OF RAINFALL FLOOD FORMATION AND DETERMINATION OF ITS PARAMETERS,
Hydrometeorological Service of the USSR, Moscow.
V. I. Koren, and L. S. Kuchment.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 688-693, 1974. 1 fig, 5 ref.

Descriptors: *Small watersheds, *Model studies, *Runoff, *Hydrograph analysis, Watersheds(Basins), Statistical models, Mathematical models, Theoretical analysis, Hydrographs, Surface runoff, Hydrology, Meteorology, Hydrologic aspects, Analytical techniques, Foreign research, Foreign countries, Equations, Water yield, Evaporation, Infiltration.
Identifiers: *USSR.

Transfer from the rainfall model on an elementary plot to the model describing the rainfall runoff formation in the catchment was achieved by theoretical probability averaging. An optimization method was applied to determine the model parameters. The model was tested on the observed data of a few small catchments. (See also W77-06708) (Humphreys-ISWS)
W77-12100

MATHEMATICAL MODEL OF SPRING RUNOFF FORMATION,
Hydrometeorological Service of the USSR, Moscow.
A. P. Zhidikov, A. G. Levin, N. S. Nechaeva, and T. G. Popov.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 694-700, 1974. 5 ref.

Descriptors: *Mathematical models, *Snowmelt, Runoff, *Watersheds(Basins), Model studies, Mathematical studies, Equations, Analytical techniques, Water sources, Hydrograph analysis, Foreign research, Foreign countries, Hydrology, Meteorology, Water balance, Snowpacks, Water storage, Water yield.
Identifiers: *USSR.

Electronic computing techniques and use of appropriate mathematical models made it possible to improve methods of flow forecasting by snowmelt calculation. The general principles and assumptions of the models are: (1) The river basin is regarded as a certain dynamic system with lumped parameters which is affected by the inflow of melt water and the response of which is the hydrograph at the river outlet. (2) The nonuniformity in space of the distribution of water storage in the snow pack, of snowmelt intensity and water yield from snow, of absorption of water by soil, of the capacity of closed concaves, of snowmelt runoff temporary control and of the rate of snowmelt down slopes and in the river network may be treated by statistical methods (e.g. distribution curves). (3) Snowmelt intensity, water yield from the snow pack, absorption of melt water and its accumulation on the basin surface, and inflow of water to the primary hydrograph network are considered as functions of time. (4) Equations for determining the components of the water balance and for describing the major processes of hydrograph formation have been obtained from theoretical premises and general concepts resulting from an analysis of empirical data and schematization of certain processes. The parameters of the equations are calculated or selected by taking into account the water catchment features. (5) The water balance components are calculated separately for open and forested parts of the basin. (6) The standard observations of snow cover, air temperature, precipitation, cloudiness and wind have been used as the original data for hydrograph calculation. (7) Precipitation falling during the snowmelt period is considered to be liquid. The model was evaluated by considering the degree of coincidence of calculated and actual flood hydrographs. (See also W77-06708) (Humphreys-ISWS)
W77-12101

MATHEMATICAL MODEL OF THE HYDROMETEOROLOGICAL REGIME FORMATION OF A RIVER BASIN,
Gosudarstvennyi Gidrologicheskii Institut, Moscow (USSR).
V. G. Andreyanov, and V. I. Babkin.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 736-742, 1974. 1 fig, 8 ref.

Descriptors: *Small watersheds, *Mathematical models, *Meteorology, *Runoff, Watersheds(Basins), River basins, Model studies, Snow, Water balance, Precipitation(Atmospheric), Forecasting, Evaporation, Soil moisture, Lakes, Water storage, Base flow, Surface runoff, Foreign research, Foreign countries, Analytical techniques, Heat balance.
Identifiers: *USSR.

The report dealt with a proposed mathematical model of the formation of the hydrometeorological regime of a river basin. The model consists of a system of equations of water and heat balances and interrelations between the elements of the balances and between the determining factors. The model was compiled relative to the conditions of a small watershed of the Valdai Hydrological Laboratory, located in a very wet zone. The application of the model contributes to the precision of the balances computation, and, at the given precipitation and radiation balance, it allows the forecast of the remaining elements of water and heat balances to be made. The construction of a mathematical model was outlined for river basins of other physiographic areas, as well as the transposition of the developed methods over river basins with a reduced amount of hydrometeorological observations. (See also W77-06708) (Humphreys-ISWS)
W77-12102

MATHEMATICAL MODELLING OF THE FORMATION OF RIVER RUNOFF IN MOUNTAIN DRAINAGE BASINS,
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
L. N. Borovikova, and Yu. M. Denisov.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 743-750, 1974. 5 fig.

Descriptors: *Watersheds(Basins), *Hydrograph analysis, *Mathematical models, *Runoff, Model studies, Meltwater, Snow, Meteorology, Precipitation(Atmospheric), Rain water, Rainfall, Surface runoff, River basins, Mountains, Analytical techniques, Mathematical studies, Foreign research, Foreign countries, Hydrographs, Hydrologic aspects.
Identifiers: *USSR.

Reported in the paper were the input of thaw and rain water to a mountainous watershed surface and its transformation into the discharge hydrograph at the outlet gage. The mountain drainage basin represents a complicated dynamic system, which transforms water falling on to its surface into the discharge hydrograph at the gaging section. The process can be described as the functioning of two large blocks. The first block transforms the initial data on air temperature, humidity of air, precipitation, etc., into the quantity of water which gets on to the surface of the catchment in a unit of time. The second block transforms incoming water into the runoff hydrograph. (See also W77-06708) (Humphreys-ISWS)
W77-12103

DETERMINISTIC AND STOCHASTIC MODELLING OF FLOODS IN MOUNTAIN REGIONS,
Kazakhskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Alma-Ata (USSR).
U. B. Vinogradov.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 751-757, 1974. 1 fig.

Descriptors: *Model studies, *Floods, *Hydrographs, *Watersheds(Basins), Rainfall, Stochastic processes, Mathematical models, Hydrograph analysis, River basins, Mountains, Surface runoff, Hydrologic aspects, Analytical techniques, Foreign research, Foreign countries.
Identifiers: *USSR.

A mathematical model for the deterministic and stochastic calculation of rainfall floods was described in the report. A mountain drainage area is a mixed collection of runoff elements; in the general case, each area forms quick surface runoff and ground runoff. The runoff hydrograph at the outlet can be obtained by adding all the inflow elementary hydrographs and smoothing them by moving averages. If necessary, the irregularity of runoff formation properties of the watershed surface can be taken into account along the river system. The ultimate purpose of stochastic modelling of rainfall runoff processes is the construction of frequency distribution curves of flood characteristics. The usual scheme of calculation is as follows: The sequence of mu-values for the rainless period of time are generated and then converted into initial loss depths. Next, rainfall quantities at different points of the watershed are generated. Normalized and standardized rainfall duration is considered to be constant over the entire basin. The repetition of the modelling of all necessary variable values constitutes a numerical experiment for the determination of distribution curves for any flood characteristics (the Monte Carlo principle). In examples of some Middle Asian catchments, acceptable results were obtained for hydrographs, for runoff depth, for maximum discharges for some floods, and for the construction of distribution curves of flood characteristics. (See also W77-06708) (Humphreys-ISWS)
W77-12104

THE VELOCITY ASSUMPTION BEHIND LINEAR INVARIABLE WATERSHED RESPONSE MODELS,
Ministry of Agriculture, Jerusalem (Israel). Hydrological Service.

A. Ben-Zvi.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 758-761, 1974. 9 ref.

Descriptors: *Watersheds(Basins), *Unit hydrographs, Mathematical models, *Hydrograph analysis, Analytical techniques, Model studies, Hydrologic aspects, Time of concentration, Velocity, Runoff, Theoretical analysis.
Identifiers: Time-area concentration curve.

Based upon the assumption that the velocity vector at every point of a watershed depends only on the location of the point, an invariable time-area concentration curve can be derived for the watershed. The curve was shown as being identical to an invariable instantaneous unit hydrograph. The existence of either function necessitates the existence of the other one. The generally accepted assumptions behind the unit hydrograph can be derived from the foregoing assumption. The response of a watershed, for which this assumption would not work may be approximated by means of a family of unit hydrographs of which every number would be valid for a limited range of discharges. (See also W77-06708) (Humphreys-ISWS)
W77-12105

APPLIED PRINCIPLES OF CATCHMENT SIMULATION,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
A. Becker.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 762-774, 1974. 6 fig, 1 tab, 15 ref.

Descriptors: *Watersheds(Basins), *Model studies, *Hydrologic systems, *Simulation analysis, Floods, Low flow, Groundwater, Mathematical models, Time lag, Hydrologic aspects, Hydrology, Mountains, Discharge(Water), River flow, Water storage, Runoff, Baseflow, Streamflow, Foreign research, Foreign countries.
Identifiers: *East Germany, Isochrones.

In a research program sponsored by the Office for Water Management of the Government of the GDR, catchment models are to be developed to improve the fundamentals of water resources systems planning and operation. The main objective of the models is the calculation of discharge series for selected river cross sections with an accuracy as high as possible during both flood and low flow periods. The paper was concerned with the principles and model concepts, especially distribution principles and an area variant concept of saturated area overland flow, being applied in the model of a mountainous catchment with an area of 15.7 sq km. The integrated model represents a nonlinear, area-variant system, representing the behavior of natural catchments. However, the sub-system models are rather simple for they are based mostly on linear relations (e.g. storage-discharge, capillary water recharge-deficiency, saturated area-gravity water storage, linear channel, linear storage distribution) in conjunction with several threshold concepts. Despite this, the integrated system model offers extensive complexity, which seems to be sufficient to meet the important requirements of catchment simulation. (See also W77-06708) (Humphreys-ISWS)
W77-12106

ROLE OF WES IN THE DEVELOPMENT OF HYDRODYNAMIC WATERSHED MODELS,
Illinois Univ. at Urbana-Champaign. Hydrosystems Section.
V. T. Chow.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 775-783, 1974. 2 fig, 12 ref.

Descriptors: *Watersheds(Basins), *Hydraulic models, *Laboratory equipment, *Hydrograph analysis, Model studies, Mathematical models, Simulated rainfall, Runoff, Hydrographs, Hydrodynamics, Hydrologic aspects, Hydrology, Surface runoff, Overland flow, Computer models, Laboratory tests.
Identifiers: Watershed experimental system.

This paper reported the function of a laboratory instrument called Watershed Experimentation System (WES) in the development of hydrodynamic watershed models. The WES is a scientific instrument of electronic, hydraulic, pneumatic, and structural design. It can produce a moving storm with variable temporal and spatial distributions of rainfall intensities over a laboratory watershed to produce runoff for computer recording and analysis of the hydrograph. Three mathematical models for watershed flow were developed on the basis of hydrodynamic differential equations. The paper described the WES and the hydrodynamic watershed models and discussed the use of the data obtained by WES to test the models. It was demonstrated that the WES plays an important role in the development of such models. Further studies are in progress in order to improve the models and modify them for practical applications. (See also W77-06708) (Humphreys-ISWS)
W77-12107

SIMULATING OVERLAND FLOW ON HILLSLOPES WITH A KINEMATIC CASCADE,
Agricultural Research Service, Beltsville, Md. Hydrography Lab.
D. E. Overton.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 784-793, 1974. 8 fig, 1 tab, 9 ref.

Descriptors: *Overland flow, *Slopes, *Rural areas, *Mathematical models, Surface runoff, Model studies, Watersheds(Basins), Analytical techniques, Analysis, Flow, Turbulent flow, Laminar flow, Mathematical studies, Hydrologic aspects, Hydrologic systems.
Identifiers: Kinematic wave equations.

Kinematic wave equations were used to generate overland flow on hillslopes. Straight line segments (planes) were used to approximate the curvature of hillslopes. Kinematic solutions for overland flow on the cascade of planes and on the actual curvature of the hillslopes were compared, and an error criterion was developed. It was found that by approximating the hillslope curvature by only three planes resulted in an error of about 10% in the kinematic solution, and the marginal error decreased rapidly with an increasing number of planes. (See also W77-06708) (Humphreys-ISWS)
W77-12108

A KINEMATIC REFERENCE FRAME FOR ESTUARIES OF ONE DIMENSION,
University Coll., Dublin (Ireland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-12109

MODELLING GROUNDWATER RESOURCES REPLENISHMENT DUE TO RIVER FLOW IN THE FLOOD PERIOD DURING THE OPERATION OF INFILTRATION WATER INTAKE,
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
For primary bibliographic entry see Field 2F.
W77-12110

MATHEMATICAL MODEL OF THE RIVE BED EROSION BELOW A DAM,
Technical Univ. of Krakow (Poland).
For primary bibliographic entry see Field 2J.
W77-12111

GROUNDWATER CHEMISTRY AND TH TRANSPORT EQUATIONS,
Princeton Univ., N.J. Water Resources Program.
For primary bibliographic entry see Field 2F.
W77-12112

A GENERALIZED STREAMFLOW SIMUL TION SYSTEM,
National Weather Service, Sacramento, Cal River Forecast Center.
R. J. C. Burnash, and R. L. Ferral.
In: Mathematical Models in Hydrology, Volume Proceedings of the Warsaw Symposium, Ju 1971: International Association of Hydrologic Sciences Publication No. 101, p 838-847, 1974. fig, 9 ref.

Descriptors: *Streamflow, *Watersheds(Basin *Model studies, *Hydrologic systems, Comput models, Soil moisture, Surface runoff, Unsat rated flow, Percolation, Rainfall, Simulation an ysis, Hydrologic aspects, Hydrologic properti Evapotranspiration, Base flow, Hydrographs.

A rational streamflow simulation system w developed for digital computers using approxim tions of soil moisture mechanics. The system w designed to provide a generalized mathemati solution of the hydrological characteristics o served in widely diverse watersheds. The mod utilizes two levels of tension water and three leve of free water from which interflow and base flo are generated. Direct runoff is produced from ra on impervious areas. Surface runoff is produc by rainfall rates which exceed the capacity of t upper zone to store and transmit water. Upp zone tension water storage is depleted b evapotranspiration. Upper zone free water stora is depleted by evapotranspiration and also b lateral drainage and percolation, both of whi vary with the moisture storages in upper and low zones. Lower zone tension water storage depleted by evapotranspiration. Lower zone fr water storages generate base flow at rates whi vary with the storages. The system can be appli economically in new areas by determining chara teristics using relatively simple systemat analyses of available hydrometeorological dat The conceptual model has achieved a high degr of accuracy in streamflow simulation over a wi range of climates, vegetative covers and bas morphologies. It has demonstrated the ability achieve a high degree of resolution when time d pendent data were available and to model bas stream volumes effectively from broad scale inp data. (See also W77-06708) (Humphreys-ISWS)
W77-12113

A MATHEMATICAL MODEL FOR SIMULA ING THE TEMPERATURE STRUCTURE O STRATIFIED RESERVOIRS AND ITS USE I RESERVOIR OUTLET DESIGN,
Water Resources Engineers, Inc., Walnut Creek Calif.
For primary bibliographic entry see Field 5B.
W77-12114

2B. Precipitation

EMPIRICAL PREDICTORS FOR NATURA AND SEEDED RAINFALL IN THE FLORID AREA CUMULUS EXPERIMENT (FACE), 197 1975,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

For primary bibliographic entry see Field 3B.
W77-11596

RAIN RESULTING FROM MELTING ICE PARTICLES,
Arizona Univ., Tucson. Inst. of Atmospheric Physics.
L. J. Battan.
Journal of Applied Meteorology, Vol. 16, No. 6, p 595-604, June 1977. 13 fig, 16 ref.

Descriptors: *Rainfall, *Radar, *Raindrops, Arizona, Particle size, Cloud physics, On-site investigations, Thunderstorm, Precipitation(Atmospheric), Rain, Melting, Analytical techniques, Weather, Meteorology.
Identifiers: *Doppler radar.

By means of a zenith-pointing radar, observations were made of the reflectivities and Doppler spectra in orthogonal planes as a dissipating shower exhibiting a bright band passed overhead. The observations have been used to test various procedures for estimating hydrometeor parameters from measurements of radar reflectivitity. The procedures involve assumptions that the raindrop diameters were distributed exponentially, preferably in the manner prescribed by the Marshall-Palmer distribution. It was concluded that, in this case, such an assumption was not valid in regions where it was expected to be valid. As a consequence, estimates of median raindrop diameters and updraft velocities calculated from radar reflectivities were in error. The analyses indicated that raindrip size sorting under the influence of vertical wind shear can account for the observed non-exponential size distributions. (Sims-ISWS)
W77-11597

THE SCALES OF HAIL,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr.
Journal of Applied Meteorology, Vol 16, No 6, p 626-648, June 1977. 16 fig, 1 tab, 144 ref. NSF ERP75 09980, AEN73 07770.

Descriptors: *Hail, *Great Plains, *North America, *United States, *Canada, *Reviews, Spatial distribution, Temporal distribution, Thunderstorms, Winds, Reviews, Damages, Crops, Agriculture, Weather, Precipitation(Atmospheric), Economics, Insurance, Investigations, Research, Data processing, Analytical techniques, Meteorology, Climatology.
Identifiers: *Hail data, Hail research, Hail insurance, Crop-hail damage.

The first climatic investigations of hail in North America were by Lemons and Flora during the 1940's. Their investigations were followed by more intensive, state-scale climatic investigations in the 1960's to meet insurance concerns. Subsequent concerns with hail by the aviation industry and the weather modification community led to the first collection of mesoscale hail data from dense networks and radar studies during the 1960's and 1970's. This paper was a review of available hail information presented in a series of time and space scales. Although the North American hail data and information are less than adequate, there is much more hail information than exists elsewhere in the world. Extensive findings on hail are available for Alberta, Illinois, and Colorado. Phenomenologically oriented studies have focused on hailstones, points hailfalls, hailstreaks, hailstorms, hailswaths, and hail days over various sized areas. Results for each of the classifications were presented according to studies that focused on national, regional, and small-scale area. The principal hail area of the continent is in and to the lee of the Rocky Mountains, where hail is both frequent and intense; hence the Great Plains area suffers great damages. Another high-frequency area related to spring storms extends from Texas to Michigan, but those storms cause less crop damage since they largely precede the crop season. Certain inexpensive data collection efforts and analyses which would greatly improve our knowledge of hail were recommended. (Sims-ISWS)
W77-11598

CONNECTIONS BETWEEN CLIMATE AND DESERTIFICATION,
Toronto Univ. (Ontario). Inst. for Environmental Studies.
F. K. Hare.
Environmental Conservation, Vol 4, No 2, p 81-90, Summer, 1977. 5 fig, 1 tab, 42 ref.

Descriptors: *Deserts, *Droughts, *Africa, *Rainfall, *Land use, *Arid climates, Arid lands, Semi-arid climates, Tropical regions, Climatic data, Land management, Weather modification, Forecasting, Dry seasons, Soil surfaces, Wind erosion, Meteorology, Weather data, Remote sensing, Meteorological data, Environmental effects, Human population, Microclimatology, Albedo, Stock water, Cultivation, Arable land, Compacted soils, Carrying capacity.
Identifiers: *Desertification, Southern oscillation, UN Conference on Desertification, Macroclimate, Topoclimate.

Despite the severity of the Sahelian drought of 1968-73 there is no firm evidence that a permanent desiccation of the West African arid zone is in progress. Evidence suggests desertification results more immediately from faulty land-use practices interacting with prolonged episodes of natural drought. The spreading of desert surfaces appears to be a process of degradation of grassland, scrub, or savanna ecosystems along desert margins; destruction of perennial vegetation; compaction of soil (especially near watering places); and deflation of fine materials (wind erosion) caused by overstocking or excessive cultivation during periods of desiccation. Because the resulting surfaces are lighter-colored and reflect more sunlight than native vegetation, they may enhance atmospheric subsidence and intensify drought. Loss of surface organic litter may also act as a positive feedback for drought. Although adequate methods for predicting such episodes do not yet exist, the use of cyclical variations, where present, time-lagged teleconnections; and general circulation modelling provide three possibilities for prediction. Strategies for desert-margin countries should include examination of climatic, land use, and population growth histories; experimentation in rainfall enhancement techniques; avoidance of destructive forms of land use through control of stocking levels and arable cultivation; detailed forecasting of rainstorm movement by means of satellite imagery; and development of meteorological modelling capabilities. (Ullery-Arizona)
W77-11629

INVESTIGATIONS ON PRECIPITATION FROM VARIOUS LOCATIONS IN NORWAY 1965-71,
Direktoratet for Jakt, Viltstell og Ferskvannsfiske, Vollebekk (Norway). Fisheries Research Inst.
E. Snekvik, A. R. Selmer-Olsen, A. Njos, and R. Baerug.
Meld Nor Landbrukshogsk. 52(13), p 1-19, 1973.

Descriptors: *Precipitation(Atmospheric), *Hydrogen ion concentration, *Chemical analysis, *Regression analysis, *Correlation analysis, Conductivity, Rain, Snow, Zinc.

The chemical analysis of precipitation during the years 1965-71 in Norway is discussed. The material was grouped according to time periods, geographical regions, and kind of precipitation. Regression and correlation analyses have been carried out to investigate the covariation between the analysed variables. The pH was lower in 1969-71 as compared to 1965-68. The average values of pH did not exceed pH 5.5 in any of the small regions used to classify the material. Precipitation from the coastal area showed a higher concentration of Cl, Mg, Na, K and had a higher conductivity than precipitation from the southern inland, while there was no significant difference in pH. The NO3-N concentration was almost twice as high in snow as compared to rain, while the total hardness, Cl and SO4-S were highest in rain. This effect is partly confounded with regions. Regression analyses revealed that Zn was a marker of general pollution. The N compounds, NH4-N and NO3-N, seemed to be important variables with respect to the covariation with conductivity. Ninety percent of the total variation in conductivity was associated with the covariation of NH4-N and NO3-N in the southern inland. The pH was negatively correlated with conductivity and NO3-N. This was the case in all regions and in both snow and rain. There was no general negative correlation between pH and SO4-S. Samples of snow accumulated over 60 days (snow profiles) had 2-4 times higher concentration of Ca, Mg, Na and K than samples accumulated over 1-3 days. The concentration of NO3-N was 3 times higher in 1-3 day samples than in snow profiles.--Copyright 1974, Biological Abstracts, Inc.
W77-11785

PRECIPITATION AS A CHAIN-DEPENDENT PROCESS,
National Center for Atmospheric Research, Boulder, Colo.
R. W. Katz.
Journal of Applied Meteorology, Vol 16, No 7, p 671-676, July 1977. 4 fig, 3 tab, 12 ref.

Descriptors: *Precipitation(Atmospheric), *Model studies, *Pennsylvania, *Mathematical models, Mathematics, *Markov processes, Statistics, Probability, Rainfall, Meteorology.
Identifiers: *Markov chain models.

A probabilistic model for the sequence of daily amounts of precipitation was proposed. The model was a generalization of the commonly used Markov chain model for the occurrence of precipitation. Methods were given for computing the distribution of the maximum amount of daily precipitation and the distribution of the total amount of precipitation. The application of the model was illustrated by an example, using State College, Pennsylvania, precipitation data. (Sims-ISWS)
W77-11803

COLLATING AIRBORNE AND SURFACE OBSERVATIONS OF THE MICROSTRUCTURE OF PRECIPITATING CONTINENTAL CONVECTIVE CLOUDS,
National Center for Atmospheric Research, Boulder, Colo.
J. D. Sartor, and T. W. Cannon.
Journal of Applied Meteorology, Vol 16, No 7, p 697-707, July 1977. 10 fig, 3 tab, 12 ref.

Descriptors: *Cloud physics, *Clouds, *Precipitation(Atmospheric), Aircraft, Clouds, Droplets, Particle size, Ice, Photography, Cameras, On-site investigations, On-site data collections, Analytical techniques, Data processing, Meteorology.
Identifiers: Sailplane observations, Surface observations, Cumulus clouds.

The observational results from sailplane flights into the updrafts of developing cumulus clouds in northeastern Colorado showed some important variations in the microstructure of the cloud droplet and ice particle distributions. Some of the variations apparently are caused by the combined interactions of cloud droplets and precipitation particles with the horizontal and vertical components of the updraft and its horizontal and vertical structure. Data from the observations were introduced into a circulation framework in an attempt to understand how the microphysics and the circulation can interact to give the features observed. The results cast doubt on the validity of

the often made assumption that the microphysical properties of a cloud are distributed randomly with respect to each other on the smaller scales, and that this condition exists uniformly throughout the cloud. The observed precipitation shafts with bimodal size distributions in the middle and lower parts of a cloud can be recreated in a two-dimensional simulation of the observed cloud air circulation with embedded microphysics. The observed and calculated frozen water content can increase by one to two orders of magnitude over the liquid water content when moving from cloudy air into a precipitation shaft. The observed change in concentration with height of the ice particles exceeds (by over two orders of magnitude) the expected ice nuclei concentration usually found in the atmosphere at comparable temperatures. The average concentrations of ice particles observed occasionally exceed 400/liter. (Sims-ISWS)
W77-11804

CLOUD CONDENSATION NUCLEI FROM A PAPER MILL. PART I: MEASURED EFFECTS ON CLOUDS,
Naval Weapons Center, China Lake, Calif. Research Dept.
E. E. Hindman, II, P. V. Hobbs, and L. F. Radke.
Journal of Applied Meteorology, Vol 16, No 7, p 745-752, July 1977. 4 fig, 3 tab, 12 ref. NSF ENV75-19701.

Descriptors: *Pulp and paper industry, *Clouds, *Nucleation, *Washington, Cloud physics, Aircraft, Measurement, Particle size, Droplets, Industry, *Air pollution effects, Environmental effects, Atmosphere, Atmospheric physics, Meteorology.
Identifiers: *Paper mills, *Cloud condensation nuclei, *Port Townsend(Wash).

The effluents from a large Kraft-process paper mill were found to increase the concentration of large (0.2-2 micrometers diameter) and giant (greater than 2 micrometers diameter) cloud condensation nuclei (CCN) above background concentrations; the concentrations of small (less than 0.2 micrometer diameter) CCN, however, were not increased significantly. Small, nonraining, warm cumulus clouds located in the plume of the paper mill were found to contain higher concentrations of droplets greater than 30 micrometers diameter than similar clouds located outside of the plume; the clouds in both locations contained similar concentrations of droplets greater than 5 micrometers diameter. Cloud droplet size distributions calculated using the CCN measurements are consistent with the measured droplet size distributions. It was concluded that the large and giant CCN from the paper mill increased the concentrations of droplets greater than 30 micrometers diameter in clouds located in its plume. Furthermore, the clouds located in and out of the plume contained similar concentrations of droplets greater than 5 micrometers diameter because the concentrations of small CCN in the plume and in ambient air were similar. (See also W77-11806) (Sims-ISWS)
W77-11805

CLOUD CONDENSATION NUCLEI FROM A PAPER MILL. PART II: CALCULATED EFFECTS ON RAINFALL,
Naval Weapons Center, China Lake, Calif. Research Dept.
E. E. Hindman, II, P. M. Tag, B. A. Silverman, and P. V. Hobbs.
Journal of Applied Meteorology, Vol 16, No 7, p 753-755, July 1977. 2 fig, 16 ref. NSF ENV75-19701.

Descriptors: *Pulp and paper industry, *Rainfall, *Nucleation, *Washington, Environmental effects, *Air pollution effects, Particle size, Droplets, Model studies, Mathematical models, Cloud physics, Clouds, Atmospheric physics, Meteorology.
Identifiers: *Paper mills, *Cloud condensation nuclei, *Port Townsend(Wash).

The paper mill at Port Townsend, Washington, is a source of large and giant condensation nuclei (CCN). The CCN cause the concentrations of droplets greater than 30 micrometers in diameter to be higher in small, nonraining warm clouds located in the plume of the mill than in similar clouds unaffected by the plume. Calculations based on a model for nonsheared, warm cumulus clouds and on a model for warm stratus clouds indicated that the higher concentrations of large droplets in the clouds in the plume should not cause any significant changes in the rainfall from the clouds. The results indicated that the large and giant CCN emitted by the mill are not responsible by themselves for the increased rainfall measured in the vicinity of the mill. The heat and moisture emitted by the mill, in combination with the CCN, may have been responsible for the increased rainfal. (See also W77-11805) (Sims-ISWS)
W77-11806

SEDIMENTATION AND CLIMATIC PATTERNS IN THE SANTA BARBARA BASIN DURING THE 19TH AND 20TH CENTURIES,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-11817

AFRICAN RAINFALL AND ITS RELATION TO THE UPPER AIR CIRCULATION,
Massachusetts Inst., of Tech., cambridge. Dept. of Meteorology.
J. W. Kidson.
Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 437, p 441-456, July 1977. 13 fig, 1 tab, 25 ref, 1 append. NSF DES74-09853 A02.

Descriptors: *Rainfall, *Air circulation, *Africa, *Droughts, *Rainfall distribution, Climatic data, Foreign research, Climatology, Foreign countries, Circulation, Water vapor, Moisture content, Albedo, Precipitation(Atmospheric), Distribution patterns, Spatial distribution, Temporal distribution, Data procesing, Meteorology.
Identifiers: *Sahel region(Africa).

The rainfall distribution over Africa analyzed for the period 1951-1975 showed a downward trend at 15 deg N not present at other latitudes. A widespread reduction in rainfall was observed during the drought years 1972 and 1973. Upper air analyses were used to construct mean monthly vertical motion patterns and water vapor budgets, but the results were not sufficiently precise to examine year-to-year differences. Changes in the August flow patterns showed that low rainfall in the Sahel is associated with the virtual disappearance of the 850-mb trough near 8 deg N and weakening of the easterly jet above it. An empirical orthogonal function analysis of the 850-, 500- and 200-mb temperatures from 150 stations showed that the changes are global in extent. The downward trend in the Sahel rainfall evidently has been paralleled by a weakening of the northern hemisphere circulation. The results suggest that local modification of surface conditions is not the principal cause of the decline in Sahel rainfall over the last two decades. (Sims-ISWS)
W77-11820

AN ELECTRON MICROSCOPY STUDY OF PARTICULATES PRESENT IN INDIVIDUAL RAINDROPS,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Metallurgical and Materials Engineering.
T. W. Gonzales, and L. E. Murr.
Journal of Geophysical Research, Vol. 82, No. 21, p 3161-3166, July 20, 1977. 5 fig, 18 ref.

Descriptors: *Raindrops, *Sampling, *Electro microscopy, Rainfall, Storms, Laboratory test Microscopy, Silicates, Asbestos, Kaolinite, Part cle size, Cloud physics, Meteorology.
Identifiers: *Particulates, *Raindrop scavengin Micas.

A technique for collecting single raindrops for th observation of particulates by transmission elec tron microscopy was described. Measurement particulate concentrations in raindrops during th course of rainstorms over central New Mexico ha shown that the particulate concentrations increas from the onset of rain, reaching a maximum co centration which then declines exponentially wit elapsed time. The particulates were observed t vary in size from less than 0.01 to 3 mu, with mean particle size of 0.1 mu. Essentially all of th particulates were observed to be crystalline polycrystalline aggregates composed mainly micas, kaolinites, and other layer silicates. Th particulate morphologies exhibited a preponde rance of platelike structure or aggregates po sessing a large surface-to-volume rati Asbestiform fibers were not abundant in the di tribution of scavenged particulates, and the deart of observations of such fibers in raindrops for thi particular area supports earlier conclusions tha very high fiber concentrations in potable water the region have their origin in geologic hydrologic mechanisms. (Sims-ISWS)
W77-11821

A NUMERICAL SIMULATION OF WARM FO DISSIPATION BY ELECTRICALL ENHANCED COALESCENCE: PART I CHARGED DROP SEEDING,
Naval Environmental Prediction Research Facil ty, Monterey, Calif.
P. M. Tag.
Journal of Applied Meteorology, Vol 16, No 7, 683-696, July 1977. 14 fig, 1 tab, 29 ref.

Descriptors: *Fog, *Droplets, *Mathematica models, Model studies, Numerical analysis, Simu lation analysis, Cloud physics, Meteorology Mathematical studies.
Identifiers: *Fog dissipation, *Charged drops Warm fog, Collision efficiencies, Coalescence Electrical charges, Drop charging, Visibility, Fo seeding, Electrostatic effects.

A numerical study of the use of highly charge water drops to clear warm fog was conducted. Th mechanism studied was the polarization of neutra fog droplets and their capture by the charge drops. A multi-level microphysical model wa used to investigate the degree of visibility im provement resulting from variations in seedin drop size and charge, the concentration of seedin material, and the fog being seeded. It was deter mined that visibility improvement decreases wit decreasing fog droplet size, and increases with in creasing seeding rate and seeding drop charge. Fo the same amount of seeding water, a treatmen spectrum with an average radius between 10 an 15 micrometers is ideal. In contrast to the finding of Part I (an applied electric field), visibility im provement here results both from a removal of fo water (to the ground) and from a transfer of wate from the fog spectrum to the larger treatmen drops. Field tests of the technique have proven in conclusive. A further evaluation was made by comparing model results to comparable numerica experiments of hygroscopic seeding, a technique that has been field tested on several occasions. I was concluded that the charges and treatment con centrations simulated in this study would not be adequate for clearing fog; unless charges and seed ing concentrations can be greatly increased, charged drop seeding is probably not a viable fog dissipation technique. (Sims-ISWS)
W77-11828

RAINFALL PARAMETERS TO PREDICT SURFACE RUNOFF YIELDS AND SOIL LOSSES FROM SELECTED FIELD-PLOT STUDIES,
Rhodesia Dept. of Conservation and Extension, Salisbury.
H. A. Elwell, and M. A. Stocking.
Rhod J Agric Res. 11(2), p 123-129, 1973.

Descriptors: *Rainfall, *Forecasting, *Runoff, Soils, Seasonal, Storms, Precipitation(Atmospheric).
Identifiers: *Rhodesia(Highweld region), *Soil losses(Rainfall).

A rainfall parameter which represented the cumulative seasonal momentum values of all storms proved to be the best predictor of direct surface runoff yield from selected field plots on the Rhodesian highveld. Total seasonal precipitation gave slightly better results than an equivalent energy parameter. There was a close relationship between soil loss and surface runoff quantities which suggest that prediction equations can be developed for both quantities from the same data source. In addition, rainfall parameters proved to be more dependable as estimators of runoff than of soil loss. --Copyright (C) 1974, Biological Abstracts, Inc.
W77-11964

EFFECT OF RAINFALL-EXCESS DETERMINATION ON RUNOFF COMPUTATION,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh, and S. Buapeng.
Water Resources Bulletin, Vol 13, No 3, p 499-514, June 1977. 10 fig, 4 tab, 26 ref.

Descriptors: *Rainfall, *Rainfall-runoff relationships, *Model studies, Rainfall disposition, Runoff, Kinetics, Infiltration, Infiltration rates, Watersheds(Basins), Overland flow, Precipitation excess, Surface runoff, Runoff forecasting, Soil moisture.
Identifiers: Kinematic wave, Converging overland flow model, Infiltration estimates, Hydrograph prediction.

Four methods of determining rainfall-excess were considered. The methods considered were phi-index and equations of Norton, Kostyakov, and Philip. The methods were utilized in a nonlinear kinematic wave model to predict surface runoff from two natural agricultural watersheds. The effect of determing rainfall-excess on surface runoff response was examined. It was observed that errors in rainfall-excess constitute a major source of error in runoff prediction. The choice of a method of determining rainfall-excess is crucial to runoff computation. Of the four methods considered, Horton's equation was the best. The equations of Philip and Kostyakov were comparable, and phi-index grossly misrepresented rainfall-excess. It was shown that errors in hydrograph computation can be minimized considerably by the use of a more refined method of infiltration. (Roberts-ISWS)
W77-11986

SHORT PERIOD FLUCTUATIONS OF NEW ZEALAND RAINFALL,
New Zealand Meteorological Service, Wellington.
A. I. Tomlinson.
New Zealand Journal of Science, Vol 19, June, 1976, p 149-161, 6 fig, 4 tab, 18 ref.

Descriptors: *Rainfall, Forecasting, *Projections, *Analytical techniques, *Fluctuations, Meteorology, Weather forecasting, Seasonal, Cycles, Weather data, Synoptic analysis, Climatology, Regions, Stations, Circulation, Orography, Theoretical analysis.
Identifiers: *New Zealand, *Extrapolation techniques, Spectral analysis techniques, Synoptic meterology, General circulation theory.

An investigation of the relation of quasi-biennial oscillation (QBO) and the 28-day osciallation corresponding to a solar or lunar cycle to rainfall fluctuations in New Zealand indicates extrapolation of carefully detected rainfall cycles could be valuable in forecasting rainfall up to several seasons ahead. Rainfall data for 1941-74 from 340 stations in New Zealand were analyzed for fluctuations and spectral densities and significant periodicities obtained. Stations were combined into correlated groups to remove site effects and ensure regional application of the results. QBO was the most common periodicity detected over most of the country. A 28-day oscillation was significantly related to recorded rainfall in one region. Several significant but transient, oscillations of 200 days or less were detected. (Ullery-Arizona)
W77-12001

METHODOLOGY FOR EVALUATING THE COST OF URBAN STORMWATER QUALITY MANAGEMENT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W77-12075

PROBLEMS OF APPLYING THE CONCEPTUAL MODEL DEVELOPED FOR THE FLAT CATCHMENTS OF HUNGARY,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W77-12087

CONVECTIVE STORM FIELD SIMULATION FOR DISTRIBUTED CATCHMENT MODELS,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
J. Amorocho, and D. Morgan.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 598-607, 1974. 3 fig, 2 tab, 10 ref.

Descriptors: *Watersheds(Basins), *Precipitation(Atmospheric), *Model studies, *Simulated rainfall, Simulation analysis, Computer models, Mathematical models, Meteorology, Thunderstorms, Rainfall, Rainfall disposition, Areal, Distribution patterns, Convection, Analytical techniques, Hydrologic aspects, Storms, Rainfall intensity, Isohyets, Mapping.

Convective storms of the types conducive to the generation of summer floods were studied in detail from ground data obtained in dense rain gage networks. Procedures of storm frequency distribution analysis, cumulus convection modelling, and systematic sampling of the rainfall intensities were used in a process for the simulation of the storm fields at ground level. The fields can be used in conjunction with distributed catchment models for the generation of synthetic flood sequences suitable for engineering design and water resources systems planning. The process described permits the simulation of a succession of storm fields over a semiarid area similar to those encountered in the United States in the States of Arizona and New Mexico. It is believed that although somewhat idealized, the patterns given by the simulation will produce catchment responses which are closer to actual watershed behavior than the lumped (space invariant) rainfall inputs which are necessary in the absence of dense rain gage networks. (See also W77-06708) (Humphreys-ISWS)
W77-12092

MATHEMATICAL MODEL OF THE HYDROMETEOROLOGICAL REGIME FORMATION OF A RIVER BASIN,
Gosudarstvennyi Gidrologicheskii Institut, Moscow (USSR).
For primary bibliographic entry see Field 2A.
W77-12102

2C. Snow, Ice, and Frost

VANADIUM AND OTHER ELEMENTS IN GREENLAND ICE CORES,
San Diego State Univ., Calif. Dept. of Chemistry.
M. M. Herron, C. C. Langway, Jr., H. V. Weiss, R. J. Hurley, and R. J. Kerr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 356, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-24, July 1976. 6 p, 2 tab, 16 ref. NSF OPP 750-6750.

Descriptors: *Ice, *Snow, *Chemical analysis, *Dating, *Trace elements, Geologic time, Sodium, Chlorides, Volatility, Pollutants, Aerosols, Air pollution, Mercury, Zinc, Manganese, Aluminum, Foreign countries, Foreign research, Annual.
Identifiers: *Vanadium, *Greenland, *Ice cores, Annual accumulations.

Chemical analysis of surface snows and deeper ice core samples from Milcent, Greenland, indicated a marine origin for Na and C1 and a terrestrial origin for A1, Mn and V. Pre-1900 enrichment factors, based on average crustal composition, are high for Zn and Hg and appear to be related to their volatility. A comparison of pre-1900 and 1971-1973 concentrations of V and Hg showed no decided increase from industrial production; however, the abundance of Zn (relative to A1) increased threefold during the mentioned time period. Information concerning the chemical composition of ancient ice is extremely useful in interpreting modern aerosols. (Henley-ISWS)
W77-11586

A METHOD OF ESTIMATING THE PROBABILITY OF OCCURRENCE OF SNOW WATER EQUIVALENTS IN THE UNITED KINGDOM,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 4A.
W77-11601

TEXTURAL CHARACTERISTICS OF DRIFT FROM SOME REPRESENTATIVE CORDILLERAN GLACIERS,
Washington Univ., Seattle. Dept. of Geological Sciences.
H. H. Mills.
Geological Society of America Bulletin, Vol. 88, No. 8, p 1135-1143, August 1977. 8 fig, 31 ref.

Descriptors: *Glacial drift, *Glacial sediments, *Particle size, *Washington, *Canada, *Glaciers, Mountains, Soils, Soil texture, Glacial soils, Sediments, Statistics, Frequency curves, Analytical techniques, Geomorphology, Glaciology.
Identifiers: *Cordilleran glaciers.

Particle-size analyses of more than 300 samples of drift from Nisqually, Paradise, and South Cascade Glaciers in the Cascade Range of Washington, from Athabasca Glacier in Alberta, Canada, and from other alpine glaciers showed that textural differences exist among glaciers and among glacier subenvironments. Differences among glaciers probably reflect bedrock terrane and are shown by the percentage of silt + clay in the less than -1.00 phi fraction, which increases in the following order: Nisqually and Paradise (volcanic bedrock), South Cascade (metamorphic and plutonic bedrock), and Athabasca (sedimentary bedrock). Differences among subenvironments are shown best by analyses of samples which include clasts as large as -6.67 phi; average frequency curves of the samples show that basal tills lack dominant modes in the coarse fraction and may have dominant modes in the fine fraction at about 4.00 phi, whereas sediments of other subenvironments possess dominant modes in the coarse fraction at or

above about -5.00 phi. Mean size and sorting increase, and percentage of silt + clay decreases in the following order: basil till, recessional-moraine till, end-moraine till, ablation drift, and stratified drift. Skewness, but not kurtosis, also varies with subenvironment. A comparison of alpine drift with continental ice-sheet drift from Ontarios showed that, in general, alpine drift is coarser, but that alpine basal till is comparable to ice-sheet basal till. When comparing nonglacial diamictons to alpine drift, it may be possible to distinguish the former from the sediments of one glacier subenvironment but not from those of another. (Sims-ISWS)
W77-11608

NOAA-ARS COOPERATIVE SNOW RESEARCH PROJECT. WATERSHED HYDRO-CLIMATOLOGY AND DATA FOR WATER YEARS 1960-1974,
National Weather Service, Silver Spring, Md. Office of Hydrology.
E. A. Anderson, H. J. Greenan, R. Z. Whipkey, and C. T. Machell.
June 1977. 311 p, 36 fig, 13 tab, 24 ref, 8 append.

Descriptors: *Watersheds(Basins), *Snow cover, *Precipitation(Atmospheric), *Vermont, Watershed management.
Identifiers: Hydro-climatology.

Data are provided for the 3.25 square mile W-3 watershed which is part of the Sleepers River Research Watershed operated by the Agricultural Research Service near Danville, Vermont. Presented are streamflow, air temperature, snow course, pan evaporation, and soil-moisture data, as well as point measurements and mean areal estimates of precipitation. Also included are data from the NOAA-ARS Snow Research Station which is located adjacent to the W-3 watershed. Detailed measurements of the snow cover and the hydrometeorological variables affecting snow cover energy exchange have been made since December 1968 at this station as part of a cooperative project to study the physical processes involved in snow metamorphosis and snowmelt. Tabulations of some of the watershed and snow cover variables are included. The remaining variables are summarized. Most of the actual data are contained on an associated magnetic tape. In addition to the data, information is provided as to the quality of the data and the hydro-climatology of the watershed. This set of data is suitable for use in developing and testing physically based hydrologic models. The watershed is hydrologically representative of most of the glaciated upland regions of the Northeastern United States. (NOAA)
W77-11662

OBSERVATIONS OF MEDIUM-SCALE FEATURES ALONG THE SEASONAL ICE EDGE IN THE BERING SEA,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
R. D. Muench, and R. L. Charnell.
Journal of Physical Oceanography, Vol 7, No 4, p 602-606, July 1977. 5 fig, 1 tab, 6 ref. NOAA-NESS 5-35190.

Descriptors: *Ice, *Sea ice, *Ice-water interfaces, *Alaska, Ice cover, Remote sensing, Satellites(Artificial), Temperature, Water temperature, Winds, Clouds, Atmosphere, Convection, Winter, Cold regions.
Identifiers: *Bering Sea, Ice bands, Ice features.

During winter 1974-75, band-like ice features were observed via satellite in the Bering Sea water-ice transition zone during periods of off-ice winds. The band-like ice features were several tens of kilometers long, were spaced from 6-12 km apart, and generally were oriented from 40-90 deg left of the surface wind direction. Formation of the features appears to be related to atmospheric convective processes; such features may be significant indicators of transition zone ice dynamics. (Sims-ISWS)
W77-11809

FORCE MEASUREMENTS ON A NAVIGABLE ICE BOOM,
ARCTEC, Inc., Columbia, Md.
M. S. Uzuner, J. J. Peter, and D. C. N. Robb.
Journal of Hydraulic Research, Vol 15, No 2, p 179-187, 1977. 7 fig, 4 ref.

Descriptors: *Ice cover, *Rivers, *Ice loads, *St Lawrence Seaway, Navigation, Winter, Loads(Forces), On-site investigations, Instrumentation, Measurement, Ice, Rivers, Ships, Cold regions.
Identifiers: *Ice booms, Winter navigation.

The St. Lawrence Seaway Development Corporation has been assigned the task of demonstrating the feasibility of winter navigation on the St. Lawrence River. As a part of the program, an ice boom was designed, installed, and instrumented at Copeland Cut in the Wiley-Donden Canal near Massena, New York. In order to measure forces exerted on the boom elements by the ice cover, 20 tension transducers were designed, built, and located in the critical members of the boom. Force measurements were made before, during, and after ship transits through the ice cover and boom opening. Typical signal recording of several of the tension transducers was presented. It was concluded that, within the flow velocities experienced at the test site, an ice boom with a navigation channel is feasible. Ship induced forces were found to be relatively small compared to steady-state forces, and they were limited primarily to the gate float area. It was found that the effect of the water surface elevation fluctuations must be considered also during the design when it is necessary to anchor the shoreside ends of boom cables well above the water level. (Sims-ISWS)
W77-11814

MATHEMATICAL MODEL OF SPRING RUNOFF FORMATION,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2A.
W77-12101

SIMULTANEOUS PASSIVE AND ACTIVE MICROWAVE OBSERVATIONS OF NEARSHORE BEAUFORT SEA ICE,
Geological Survey, Tacoma, Wash. Water Resources Div.
W. J. Campbell, P. Gloersen, H. J. Zwally, R. O. Ramseier, and C. Elachi.
Paper presented at the 9th Annual Offshore Technology Conference, held in Houston, Texas, May 2-5, 1977, p 287-294, 1977. 9 fig, 10 ref.

Descriptors: *Sea ice, *Remote sensing, *Arctic Ocean, *Aircraft, *Infrared radiation, Microwaves, Analytical techniques, Floating, Ice.
Identifiers: *Beaufort Sea, *Sea-ice morphology, *Microwave imagery.

The use of active and passive microwave imagery in combination is the optimum way to observe the morphology and dynamics of near shore ice. Active and passive microwave data from aircraft that are described in this paper are also compared to the ESMR (Electricially Scanning Microwave Radiometer) imagery of the Nimbus-5 satellite. The information thus obtained shows how the data to be received from the SAR (Synthetic Aperture Radar) and SMMR (Scanning Multichannel Microwave Radiometer) and on Seasat A and Numbus G have the potential of providing a vastly increased understanding of the near shore ice of the Beaufort Sea. (Woodard-USGS)
W77-12157

2D. Evaporation and Transpiration

THE DIVERGENCE OF THE WATER VAPOUR FLUX OVER SOUTHERN AFRICA,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Geography.
O. S. McGee.
Water SA., Vol. 2, No. 2, p 73-85, 1976. 1 fig, 1 tab, 13 ref.

Descriptors: *Water vapor, *Moisture content, Theoretical analysis, Topography.
Identifiers: South Africa, Radiosondes.

Data from all available radiosonde ascents during 1967 over South Africa are used to determine the annual water vapour flux divergence. A theoretical approach is given in some detail as well as certain explanations as to why results appear unrealistic at first sight. The need appears for a closer appraisal of topographical influences and the acceptance of a possible transport of vapour through the upper level at which customarily, it is assumed that there is no such transport. (So African Water Info Center)
W77-11579

ESTIMATION OF NET WATER DEMAND OF CROPS IN THE UPPER BERG RIVER VALLEY,
Soils and Irrigation Research Inst., Potchefstroom (South Africa).
For primary bibliographic entry see Field 3F.
W77-11580

SUBSTANTIATION OF THE PRIESTLEY AND TAYLOR PARAMETER ALPHA = 1.26 FOR POTENTIAL EVAPORATION IN HIGH LATITUDES,
Atmospheric Environment Service, Downsview (Ontario).
R. B. Stewart, and W. R. Rouse.
Journal of Applied Meteorology, Vol 16, No 6, p 649-650, June 1977. 1 fig, 7 ref.

Descriptors: *Evaporation, *Lakes, *Model studies, *Canada, Equations, Latent heat, Energy budget, Temperature, Energy, Heat, Summer, Heat transfer, Water loss, Saturated soils, Water vapor.
Identifiers: *Potential evaporation, Shallow lakes, Sedge meadows, High latitudes.

Summertime latent heat flux values determined by the energy budget approach were compared to equilibrium model estimates for two shallow lakes and two sedge meadow surfaces in northern Canada. Comparison of energy budget values with equilibrium estimates for each surface showed that the latent heat flux can be determined accurately by the Priestley and Taylor model, where, alpha, the ratio of actual to equilibrium evaporation equals 1.26 Results suggested that the Priestley and Taylor parameter generally is appicable to saturated surfaces in high latitudes. (Sims-ISWS)
W77-11599

NOTE ON EVAPOTRANSPIRATION BY PROFILE-DEPLETION METHOD IN DEEP VERTISOL,
College of Agriculture, Indore (India). Dryland Agriculture Research Project.
R. K. Katre, and M. B. Russell.
Indian Journal of Agricultural Sciences, Vol 44, No 11, p 781-782, November 1974. 1 fig.

Descriptors: *Evapotranspiration, *Soil moisture, *Withdrawal, *Soil profiles, Wheat, Water sampling, Soil-water-plant relationships, Dry farming, Water utilization, Fallowing, Soil analysis, Seasonal, Estimating.
Identifiers: *India, Vertisol.

A study was conducted to evaluate the effect of sampling depth on seasonal profile water depletion

and total water use under fallow and unirrigated wheat in vertisol on a research farm of Jabalpur, India. Profile-moisture sampling methods are described. The total seasonal profile depletion to depths of 80, 100 and 200 cm from sowing to harvest were 5.8, 6.8 and 9.6 cm under fallow and 11.9, 14.8 and 20.7 cm under unirrigated wheat. There was no difference between fallow and unirrigated wheat in the ratio of seasonal profile depletion from the 80-cm and 200-cm profiles, or in the pattern of depletion. The total seasonal water use on the basis of seasonal profile depletion depths of 80, 100 and 200 cm under unirrigated wheat was 18.0, 20.9 and 26.8, respectively. It was concluded that estimates of water use based on depletion data to a depth of 200 cm will be higher and more likely correct than those from 80- or 100-cm depths. (Jahns-Arizona)
W77-11632

THE HYDROLOGIC HISTORY OF THE SAN CARLOS RESERVOIR, ARIZONA, 1929-71, WITH PARTICULAR REFERENCE TO EVAPOTRANSPIRATION AND SEDIMENTATION,
Geological Survey, Tucson, Ariz. Water Resources Div.
F. P. Kipple.
For sale by Supt. of Documents, GPO, Washington, DC 20402, price $2.00. Professional Paper 655-N, 1977. 40 p, 40 fig, 26 tab, 20 ref.

Descriptors: *Evapotranspiration, *Hydrologic budget, *Reservoirs, *Arizona, *Sedimentation, Reservoir silting, Evaporation, Precipitation(Atmospheric), Runoff, Reservoir storage, Usable storage, Inflow, Groundwater, Surface waters, Discharge(Water), Bank storage, Hydrologic data.
Identifiers: *San Carlos Reservoir(Ariz).

Reservoir data records were used in an investigation of evapotranspiration from the land area of San Carlos Reservoir, Ariz., and evaporation from the water-surface area. A water-budget analysis indicates that the evapotranspiration loss was 11.3 percent and the evaporation loss was 10.5 percent of the total outflow from the reservoir during 1931-71. The water-budget computations were used to develop ratings relating lake stage to usable bank storage. The rating developed for the 1948-71 period indicates that usable bank storage is approximately 159,000 acre-ft, or about 14 percen t of total usable storage capacity, if the reservoir is filled to the spillway level of 2,511 ft. A procedure was developed to simulate sediment deposition in the reservoir. The procedure was used to estimate the change in storage capacity between five reservoir capacity surveys made during the period 1914-76. (Woodard-USGS)
W77-11870

ESTIMATING EVAPORATION AND TRANSPIRATION FROM A ROW CROP DURING INCOMPLETE COVER,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-11947

WATER TRANSPORT IN WHEAT PLANTS IN THE FIELD,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 3F.
W77-11949

A NEW TECHNIQUE FOR MEASURING THE WATER POTENTIAL OF DETACHED LEAF SAMPLES,
Intermountain Forest and Range Experiment Station, Ogden, Utah.
For primary bibliographic entry see Field 7B.
W77-12117

ALGORITHM FOR SOLAR RADIATION ON MOUNTAIN SLOPES,
Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 7B.
W77-12135

FIELD STUDIES OF THE CONDUCTANCE OF WHEAT LEAVES AND TRANSPIRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 3F.
W77-12175

2E. Streamflow and Runoff

STATISTICAL PROCEDURES FOR BED FORM ANALYSIS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-11582

SOME BASIC CONCEPTS ON FLOW IN BRANCHING CONDUITS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 8B.
W77-11591

TURBULENT FLOW IN VERY NONCIRCULAR CONDUIT,
Research Council of Alberta, Edmonton. Transportation and Surface Water Engineering Div.
For primary bibliographic entry see Field 8B.
W77-11592

WATER YIELD CHANGES AFTER THE URBANIZATION OF THE CANON'S BROOK CATCHMENT, HARLOW, ENGLAND,
University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W77-11600

MODEL OF THE DISTURBANCES IN HYDROLOGICAL SEQUENCES BASED ON THE METHOD OF DEMODULATION,
Karlova Universita, Prague (Czechoslovakia).
J. Andel, and J. Balek.
Hydrological Sciences Bulletin, Vol. 22, No. 1, p 163-173, March 1977. 9 fig, 1 tab, 4 ref.

Descriptors: *Model studies, *Graphical analysis, *Hydrology, Hydrodynamics, Filters, Statistical methods, Phase diagrams, Discharge(Water), Frequency, Foreign research.
Identifiers: *Hydrologic sequences, Demodulation, Amplitude, Periodic components, Phase, Sequences.

A model which detects the stability of the amplitude and phase of periodic components provided information on the disturbances which may have influenced the formation sequences within an observation period. The model was applied in combination with another model to detect the most frequent periodicities. The model was developed in an attempt to establish a bridge between a statistical analysis of the hydrological phenomena and the physical meaning of the results obtained. There were several factors which may have influenced the formation of the periodic components in hydrological sequences: sunspots and atmospheric fluctuations, long-term fluctuations of the regional and local climate, vegetation changes, and blockage of the outflows from lakes. The above mentioned factors were typical phenomena which could have developed periodic components, and, when disturbed either naturally or artificially, they may have disturbed the components in a similar way. Also, sudden changes, such as those caused by urbanization and water and agricultural management, may have produced other types of disturbances which were reflected in the shape and stability of the amplitude and phase diagrams. The relationship can be traced between the phenomena and corresponding periodicities by analyzing diagrams in the paper. (Roberts-ISWS)
W77-11602

A STOCHASTIC MODEL FOR THE SIMULATION OF DAILY FLOWS,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
B. Treiber, and E. J. Plate.
Hydrological Sciences Bulletin, Vol. 22, No. 1, p 175-192, March 1977. 16 fig, 7 ref.

Descriptors: *Stochastic processes, *Model studies, *Flow, Daily hydrographs, Synthetic hydrology, Floods, Floodwater, Markov processes, Hydrology, Peak discharge.
Identifiers: *Stochastic models, *Daily flow, Daily streamflow, Synthetic daily streamflow, Markov chain model.

Existing models for generating synthetic daily streamflow data are unsuitable for reproducing the predominant features of daily flows, the rising and recession of flood flows, the peaks of the floods, the volume of the waves and the range. In this paper, a model was presented which is able to reproduce the important features of daily flows. In the model the measured record of daily data is assumed to be the output of a linear system. The input of the system consists of pulses, occurring on certain days. The pulses are convoluted with the system function in order to produce the output. The form of the system function depends on the magnitude of the output. First, on the days on which pulses occur the magnitude of pulses and the form of the system function as a function of the system output are determined. Subsequently, a model was developed for the generation of the pulses. The model consists of a combination of two processes. Using a Markov chain model, the sequence of dry and wet days (days with and without pulses) is generated. Thereafter, a pulse of certain magnitude is assigned to each wet day. A modified first-order autoregressive process is used to produce the correlated pulses. The random components of the pulses are taken from a transformed exponential distribution. The periodicity of the flows within the year is reproduced by using different model parameters for each month of the year. The model yields good results for small and medium size basins, especially as far as peak flows, the volume of the waves, and the range are concerned. A sequence of daily flows from at least 20 years is required for input data. (Lee-ISWS)
W77-11603

THE MONTE CARLO APPROACH TO OPTIMIZATION OF THE OPERATION RULES FOR A SYSTEM OF STORAGE RESERVOIRS,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-11604

HYDROLOGIC RESPONSE AND NUTRIENT CONCENTRATIONS FOLLOWING SPRING BURNS IN AN OAK-HICKORY FOREST,
Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab.
For primary bibliographic entry see Field 4C.
W77-11613

LOW FLOW CRITERIA FOR DIVERSIONS AND IMPOUNDMENTS,
Geological Survey, Menlo Park, Calif. Environmental and Safety Section.
For primary bibliographic entry see Field 4A.
W77-11778

THE INTEGRATED HYDROLOGICAL CATCHMENT MODEL EGMO,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 2A.
W77-11815

HYDROLOGIC UNIT MAP--1974, STATE OF LOUISIANA.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11880

HYDROLOGIC UNIT MAP--1974, STATE OF ARKANSAS.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11881

HYDROLOGIC UNIT MAP--1974, STATE OF KENTUCKY.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11882

HYDROLOGIC UNIT MAP--1974, STATE OF MISSISSIPPI.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11883

HYDROLOGIC UNIT MAP--1974, STATE OF TENNESSEE.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11884

HYDROLOGIC UNIT MAP--1974, STATE OF MISSOURI.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11885

MORPHOLOGY AND MORPHOMETRY OF A CHANNELIZED STREAM: THE CASE HISTORY OF BIG PINE CREEK DITCH, BENTON, COUNTY, INDIANA, STUDIES IN FLUVIAL GEOMORPHOLOGY NO. 4,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
R. S. Barnard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 468, Price codes: A06 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 92, June 1977. 86 p, 30 fig, 4 tab, 5 plates, 27 ref. OWRT-A-035-IND(1).

Descriptors: *Channel Improvement, *Channel Morphology, *Meanders, *Stream Stabilization, *River training, Bank stability, Channel erosion, Flood control, sediment control, Slope stability, Stream improvement, Channel flow, discharge regime, Shape, Slopes, Width, Drainage ditches, Scour, Braiding, Sediment load, Streambeds, Piles, Riprap, Flood plain, Indiana.
Identifiers: *Channelization, *Channel Morphometry, Pool-Riffle.

Stream channelization results in dislocation of the fluvial regime which are in opposition to the dynamics of natural stream flow. Streams tend to maintain a certain channel form, sinuosity, slope, and load characteristic, so that when one of these parameters is altered, the open thermodynamic system tends to adjust other parameters to regain a quasi-equilibrium state. Big Pine Creek Ditch, in Benton County, Indiana, was channelized in 1932. Subsequent changes in channel form and slope have caused considerable lateral migration, scour and fill at various points down the 7 mile channelized reach. A study of this test stream includes an assessment of the cross-sectional and morphometric deterioration, as meander development and profile adjustments have considerably reduced the channel's drainage capacity. Causes for deterioration are determined and relationship found between stream power and sinuosity. Definition of these relationships has allowed the recognition of design errors, and suggests methods for correction and new designs for drainage improvement. The use of new concepts and designs should lead to the construction of more stable channels. (Wierswa-Purdue)
W77-11939

ESTIMATION OF PARAMETERS OF A UNIFORMLY NONLINEAR SURFACE RUNOFF MODEL,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Nordic Hydrology, Vol 8, No 1, p 33-46, 1977. 6 tab, 9 fig, 11 ref.

Descriptors: *Parametric hydrology, *Runoff forecasting, *Surface runoff, Watersheds(Basins), Runoff, Model studies, Uniform flow, Topographic mapping, Agricultural watersheds, Rainfall, Hydrographs, Precipitation excess.
Identifiers: *Parameters, *Nonlinear surface runoff model, Parameter estimation, Hydrograph prediction, Matrix.

The surface runoff madel, which was based on the concept of uniform nonlinearity, had three parameters. It was shown that the parameters can be estimated from information obtained from a topographic map of the watershed. Previously, the solution involved optimizing the model parameters over a set of rainfall-runoff events by a suitable algorithm in conjunction with an objective function. The optimized parameter values then were used in the model for prediction of surface runoff for rainfall events not used in the optimization. This method has serious limitations. An attempt was made to estimate the parameters of a uniformly nonlinear surface runoff model. An implicit assumption was that no changes take place in watershed physiography over the period in question. If changes do take place and are pronounced in scale, the determining equations have to be rederived. Also, the watersheds, grouped together, have to have similar geologic and physiographic features. The uniformly nonlinear model can be completely specified and is considered a promising tool in watershed hydrology. (Roberts-ISWS)
W77-11985

SHORT COURSE PROCEEDINGS - APPLICATIONS OF STORMWATER MANAGEMENT MODELS, 1976,
Massachusetts Univ. Amherst.
For primary bibliographic entry see Field 6A.
W77-12074

METHODOLOGY FOR EVALUATING THE COST OF URBAN STORMWATER QUALITY MANAGEMENT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W77-12075

LINEAR AND NONLINEAR MODELS FOR PEAK FLOW FORECASTING,
Slovenska Akademie Vied, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 4A.
W77-12083

A SWAMPLAND MODEL,
Ministerio do Interior, Rio de Janeiro (Brazil). Departmento Nacional de Obras de Saneamento.
O. Pfafstetter.
In: Mathematical Models in Hydrology, Volume 2 Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 476-482, 1974. 2 fig.

Descriptors: *Rivers, *Swamps, *Model studies *Mathematical models, Wetlands, Rainfall, Precipitation(Atmospheric), Storage, Evaporation, Infiltration, Floods, Foreign countries, Channels, Foreign research, Backwater, Water balance, Discharge(Water), Hydrology.
Identifiers: Brazil, *Paraguay River(Brazil).

A mathematical model for large rivers running through a very flat plain was described. Outstanding characteristics dealt with by the model were the very large overbank storage, pronounced backwater effect, important water losses by evaporation, infiltration on the flooded area, appreciable water gain from precipitation on the exposed water surfaces, and almost no runoff from the unflooded area. In order to reduce computer time for model runs, the selected river section was divided into only three reaches, and seven-day routing intervals were used. Special measures were conceived to prevent model instabilities related to large routing intervals and long river sections. (See also W77-06708) (Sims-ISWS)
W77-12085

DETERMINATION OF INSTANTANEOUS UNIT HYDROGRAPHS BY LEAST SQUARES POLYNOMIALS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
P. Johnson, and M. Clements.
In: Mathematical Models in Hydrology, Volume 2 Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 101, p 483-492, 1974. 4 fig, 1 tab, 17 ref.

Descriptors: *Unit hydrographs, *Model studies *Synthetic hydrology, *Least squares method Watersheds(Basins), Hydrographs, Rainfall, Runoff, Streamflow, Simulation analysis, Mathematical studies, mathematical models, Regression analysis, Hydrology.
Identifiers: *Polynomials.

After reviewing the dichotomy of approach used in deriving unit hydrographs, the theory of least squares polynomials and their application to the convolution integral was detailed. A method for deriving the instantaneous unit hydrograph using a least squares polynomial technique was outlined and results of applying the method to three real flood events were discussed. (See also W77-06708) (Sims-ISWS)
W77-12086

REPRESENTATION OF A CATCHMENT BY A NETWORK OF RESERVOIRS,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-12088

A MULTIPLE INPUT SYSTEM MODEL FOR THE HYDROLOGICAL BASIN,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-12089

RAINFALL-DISCHARGE TRANSFORMATION MODELS MAY BE DIVIDED INTO TWO CATAGORIES (LES MODELES DETERMINISTES DE TRANSFORMATION DES PRECIPITATIONS EN DEBIT),
Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).
For primary bibliographic entry see Field 2A.
W77-12090

BEHAVIOUR AND PHYSICAL STABILITY OF SHEETFLOW IN SURFACE RUNOFF MODELS,
Prague Agricultural Univ. (Czechoslavakia). Dept. of Water Resources.
V. Jelen, J. Nemec, and J. Zezulak.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 616-623, 1974. 3 fig, 4 ref.

Descriptors: *Surface runoff, *Sheet flow, Model studies, Mathematical models, Simulated rainfall, Laboratory tests, Flow, Analytical techniques, Watersheds(Basins), Hydrodynamics, Computer models, Analog computers, hydrology.

Verification of mathematical simulation of surface runoff using a laboratory catchment model involves the measuring of sheetflow produced by a rain simulator on the model. The depth of sheetflow and its surface are subject to changes resulting from the possible wave regime of the flow. The conditions of formation, forms and parameters of the wave regime were ascertained numerically by analog computer, and its mathematical expression was discussed using the results of the numerical computation. (See also W77-06708) (Sims-ISWS)
W77-12094

A MATHEMATICAL MODEL FOR FLOOD WAVE SIMULATION USING SYNTHETIC RAINFALL DATA FOR A VAST WATERSHED,
Institute for Water Resources, Belgrade (Yugoslavia).
M. Brajkovic, S. Jovanovic, and R. Dakkak.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 624-633, 1974. 8 fig, 5 ref.

Descriptors: *Flood waves, *Floods, *Model studies, Mathematical models, Rainfall, Foreign countries, Runoff, Foreign research, Hydrographs, Watersheds(Basins), Simulation analysis, Discharge(Water), Rivers, Flood flow, Flood peak, Flood discharge, Hydrology.
Identifiers: *Zapadna Morava River(Yugoslavia), Velika Morava River(Yugoslavia).

In this paper an approach for flood wave simulation over a vast catchment area was presented. The mathematical model of the Zapadna Morava River basin and rainfall-runoff relationships was verified using historical rainfall records and the corresponding observed hydrographs. To generate the flood waves at a number of control sections, 29 synthetic daily rainfall series for 22 rain gaging stations in the same watershed were used. From each rainy season, lasting from 1 March to 30 June, only the rainy spell was selected. Hence, 29 flood events were obtained by simulation which are supposed to have the highest peak discharges in the period considered (March-June). To test the results obtained, in this phase of study a frequency analysis of synthetic peak discharges was done, and the results were compared with frequency analysis of historical annual floods in V. Morava River basin. (See also W77-06708) (Sims-ISWS)
W77-12095

NATURAL CATCHMENT REPRESENTATION BY A SERIES MODEL OF LINEAR CHANNELS-PART 1,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-12096

NATURAL CATCHMENT REPRESENTATION BY A SERIES MODEL OF LINEAR CHANNELS-PART 2,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-12097

A DETERMINATE MODEL FOR RUNOFF AS A NONLINEAR SYSTEM,
Gatehouse Farm, Essex (England).
F. V. Appleby.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 667-687, 1974. 8 fig, 2 tab, 35 ref.

Descriptors: *Watersheds(Basins), *Hydrograph analysis, *Model studies, *Reviews, Streamflow, Rainfall-runoff relationships, Hydrographs, Hydrological systems, Baseflow, Surface runoff, Storm runoff, Theoretical analysis, Analytical techniques, Analysis, Mathematical models.

An outline presentation of a tentative general theory of streamflow runoff based on (1) the Horton-Zoch dichotomy for total runoff as a system of two independent states of flow, a 'baseflow' and a 'surfaceflow:' and (2) a generalization of the Dooge concept of a translation association for the subsystems. The complete mathematical model is a strongly nonlinear and compact system construction with scope for development. The system is self-adaptive and directly dependent on rainfield episode conditions. The mathematical theories of distributions, probability and parabolic systems are applicable disciplines. Parallels with molecular physics and biological associations were suggested. The theory was supported by hydrograph decompositions from a wide range of watershed conditions. (See also W77-06708) (Humphreys-ISWS)
W77-12099

PHYSICO-STATISTICAL MODEL OF RAINFALL FLOOD FORMATION AND DETERMINATION OF ITS PARAMETERS,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2A.
W77-12100

ROLE OF WES IN THE DEVELOPMENT OF HYDRODYNAMIC WATERSHED MODELS,
Illinois Univ. at Urbana-Champaign. Hydrosystems Section.
For primary bibliographic entry see Field 2A.
W77-12107

SIMULATING OVERLAND FLOW ON HILLSLOPES WITH A KINEMATIC CASCADE,
Agricultural Research Service, Beltsville, Md. Hydrography Lab.
For primary bibliographic entry see Field 2A.
W77-12108

A GENERALIZED STREAMFLOW SIMULATION SYSTEM,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 2A.
W77-12113

HYDROLOGIC DATA FOR NORTH CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-12155

MAXIMUM FLOODFLOWS IN THE CONTERMINOUS UNITED STATES,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-12156

2F. Groundwater

HYDROGEOLOGY OF THE IOSEGUN LAKE AREA, ALBERTA,
Research Council of Alberta, Edmonton.
O. Tokarsky.
Report 76-2, 1977. 12 p, 1 map, 14 ref. $2.00.

Descriptors: *Hydrogeology, *Areal hydrogeology, *Groundwater, *Canada, Topography, Maps, Climatology, Precipitation(Atmospheric), Geology, Geologic formations, Wells, Water wells, Water levels, Aquifers, Sandstones, Springs, Water yield, Water resources, Water chemistry, Dissolved solids.
Identifiers: *Iosegun Lake Area(Alberta), *Alberta(Canada).

The Iosegun Lake area is covered only thinly by drift in the more rugged, hilly areas. The drift thickness may exceed 200 feet (60 m) in the area of Little Smoky River where thick buried valley sand forms an important aquifer from which yields in excess of 25 igpm (2 l/sec) are common. A continental sandstone-shale sequence, the Paskapoo Formation of Paleocene-Late Cretaceous age, underlies most of the southern and southwestern parts of the area and contains sandstone aquifers generally capable of producing upwards of 25 igpm (2 l/sec) to a single well. The Wapiti Foundation, a continental sequence of bentonitic and clayey sandstones of Late Cretaceous age, underlies the remainder of the area. Aquifers within the formation generally are thin and discontinuous. Yields in a single well usually range from 5 to 25 igpm (0.4 to 2 l/sec). Sodium bicarbonate waters with total dissolved solids contents between 500 and 1500 ppm are the rule in the normally utilized aquifers, although wells completed in the Paskapoo Formation tend to have somewhat higher percentages of calcium and magnesium, and lower total dissolved solids contents. (Sims-ISWS)
W77-11587

HYDROGEOLOGY OF THE MOUNT ROBSON-WAPITI AREA, ALBERTA,
Research Council of Alberta, Edmonton.
R. Barnes.
Report 76-5, 1977. 36 p, 3 fig, 1 tab, 1 map, 23 ref, 1 append. $2.00

Descriptors: *Hydrogeology, *Areal hydrogeology, *Groundwater, *Canada, *Rocky Mountain Region, Topography, Drainage, Maps, Climatology, Precipitation(Atmospheric), Runoff, Geology, Geologic formations, Wells, Water wells, Test wells, Aquifers, Springs, Water yield, Water chemistry, Dissolved solids, Water resources.
Identifiers: *Mount Robson Area(Alberta), *Wapiti Area(Alberta), *Alberta(Canada).

Within the Rocky Mountain and Foothills, bedrock aquifers are characterized by fracture permeability and have structural rather than lithological boundaries. Flow systems are thought to be generally shallow and are bounded by major thrust fault zones which form highly permeable conduits for groundwater movement in both horizontal and vertical planes. Discharge from shallow bedrock aquifers is most abundant along

the fault zones, and flow rates increase with decreasing elevation from about 10 igpm to more than 1500 igpm (0.75 to 110 1/s). Northeast of the Rocky Mountains, the dissected Western Alberta High Plains are underlain by fractured sandstone and shale of the Paskapoo Formation. Fracture permeability leads to rapid transmission of groundwater, and water quality is excellent. The water table is often deep below the surface, and calcium-magnesium ion ratios range between 3 and 4. Northeast of the High Plain, natural discharge features are rare. Total dissolved solids contents of groundwater from shallow bedrock aquifers increase from less than 500 ppm on the northeast edge of the High Plain, natural discharge features are rare. Total dissolved solids contents of groundwater from shallow bedrock aquifers increase from less than 500 ppm on the northeast edge of the High Plains to highs of 2000 to 2500 ppm on the Wapiti Plain, and sodium and potassium gradually become the dominant cations. Yields range from 100 to 500 igpm (7.6 to 38 1/s) in alluvial outwash gravels of the Rocky Mountain Foothills and High Plains, and 1 to 25 igpm (0.076 to 1.9 1/s) in sandstone, shale, and coal aquifers of the Upper Cretaceous Wapiti Formation. Yields from bedrock aquifers of the Rocky Mountains generally are unpredictable, but carbonate rock types probably are the most highly yielding. (Sims-ISWS)
W77-11588

HYDROGEOLOGY OF THE WHITECOURT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
O. Tokarsky.
Report 76-3, 1977. 12 p, 1 map, 10 ref. $2.00.

Descriptors: *Hydrogeology, *Areal hydrogeology, *Groundwater, *Canada, Topography, Maps, Drainage, Climatology, Precipitation(Atmospheric), Runoff, Geology, Geologic formations, Wells, Water wells, Water levels, Aquifers, Springs, Water yield, Water chemistry, Dissolved solids, Water resources.
Identifiers: *Whitecourt Area(Alberta), *Alberta(Canada).

The Whitecourt map area is covered only thinly by a drift over most of the region northwest of the Athabasca River. The drift thickness may exceed 100 ft (30 m) in places in the southern, southeastern, and eastern parts of the area in buried valleys. Sand and sand and gravel within the valleys form important aquifers which may yield upwards of 25 igpm (about 2 1/sec) to a single well. Two formations, both continental shale-sand sequences (the Paskapoo Formation of Paleocene-Late Cretaceous age and the Wapiti Formation of Late Cretaceous age) underlie most of the area. Single well yields from aquifers within the formations generally range from 5 to 25 igpm (0.4 to 2 1/sec), although areas of both higher and lower production are to be found. Sodium bicarbonate waters with total dissolved solids contents from 500 to 2000 ppm are the rule within commonly utilized aquifers at depths of less than 500 ft (150 m). The total dissolved solids contents are lowest in wells in the areas with more rugged topography, and highest in the area of low relief. (Sims-ISWS)
W77-11589

A METHOD OF CALCULATING THE HYDRAULIC PROPERTIES OF LEAKY AQUIFER SYSTEMS,
VIAK A. B., Falun (Sweden).
G. Gustafson.
Nordic Hydrology, Vol. 8, No. 2, p 65-82, 1977. 14 fig, 2 tab, 4 ref, 2 append.

Descriptors: *Aquifer testing, *Hydraulic properties, *Artesian aquifers, *Leakage, *Glacial aquifers, Pumping, Drawdowns, Storage coefficient, Permeability, Transmissivity, Graphical analysis, Aquicludes, Groundwater movement, Observation wells, Boundaries(Surfaces), Drains, On-site tests, Analytical techniques, Curves, Foreign research.
Identifiers: *Eskers, *Leakage factor, *Sweden, Image wells, Barrier boundaries, Drain function, Channel aquifers, Type curves.

The paper described a method for calculating the hydraulic properties of esker aquifers where a leakage to the aquifer is induced by pumping. The method is an extension of the channel method described in an earlier paper. As an example of the applicability of the method, a short description of a performed pump-test was given. (Visocky-ISWS)
W77-11605

FLUCTUATIONS IN THE WATERLEVEL IN WELLS DUE TO VARIATIONS IN ATMOSPHERIC PRESSURE,
TERRAQUA ApS, Kalundborg (Denmark).
For primary bibliographic entry see Field 4B.
W77-11606

ESTIMATION OF TRANSMISSIVITY AND PERMEABILITY IN SWEDISH BEDROCK,
Chalmers Univ. of Technology, Goteborg (Sweden).
L. Carlsson, and A. Carlstedt.
Nordic Hydrology, Vol. 8, No. 2, p 103-116, 1977. 8 fig, 3 tab, 14 ref.

Descriptors: *Transmissivity, *Europe, *Bedrock, *Permeability, Pump testing, Groundwater, Water yield, Specific yield, Drawdown, Hydrology, Foreign research, Foreign countries, Groundwater resources, *Estimating.
Identifiers: *Groundwater evaluation, *Sweden.

Statistical analysis of pumping-test data from wells was used to calculate average values of transmissivity and permeability in different Swedish rocks. The influence of the well-loss on the calculations was discussed. The highest values of transmissivity and permeability of the investigated rocks were found in the sandstones of Algonkian and Cambrian age. The Archean crystalline rocks show a wide range of results, and of the investigated rocks, the gneisses seem to be more permeable than the granites. However, the degree of tectonization affects the hydraulic properties of the rocks considerably. (Lee-ISWS)
W77-11607

SOIL WATER MODELING II: ON SENSITIVITY TO FINITE DIFFERENCE GRID SPACING,
Agricultural Research Service, Columbia, Mo.
For primary bibliographic entry see Field 2G.
W77-11795

HOT GROUNDWATER SYSTEMS IN ICELAND TRACED BY DEUTERIUM,
Iceland Univ., Reykjavik. Science Inst.
B. Arnason.
Nordic Hydrology, Vol 8, No 2, p 93-102, 1977. 3 fig, 21 ref.

Descriptors: *Groundwater, *Geothermal studies, *Thermal water, *Deuterium, On-site investigations, Surveys, Foreign countries, Tracers, Foreign research, Oxygen, Stable isotopes, Isotope studies, Recharge, Wells, Springs, Thermal springs, Precipitation(Atmospheric), Groundwater movement, Hydrology.
Identifiers: *Iceland.

Deuterium and oxygen-18 were used as natural tracers for hydrothermal systems in Iceland, and results were summarized. The deuterium content of a single sample of a local cold spring or river, except those rivers fed by considerable amount of glacier melt water, can be used to estimate the mean deuterium concentration of precipitation in the corresponding locality. Furthermore, the deuterium content of the last winter layer, collected on Icelandic glaciers in spring before the melting season, is practically identical to the mean value of the corresponding annual precipitation. These facts were used to draw a detailed map showing the amount of deuterium in precipitation over the whole country. Deep ice core studies showed that the deuterium content of precipitation in each place has remained more or less unchanged during the last 8000 years. Measurements of both deuterium and oxygen-18 in the groundwater have confirmed that all groundwater in Iceland is originally meteoric, and that the deuterium content of the thermal water does not change on its way through the bedrock. The deuterium content of water discharging from hot springs or drill holes is often very different from the deuterium content of local precipitation. On the other hand, by comparing results obtained with the deuterium map, it is often possible to find where the water has fallen as rain and to trace its underground flow path. Deuterium measurements were made on water from nearly all geothermal areas in the country. (Sims-ISWS)
W77-11812

COMPREHENSIVE GEOHYDROLOGICAL STUDY OF CONSOLIDATED SEDIMENTARY ROCKS IN BORNHOLM,
TERRAQUA ApS, Kalundborg (Denmark).
T. Sorensen, and H. O. Hansen.
Nordic Hydrology, Vol 8, No 2, p 117-128, 1977. fig, 8 ref.

Descriptors: *Aquifer systems, *Europe, *Hydrogeology, Hydraulic properties, *On-site investigations, Mathematical models, Pumping, Geologic mapping, Sedimentary rocks, Borehole geophysics, Logging(Recording), Planning, Groundwater recharge, Observation wells, Drawdown, Graphical analysis, Leakage, Transmissivity, Storage coefficient, Tritium, Resistivity, Porosity, Foreign research, Foreign countries.
Identifiers: *Denmark, *Bornholm(Denmark).

Problems and procedures concerning planning and execution of geohydrological investigations of aquifer systems composed of consolidated sedimentary rocks were discussed. The discussion was illustrated by investigations in an area on the island of Bornholm, Denmark, where the aquifer system is composed of inclined and faulted beds of sand-, silt- and claystone. The investigations included the following elements: (1) Hydrogeological mapping; (2) geophysical investigations and well-logging (gamma-, resistivity-, flow- and conductivity-log); (3) Pumping-test, evaluation of hydraulic properties of the aquifers, construction of mathematical model; and (4) delineation of infiltration areas and evaluation of potential infiltration, protection against groundwater pollution. The paper emphasized the general procedure for engineering geohydrological investigations of consolidated sedimentary rocks and the correlation of the information collected by different methods. (Visocky-ISWS)
W77-11813

RELATIONSHIP OF TECTONIC STRUCTURE TO AQUIFER MECHANICS IN THE WESTERN GRAND CANYON DISTRICT, ARIZONA,
Wyoming Univ., Laramie. Dept. of Geology.
P. W. Huntoon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 308. Price codes: A05 in paper copy, A01 in microfiche. Wyoming, Water Resources Research Institute, Laramie, Water Resources Series No. 66, April 1977. 51 p, 8 fig, 4 tab, 40 ref. OWRT B-031-WYO(1), 14-34-0001-6134.

Descriptors: *Groundwater geology, *Groundwater potential, *Groundwater recharge, *Aquifer characteristics, *Arizona, Permeability, Limestone, Carbonate rocks.
Identifiers: *Groundwater prospecting, *Grand Canyon district(Ariz).

The Rampart Cave Member of the Muav Limestone is the major aquifer in the western Grand Canyon district based on spring locations in the walls of the Grand Canyon. Permeabilities of the Paleozoic rocks are locally enhanced by faulting. Caves are not associated with springs in the area. Most of the waters discharging from the carbonate rocks are of the calcium-magnium-bicarbonate type; total dissolved solids range between 272 and 810 mg/1, temperatures range between 69 and 80F, and discharges range up to about 7 cu ft/sec. Minimum recharge rates are on the order of 0.1 in/yr. Total spring and seep discharge is approximately 20 cu ft/sec. Prospects for developing large ground water supplies in the district are dim because the total recharge is small, permeabilities are small, and there are no extensive permeable zones under the plateaus in which large quantities of water are in storage. Selected fault zones that supply water to large springs offer the most promising areas for drilling. Drill sites should be located on the downthrown block along the fault and the hole should penetrate to the bottom of the Rampart Cave Member. Minimum drilling depths along promising faults in the area are 1900 ft. Prospects for ground water development from the Paleozoic rocks in the Shivwits plateau are virtually nonexistent because the rocks in the region appear to be essentially dry, even along permeable fault zones.
W77-11867

MOVEMENT OF MOISTURE IN THE UNSATURATED ZONE IN A LOESS-MANTLED AREA, SOUTHWESTERN KANSAS,
Geological Survey, Mineola, N.Y. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-11872

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--GREAT BASIN REGION,
Geological Survey, Carson City, Nev. Water Resources Div.; and Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-11873

DIGITAL MODEL ANALYSIS OF THE PRINCIPAL ARTESIAN AQUIFER, SAVANNAH, GEORGIA AREA,
Geological Survey, Doraville, Ga. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11879

GROUND WATER RECHARGE IN WESTERN UTTAR PRADESH,
Indian Inst. of Tech., Kanpur. Dept. of Chemistry.
For primary bibliographic entry see Field 4B.
W77-11932

A DISCRIMINANT FUNCTION FOR GROUND WATER EXPLORATION,
Southern Methodist Univ., Dallas, Tex. Geophysics Div.
D. J. Jin.
Texas Journal of Science, Vol 27, No 1, March, 1976, p 87-94, 2 tab, 1 ref.

Descriptors: *Groundwater, *Groundwater potential, *Aquifer characteristics, *Permeability, Porosity, *Aquifers, *Aquifer testing, Groundwater movement, Groundwater resources, Surface-groundwater relationships, Exploration, Evaluation, Locating, Water sources, Mathematical studies.
Identifiers: Grain size, Discriminant function.

A function expressing the relationship of an aquifer's grain size, porosity, and permeability is established for use as a standard in determining the suitability of an area for ground water development. Data used in establishing the function were collected from aquifers already proven to be suitable or not suitable for ground water development. Results support both the discriminant function as a powerful analytical tool for ground water exploration and the choice of grain size, porosity, and permeability as good discriminatory variables. (Ullery-Arizona)
W77-12003

A MULTI-LAYER MODEL FOR GRAVITY DRAINAGE OF UNSATURATED SOIL,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
G. Glugla.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 608-615, 1974. 5 fig, 1 tab, 2 ref.

Descriptors: *Subsurface drainage, *Groundwater movement, *Groundwater recharge, *Model studies, Soil water, Infiltration, Groundwater, Evapotranspiration, Rainfall, Snowmelt, Precipitation(Atmospheric), Moisture content, Root zone, Mathematical models, Recharge, Hydrology.
Identifiers: *Gravity drainage.

The increasing demands on water resources as a result of the rapid industrial development in the German Democratic Republic require a detailed research of the water balance components. Knowledge of the annual course of natural groundwater recharge is an essential prerequisite towards optimal withdrawal policy for groundwater systems. Starting from the diffusion equation for water movement in unsaturated soils, a simple mathematical multi-layer model was developed to calculate vertical water movement in the unsaturated soil. The multi-layer model allows the computation of gravity drainage and water content of the soil continuously, depending on such primary factors as precipitation, evapotranspiration, and soil retention. The mathematical multi-layer model is suitable for calculating the annual course of natural groundwater recharge for areas without capillary rise of water from the groundwater level into the root zone. The testing of the multi-layer model was carried out with measured data from weighing lysimeters. (See also W77-06708) (Sims-ISWS)
W77-12093

MODELLING GROUNDWATER RESOURCES REPLENISHMENT DUE TO RIVER FLOW IN THE FLOOD PERIOD DURING THE OPERATION OF INFILTRATION WATER INTAKE,
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
I. I. Krashin, and D. I. Peresunjko.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 815-820, 1974. 3 fig.

Descriptors: *Model studies, *Groundwater recharge, *Aquifer characteristics, *Hydrogeology, Analog models, Simulation analysis, Alluvial aquifers, Seepage, Infiltration, Rivers, Floods, Mathematical models, Water yield, Well spacing, Foreign research, Foreign countries.
Identifiers: *USSR, *Sergi river valley(Ural).

The process of periodical drainage in the dry weather period and alluvial aquifer replenishment due to infiltration in the flood period was simulated on an analog computer USM-1 (RC-network) for the Sergi river valley (Ural). The infiltration yield is just twice the dry weather flow of the river. The model takes account of water-bearing rocks of double-layer structure, anisotropy of the seepage coefficient of alluvium in plan and section, and the ratio of groundwater and river water which varies in annual and perennial cycles. The modelling showed that groundwater resources are formed due to seepage from the river and periodical drainage of alluvial storage. The modelling also showed that the previously designed pattern of locating wells of a water intake must be changed. The disadvantage of the design pattern is that a large part of the water intake is located in an area of insufficient alluvial regulating storage, which results in a sharp drawdown in these wells' levels and is accompanied by the complete drainage of individual large blocks of alluvium. The optimum pattern of locating wells of the water intake was selected with the aid of the model. (See also W77-06708) (Humphreys-ISWS)
W77-12110

GROUNDWATER CHEMISTRY AND THE TRANSPORT EQUATIONS,
Princeton Univ., N.J. Water Resources Program.
G. F. Pinder, and J. D. Bredshoeft.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 831-837, 1974. 9 ref.

Descriptors: *Groundwater movement, *Finite element analysis, *Model studies, *Numerical analysis, Mathematical models, Chemical reactions, Groundwater, Convection, Equations, Porous media, Open channel flow, Flow, Hydrologic aspects, Hydrologic systems, Base flow, Surface water, Surface-groundwater relationships, Simulation analysis, *Geochemistry.

Continuum theory was used as a frame of reference in which to view efforts to apply numerical methods to hydrological problems. In order to manage effectively groundwater developments, it is necessary to predict the response of groundwater systems to various hydrological stresses. To predict the response generally requires simulation of the field problem through the use of a deterministic model. In the most general case, the complete physical-chemical description of moving groundwater must include chemical reactions in a multicomponent fluid and requires the simultaneous solution of the differential equations that describe the transport of mass, momentum, and energy in porous media. The difficulties encountered in solving this set of equations for real problems have forced hydrologists to consider simplified subsets of the general problem. The equation of motion for single component groundwater flow, which describes the rate of propagation of a pressure change in an aquifer, has been solved for many different initial and boundary conditions. In order to describe the transport of miscible fluids of different density, such as salt water and freshwater, the mass transport equation and the equation of motion were coupled and were solved numerically. Numerical solutions also were obtained for the heat transport equation and the equation of motion, particularly for convection problems. The challenging problem for the future is the simultaneous solution of the mass, momentum and energy equations for porous flow and simulation of the complete groundwater system. (See also W77-06708) (Humphreys-ISWS)
W77-12112

SENSITIVITY ANALYSIS IN AQUIFER STUDIES,
Stanford Univ., Calif. School of Earth Sciences.
For primary bibliographic entry see Field 4B.
W77-12160

2G. Water In Soils

SOIL AERATION, NITRATE REDUCTION AND FLOODING TOLERANCE IN HIGHER PLANTS,
Seville Univ. (Spain). Dept. of Ecology.
For primary bibliographic entry see Field 3C.
W77-11517

THE DEPTH OF PENETRATION WITH WATER OF THE PESTICIDE BHC IN THE PRESENCE OF SULFANOL INTO THE GROUND, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikriobiologii i Gigieny, Vilnius (USSR).
For primary bibliographic entry see Field 5B.
W77-11523

INTERFACIAL REACTIONS AND THE FATE OF HEAVY METALS IN SOIL-WATER SYSTEMS,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5B.
W77-11524

ORGANIC MATTER AND PARATHION DEGRADATION IN FLOODED SOIL,
Central Rice Research Inst., Cutrack (India).
For primary bibliographic entry see Field 5B.
W77-11561

ESTIMATION OF NET WATER DEMAND OF CROPS IN THE UPPER BERG RIVER VALLEY,
Soils and Irrigation Research Inst., Potchefstroom (South Africa).
For primary bibliographic entry see Field 3F.
W77-11580

EVALUATION OF THEORETICALLY PREDICTED THERMAL CONDUCTIVITIES OF SOILS UNDER FIELD AND LABORATORY CONDITIONS,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soil and Water.
A. Hadas.
Soil Science Society of America Journal, Vol. 41, No. 3, p 460-466, May-June 1977. 7 fig, 18 ref.

Descriptors: *Soil water movement, *Heat transfer, *Water vapor, Soil moisture, Soil water, Soil temperature, Irrigation, Irrigation effects, Thermal conductivity, Model studies, On-site investigations, Laboratory tests, Soil physics, Agriculture, Soil science.
Identifiers: Vapor movement.

In the literature one finds claims that the Philip-deVries model of heat and moisture transfer fails to predict the amounts of water moved by vapor transfer. In the work reported here, an attempt was made to check and to verify the predictive capabilities of the deVries, Philip and deVries models for vapor transfer by evaluating the latent heat transfer carried by vapor rather than to account for vapor flow from the usually performed total moisture balance. It was found that the deVries model predicts accurately the transfer of heat by vapor under steady-state conditions, but the model underestimates transfer of heat under nonsteady-state conditions. The possibility that the assumed diffusive vapor transport should be corrected by including 'enhancement factors' so as to incorporate local thermal gradients and mass movement induced vapor transfer, not accounted by the present model, was brought up; and the nature of the enhancement factors and the implications to field conditions were discussed. (Sims-ISWS)
W77-11611

EVALUATING WEATHERING CHARACTERISTICS OF WATER-HARVESTING CATCHMENTS FROM RAINFALL-RUNOFF ANALYSES,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W77-11612

A METHOD FOR THE SIMULTANEOUS CONTROL OF THE WATER REGIME AND GASEOUS ATMOSPHERE IN SOIL COLUMNS,
Utah State Univ., Logan. Dept. of Soil Science.
R. J. Wagenet, and J. L. Starr.
Soil Science Society of America Journal, Vol 41, No 3, p 658-659, May-June 1977. 1 fig, 4 ref.

Descriptors: *Soil water, *Leaching, *Soil gases, Equipment, Laboratory tests, Laboratory equipment, Nitrogen, Water chemistry, Soil water movement, Soil physics, Soil science.
Identifiers: *Soil columns.

A technique which is useful in laboratory soil columns was described. The technique allows control of soil water content, regulation of the average composition of the soil atmosphere, and collection of leachate in variable increments. The design and construction of the system, as well as its advantages and disadvantages, were explained in detail, and references were made to the adaptability of the technique to studies involving N transport and transformation, microbial populations, salinity, reduction-oxidation reactions, or soil gas sampling. (Sims-ISWS)
W77-11614

A MODIFIED MERCURY TENSIOMETER,
Ministry of Agriculture and Natural Resources, Nicosia (Cyprus). Dept. of Water Development.
L. Savvides, R. S. Ayers, and M. Ashkar.
Soil Science Society of America Journal, Vol 41, No 3, p 660-661, May-June 1977. 1 fig.

Descriptors: *Tensiometers, *Equipment, *Soil water, Manometers, Foreign research, Mercury, Instrumentation, Tension, Moisture tension, On-site investigations, Irrigation, Moisture content, Agriculture, Soil science.
Identifiers: *Cyprus, Mercury tensiometers, Moisture-measuring equipment.

A modified type of Hg tensiometer was introduced. The manometer in the tensiometer uses the usual principal as other Hg manometers use. However, the main difference in the modified tensiometer is that the Hg manometer is contained within the tensiometer body itself. A relatively small volume of Hg is used, and the small mercury reservoir can be filled or emptied rather easily. Once the reservoir is filled, the mercury usually can be safely left for the lifetime of the tensiometer. Tensiometers of the proposed design have been handled successfully for scheduling irrigation on shallow soils by unskilled farmers in Cyprus for the last 4 years. (Sims-ISWS)
W77-11615

AN ULTRASONIC NEBULIZATION TECHNIQUE FOR ADDING AQUEOUS SOLUTIONS UNIFORMLY TO DRY SOILS,
Montana State Univ., Bozeman. Dept. of Chemistry.
A. Mubarak, R. Woodriff, and R. A. Olsen.
Soil Science Society of America Journal, Vol 41, No 3, p 661-662, May - June 1977. 2 fig, 2 tab, 4 ref.

Descriptors: *Soil moisture, *Laboratory equipment, *Wetting, Aqueous solutions, Electrolytes, Soil water, Laboratory tests, Equipment, Water vapor, Moisture content, Aerosols, Soils, Soil tests, Soil physics, Soil science.
Identifiers: Nebulizers.

An ultrasonic nebulizer was utilized successfull to provide a relatively convenient laborator means for wetting dry soil with aqueous solution to any selected moisture or electrolyte conten The technique is believed to cause a minimum c alteration of the chemical and physical propertie of the sample and causes aqueous solutions t become very uniformly distributed throughout a accessible zones. (Sims-ISWS)
W77-11616

WATER INTAKE BY A WATER-FILLED PLEX IGLAS PERMEAMETER CELL,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy
G. Y. Tsuji, and D. Swartzendruber.
Soil Science Society of America Journal, Vol 4 No 3, p 662-664, May-June 1977. 2 fig, 4 ref.

Descriptors: *Permeameters, *Laboratory equip ment, *Plastics, Soil tests, Permeability, Equip ment, Instrumentation, Absorption, Water los Laboratory tests, Soil science.
Identifiers: *Acrylic plastic, Plexiglas, Water ab sorption by plastic.

Water entry into a Plexiglas (acrylic plastic) pe meameter cell was measured by the recession o water in capillary standpipes connected to th water-filled cell. Submergence of the permeamet in water demonstrated that the water entry was n caused primarily by a slight leak in the permeam ter or by water vapor diffusion through its wall Also, the rate essentially was unaffected when th permeameter contained a water-saturated mixtu of sand, silt, and bentonite. Calculations for th permeameter in air indicated the observed intak rate to be 20 times that attributable to water vapo diffusion through the Plexiglas walls, and 1/8 th attributable to direct water absorption as obtaine from a maximal handbook value. Hence, it ap pears that direct absorption by the Plexiglas is th likely cause of water entry into the permeamete (Sims-ISWS)
W77-11617

CYANIDE MOBILITY IN SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water an Engineering.
For primary bibliographic entry see Field 5B.
W77-11619

THE EFFECT OF SALINITY OF QARUN LAK ON THE ADJACENT SOIL,
Ministry of Agriculture, Cairo (Egypt). Soils an Water Research Inst.
For primary bibliographic entry see Field 2H.
W77-11625

SOME CHARACTERISTICS OF SOIL CRUST IN CALCAREOUS SOIL,
Ministry of Agriculture, Cairo (Egypt). Soils an Water Research Inst.
Sh. Milad, and M. El Hakim.
Agricultural Research Review (Cairo), Vol 54, N 4, April, 1976. p 75-79, 3 tab, 7 ref.

Descriptors: *Calcareous soils, *Soil-water-pla relationships, *Drying, *Soil properties, *Calciu carbonate, *Soil surfaces, Deserts, Arid land Agriculture, Crop production, Permeability, Roo development, Soil texture, Particle size.
Identifiers: *Soil crusts, Seedlings, Root hair Egypt.

The harmful effects upon seedlings of soil crustin in calcareous soils severely limits potential cro production. To help find appropriate methods o reclamation, a study of some characteristics of so crusting was carried out. Composite samples o crusted surface calcareous soils and adjacen depths were collected from an uncultivated are near Alexandria, Egypt and analyzed. Chemica analysis of water extracts from both sample revealed low salt contents suggesting granulome

ric size distribution as an explanation of crust formation. A wide difference in fine particle content was found to exist between the two samples, suggesting great significance in regard to their relative permeability and plasticity. The high plasticity and low permeability of the crust sample relative to the underlying sample results in vertically and horizontally cracked crust upon drying, thus explaining the damaging effect of soil crust upon seedling root hairs. Furthermore, the low permeability of the crust renders irrigation difficult. Crusts may also interfere with O2 and CO2 interchange between soil and atmosphere. (Ullery-Arizona)
W77-11626

RESTRICTED DRAINAGE AND ITS EFFECT ON RISING GROUND WATER TABLE AND SOIL SALINITY,
Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
For primary bibliographic entry see Field 4B.
W77-11627

A STUDY ON THE MOISTURE AVAILABILITY AND OTHER CONDITIONS OF UNSTABILISED DUNES IN THE CONTEXT OF PRESENT LAND USE AND THE FUTURE PROSPECTS FOR DIVERSIFICATION,
Central Arid Zone Research Inst., Jophpur (India).
For primary bibliographic entry see Field 4D.
W77-11628

WATER REPELIENCY OF SOILS UNDER CITRUS TREES IN EGYPT AND MEANS OF IMPROVEMENT,
Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
For primary bibliographic entry see Field 2I.
W77-11633

EFFECTS OF SODIUM SULFATE AND SODIUM CARBONATE SOLUTIONS ON CHEMICAL AND PHYSICAL PROPERTIES OF A CHERNOZEM SOIL,
Department of Agriculture, Vegreville (Alberta). Solonetzic Soil Sub-Station.
For primary bibliographic entry see Field 2K.
W77-11650

DISTRIBUTION OF NITRIFYING AND HETEROTROPHIC MICROORGANISMS IN CUTOVER PEATS,
For primary bibliographic entry see Field 5C.
W77-11651

WATER STATUS AND DISTRIBUTION OF CYANIDIUM CALDERIUM IN SOIL,
California Univ., Los Angeles. Dept. of Bacteriology.
D. W. Smith, and T. D. Brock.
J Phycol. 9(3), p 330-332, 1973.

Descriptors: *Soil algae, *Distribution, Mosses, *Photosynthesis, Soils, Soil water, Lichens.
Identifiers: *Cyanidium-Caldarium.

The size and photosynthetic ability of C. caldarium populations in soil were related to the water status of soil, wetter soil areas having larger populations and more extensive photosynthesis. The application of the direct methods used to the study of other soil algae, mosses, and lichens is discussed.--Copyright 1974, Biological Abstracts, Inc.
W77-11788

SOIL WATER MODELING II: ON SENSITIVITY TO FINITE DIFFERENCE GRID SPACING,
Agricultural Research Service, Columbia, Mo.
C. R. Amerman, and E. J. Monke.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 3, p 478-484, 488, May-June 1977. 10 fig, 2 tab, 18 ref.

Descriptors: *Soil water, *Soil water movement, *Model studies, *Mathematical models, Infiltration, Finite element analysis, Analytical techniques, Mathematics, Water levels, Flow, Hydraulic conductivity, Saturated flow, Unsaturated flow, Hydrology.
Identifiers: *Grid size effects, Grid spacing, Model grids.

The influence of finite difference grid size on soil water flow model accuracy was studied using two cases. One case was of steady, two-dimensional infiltration using the successive overrelaxation (SOR) method of solving finite difference equations. The other case was of transient, two-dimensional infiltration using the alternating direction implicit (ADI) method. Finite difference expressions were formulated for both cases using central differencing techniques. In the transient case, a very small grid size in both time and space dimensions was necessary at the initiation of infiltration. Furthermore, the ADI method for the nonlinear case was only conditionally stable-at least at the initiation of infiltration. As infiltration proceeded, however, both the time and the space grid sizes could be made larger. Indicators of a grid size that was obviously too coarse were a fluctuating infiltration rate in the transient case and irregulary shaped equipotential lines in the steady-state case. Although the models were nonlinear, they both converged; i.e., successively smaller grid sizes yielded solutions that asymptotically approached a limit. For a given regular grid size, considerable computational saving could be effected without appreciable loss of accuracy by using an irregular grid in which the regular grid size was duplicated in the part of the section exhibiting the greatest curvature of equipotential lines, while larger grid sizes could be used in other parts of the section. Smaller grid sizes also were needed in regions where hydraulic gradient changed rapidly. Accuracy of estimation varied approximately with the inverse of grid size rather than with the square of the inverse, as is generally claimed for central differencing on a square grid. (See also W76-10933) (Sims-ISWS)
W77-11795

OCHRE AND SUBSURFACE DRAINAGE IN CULTIVATED ORGANIC SOILS OF WILLARD MARSH, OHIO,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 2J.
W77-11797

OPTIMAL PREDICTION OF PONDING,
Agricultural Research Service, Fort Collins, Colorado.
R. E. Smith, and J. Y. Parlange.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 3, p 493-496, May-June 1977. 1 tab, 6 ref, 1 append.

Descriptors: *Ponding, *Runoff, *Rainfall, *Model studies, Mathematical models, Soil physics, Porous media, Infiltration, Precipitation(Atmospheric), Hydraulic conductivity, Moisture content, Saturated soils, Surface runoff, Soil science, Watersheds(Basins).

Soil physics and porous media flow are being used more and more today to develop means to predict hydrologic response of watersheds and to provide better management tools for water resources. One important variable in studying watershed response to storm rainfall is the time between initiation of rainfall and the initiation of surface runoff, or ponding time. This study described a mathematical technique that allows improved estimates of the delay in watershed response to rain, knowing only two basic soil parameters from the physics of soil water flow. (Sims-ISWS)
W77-11798

COMPREHENSIVE GEOHYDROLOGICAL STUDY OF CONSOLIDATED SEDIMENTARY ROCKS IN BORNHOLM,
TERRAQUA ApS, Kalundborg (Denmark).
For primary bibliographic entry see Field 2F.
W77-11813

HEAT AND VAPOR MOVEMENT DURING INFILTRATION INTO DRY SOILS,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
E. R. Perrier, and O. Prakash.
Soil Science, Vol 124, No 2, p 73-76, August 1977. 4 fig, 4 ref.

Descriptors: *Infiltration, *Water vapor, *Temperature, Humidity, Moisture, Soil moisture, Sorption, Heat, Soils, Soil water, Soil water movement, Evaporation, Thermal conductivity, Laboratory tests, Soil science.
Identifiers: Wetting fronts, *Dry soils.

Temperature and relative humidity were monitored in a horizontal column apparatus at selected sites during infiltration into dry soil. As the wetting front approached a measurement site, the temperature was observed to rise; later the humidity was observed to increase, which was followed very closely by the wetting front. As the liquid front passed the measurement site, the temperature was observed to drop rapidly. The data showed that the advance of a wetting front involves several processes: (1) as dry soil is wetted, a large amount of heat is evolved; (2) evaporation during the wetting process supplies a vapor phase; (3) as liquid moves into dry soil, the vapor phase moves as a front immediately ahead of the wetting front; (4) a large portion of the heat evolved moves as a front well in advance of both the vapor and liquid fronts; and (5) the heat evolved subsequently heats the liquid front; however, due to evaporation and the thermal conductivity of water, the wetted soil behind the liquid front is cooled. (Sims-ISWS)
W77-11818

PERCOLATION THEORY OF RESIDUAL PHASES IN POROUS MEDIA,
Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Sceince.
R. G. Larson, L. E. Scriven, and H. T. Davis.
Nature, Vol. 268, No. 5619, p 409-413, August 4, 1977. 6 fig, 17 ref.

Descriptors: *Percolation, *Porous media, *Model studies, Mathematical models, Laboratory tests, Soil water movement, Wetting, Percolating water, Soil water, Fluid mechanics, Flow, Groundwater.
Identifiers: *Percolation theory, Residual phases.

When one fluid displaces another by flow through a porous medium, the fraction of pore space occupied by trapped residual phase correlates with the ratio of viscous to capillary forces in the flow. This dependence, heretofore unexplained, is derived from the mechanics of fluid blobs, the nature of pore sturcture, and percolation theory. Pore space topology was shown to be as important as geometry in the statistical flow behavior of large populations of fluid blobs in two-phase flow in porous media. Topology and geometry each can be modelled usefully by a single parameter characteristic of the pore space. (Sims-ISWS)
W77-11822

DIURNAL SOIL WATER REGIME IN THE TILLED PLOW LAYER OF A WARM, HUMID CLIMATE,
Southern Piedmont Conservation Research Center, Watkinsville, Ga.
R. R. Bruce, A. W. Thomas, L. A. Harper, and R. A. Leonard.
Soil Science Society of America Journal, Vol 41, No 3, p 455-460, May-June 1977. 12 fig, 1 tab, 14 ref.

Descriptors: *Soil water, *Diurnal, *Cultivation, *Humid climates, Depth, Soil temperarture, Air temperature, Wind velocity, Vapor pressure, Water vapor, On-site investigations, Humid areas.
Identifiers: Plow layer.

The soil water content in 10 depth intervals in the surface 15 cm of soil was determined hourly for 9 days in June at 83 deg 25 min W, 33 deg 52 min N. Over the same period at 15-min intervals, soil temperatures were measured at eight depths, windspeed and air temperatures at six elevations, atmospheric water vapor pressures at three elevations, incident solar and net radiation at one meter. From the microclimate data, flux of water vapor at the soil surface was calculated, which was then used to compute soil water flux at several depths by using soil water content data. The diurnal soil water content and soil water flux patterns were compared for a dry period before a rainfall event and afterward. Dramatic diurnal variation of the soil water content at depths less than 2 cm was observed. The variation during periods of no rain is related to daily radiation inputs at the soil surface, which generated the observed temperature and soil water gradients responsible for soil water redistribution. Occurrence of rainfall and infiltration events during the measurement period showed additional dynamics of the field system. Descriptions of the diurnal soil water dynamics in the plow-layer provide a basis for examining soil processes dependent upon soil water regime. (Visocky-ISWS)
W77-11826

OBSERVATIONS ON ALGAE OF SOME ARID AND SEMI-ARID SOILS OF RAJASTHAN,
Wilson Coll., Bombay (India). Dept. of Biology.
Y. S. Anantani, and K. V. Marathe.
J Univ. Bombay. 41(68), p 88-91, 1972.

Descriptors: Algae, *Soil algae, *Soil moisture, *Moisture content, Climates, Salts, *Arid lands.
Identifiers: Rajasthan(India).

The soils of Rajasthan, India, have very poor algal flora. This is due to harsh climatic conditions, low soil moisture content and large quantities of dissolved salts.--Copyright 1974, Biological Abstracts, Inc.
W77-11869

MOVEMENT OF MOISTURE IN THE UNSATURATED ZONE IN A LOESS-MANTLED AREA, SOUTHWESTERN KANSAS,
Geological Survey, Mineola, N.Y. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-11872

GROUND WATER RECHARGE IN WESTERN UTTAR PRADESH,
Indian Inst. of Tech., Kanpur. Dept. of Chemistry.
For primary bibliographic entry see Field 4B.
W77-11932

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT - PHASE III,
Washington Univ., Seattle, Coll. of Forestry.
For primary bibliographic entry see Field 4C.
W77-11941

EFFECT OF SOIL MOISTURE TENSION AND AMENDMENTS ON YIELDS AND ON HERBAGE N, P, AND S CONCENTRATIONS OF ALFALFA,
Department of Agriculture, Saskatoon (Saskatchewan).
For primary bibliographic entry see Field 3F.
W77-11942

RELATIONSHIP BETWEEN POTATO YIELD AND OXYGEN DIFFUSION RATE OF SUBSOIL,
Department of Agriculture, Fredericton (New Brunswick). Research Station.
For primary bibliographic entry see Field 3F.
W77-11963

ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS,
Ontario Dept. of Agriculture and Food, Toronto. Dept. of Land Resource Science.
For primary bibliographic entry see Field 5B.
W77-11967

MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
For primary bibliographic entry see Field 5C.
W77-11976

USING LIQUID POULTRY WASTES IN WOODLANDS,
Connecticut Agricultural Experiment Station New Haven.
For primary bibliographic entry see Field 5E.
W77-11979

DATA CONCERNING THE NATURAL CONDITIONS AND THE SOIL OF DABULENI-POTELU-CORABIA STATION FOR IMPROVEMENT OF SOIL WATER RESOURCES,
Institutul de Studii si Ceretari Pedologic, Bucharest (Rumania).
M. Parichi, T. Trandafirescu, S. Nastea, and G. Dragomir.
An Inst Stud Cercet Pedol. 39, p 313-320, 1971(1972).

Descriptors: *Soil water, *Drainage, *Dunes, Soils, *Sands, Clays, Loams, Humus, *Wind erosion.
Identifiers: *Dabuleni-Potelu-Corabia Station(Romania).

The Dabuleni-Potelu-Corabia Station (Romania) for improvement of water resources is located on the left side of the Danube river in the territory of Potelu lacustrine complex. Due to the natural conditions (relief, climate, ground water, parent material), slightly developed soils, including floodplain soils occur. The first type is characteristic of eolian dune relief; the second one developed under the influence of different natural and artificial drainage stages existing in Potelu complex. Sands and sandy regosols are characterized by a very low humus content and are very often subject to wind erosion; among the recent alluvia the clay-loamy ones have a higher humus content (1-2%).--Copyright 1974, Biological Abstracts, Inc.
W77-11981

RELEASE OF SOIL POTASSIUM ON WETTING AND DRYING,
College of Agriculture, Dapoli (India).
S. B. Kadrekar, and M. M. Kibe.
J Indian Soc Soil Sci. 21(2), p 161-166, 1973.

Descriptors: Soil water, *Potassium, *Potash, *Hydration, *Drying, Soil types.
Identifiers: *Soil potash.

The studies on release of soil potash with different degrees of hydration and drying revealed that under continuous moist conditions, the release of potash took place only at the en over 50-60 days. Alternate wetting followed by oven-drying released maximum potash in the soils. Wetting followed by air-drying brought about early release of soil potash from the nonexchangeable forms. Dongargaon soil (derived from mixed rocks like granites, gneisses, etc.) released maximum potash, followed by Poona soil (basaltic origin) and Dapoli soil (laterized basalt) in descending order. The lower moisture level (1/2 moisture equivalent) was conducive to greater release of soil potash.--Copyright 1974, Biological Abstracts, Inc.
W77-11982

MASS TRANSFER STUDIES IN SORBIN POROUS MEDIA: II. EXPERIMENTAL EVALUATION WITH TRITIUM (3H20),
New Mexico State Univ., University Park. Dept. of Agronomy.
M. T. van Genuchten, and P. J. Wierenga.
Soil Science Society of America Journal, Vol 41, No 2, p 272-278, March-April 1977. 6 fig, 3 tab, 21 ref, 1 append.

Descriptors: *Tritium, *Mass transfer, *Porous media, *Sorption, Diffusion, Curves, Adsorption, Soil aggregates, Unsaturated flow, Mathematical models, Clay loam, Laboratory tests, Equations.
Identifiers: Intra-aggregate diffusion, Immobile water, Miscible displacement, Isotope exchange, Soil columns.

A comparison was made between observed tritium effluent concentration distributions and those calculated with a previously published analytical solution for the movement of chemicals through unsaturated, aggregated sorbin media. In the analytical model, the liquid phase of the soil was divided into mobile and immobile regions, with transfer between the two regions diffusion controlled. Effluent data obtained from several displacements of tritium through a 30-cm long columns of Glendale clay loam were used to determine the different parameters in the analytical solution by curve fitting. The data indicated some adsorption or isotopic exchange of tritium during its flow through the soil columns. The amount of immobile water increases with decreasing flow velocity and increasing aggregate size, and varies between 6 and 45% of the total volume of water in the columns. The analytical solution provided an excellent description of the experimental effluent data, and showed that tailing can be explained satisfactorily by diffusional exchange of tritium between mobile and immobile regions of the soil. (See also W77-11982 and W77-11984) (Visocky-ISWS)
W77-11983

MASS TRANSFER STUDIES IN SORBING POROUS MEDIA: III. EXPERIMENTAL EVALUATION WITH 2,4,5-T,
New Mexico State Univ., University Park. Dept. of Agronomy.
M. Th. van Genuchten, P. J. Wierenga, and G. A. O'Connor.
Soil Science Society of America Journal, Vol 41, No 2, p 278-285, March-April 1977. 6 fig, 3 tab, 16 ref, append.

Descriptors: *Mass transfer, *Sorption, *Porous media, Diffusion, Adsorption, Unsaturated flow, Hysteresis, Soil aggregates, Clay loam, Laboratory tests, Curves, Mathematical models.
Identifiers: Intra-aggregate diffusion, Miscible displacement, 2,4,5-T.

Comparisons were made between observed and calculated effluent concentration distributions for the movement of 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) through 30-cm long unsaturated soil columns. The comparisons were made using both analytical and numerical solutions of a previously published model, which included the effects of intra-aggregate diffusion and adsorption. The results in this study indicated that intra-aggregate diffusion and adsorption/desorption are the main mechanisms responsible for effluent tailing. An estimated 60% of the adsorption was found to occur in the stagnant region of the soil. When intra-aggregate diffusion was included in the model, the observed adsorption/desorption hysteresis phenomenon found to be significant in several earlier studies was shown to be much less

nportant in describing the observed concentra-on distributions. (See also W77-11982 and W77-1983) (Visocky-ISWS)
/77-11984

DVANTAGES OF USING HIGH SALT-SODI-M WATERS IN THE RECLAMATION OF YPSIFIED HEAVY-TEXTURED SOIL,
linistry of Agriculture, Cairo (Egypt). Soil and /ater Research Inst.
I. El Hakim, H. K. Bakhati, Sh. Milad, and F. ayoumi.
gricultural Research Review (Cairo), Vol 54, No p 35-44, April, 1976. 1 fig, 3 tab, 17 ref.

escriptors: *Leaching, *Land reclamation, Salts, *Alkaline soils, Soil types, Percolation, Ion ansport, Irrigation practices, Magnesium, Gyp-m, Sodium, Calcium, Calcium compounds, ermeability, Water utilization, Flocculation, aline water.

a continuation of another study, gypsified sodic ils were subjected to different leaching treat-ents with salt-free and salt waters diluted in eps to determine how full reclamation may be tained in the shortest period of time and with the allest quantity of water. The experiments are scribed and results presented. It is concluded at beginning leaching with waters of moderate ncentrations is more advantageous for reclaim-g sodic soils than using salt-free water or waters high salinity. The initial base status of the soil, e rate of water percolation through the soil, the itial concentration of water applied during the aching period, the availability of calcium ions ring the leaching process, are all factors which ust be taken into account, and which may inter-re in the extent of reclamation that can be real-ed. (Jamail-Arizona)
77-11994

ATER RETENTION IN SOIL UNDERLAIN BY COARSE-TEXTURED LAYER: THEORY AND FIELD APPLICATION,
epartment of Scientific and Industrial Research, lmerston North (New Zealand). Plant Physiolo-Div.
E. Clothier, D. R. Scotter, and J. P. Kerr.
il Science, Vol 123, No 6, p 392-399, June 1977. ig, 1 tab, 22 ref.

escriptors: *Retention, *Soil water, *Soil tex-re, *Soil investigations, *Loam, *Field capacity, n-site investigations, Water storage, Soil ofiles, Soil physical properties, Soil water move-ent, Hydraulic conductivity, Pores, Permeabili-

entifiers: *Coarse soil layer, *Sandy loam.

water retention theory is presented which incor-rates the physical characteristics of the overly-soil, the depth to a coarse layer, and the coar-ess of the underlay. This theory is applied to edict water retention in situ by a Manawatu fine dy loam, which consists of finer textured soil erlying a coarse layer at 90 cm. Field data on s soil indicates the layering resulted in an addi-nal 5.5 cm of water storage at field capacity, a % increase over a similar hypothetical soil with coarse layer. The water retention curve shape the soil overlying the coarse stratum is a major tor controlling water stored in the soil profile. draulic conductivity data is not required for erence in application of the theory. (Jahns-zona)
7-11996

FECT ON IRRIGATION WATER QUALITY, LFURIC ACID AND GYPSUM ON PLANT OWTH AND ON SOME PHYSICAL AND EMICAL PROPERTIES OF PIMA SOIL,
zona Univ., Tucson. Dept. of Soils, Water and gineering.
primary bibliographic entry see Field 3C.
7-11998

EFFECT OF DEPTH AND QUALITY OF GROUND WATER ON SOIL SALINIZATION: A FIELD STUDY WITH A FLUCTUATING WATER TABLE,
Central Soil Salinity Research Inst., Karnal (India).
A. K. Bandyopadhya.
J Indian Soc Soil Sci. 20(4), p 407-408, 1972.

Descriptors: *Groundwater, *Water table fluctuations, *Water quality, *Saline soils, Depth, Evaporation, Rainfall, *Alkaline soils.

A highly saline-sodic soil was studied in which the water table fluctuated between 107 and 300 cm. Under these conditions it is the quality of the ground water which governs the salinity of the surface soil. This in turn is determined by rainfall and evaporation. Soil salinity was highest when the water table was at maximum depth.—Copyright 1974, Biological Abstracts, Inc.
W77-12000

ALL-PLASTIC SUCTION LYSIMETERS FOR THE RAPID SAMPLING OF PERCOLATING SOIL WATER,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
For primary bibliographic entry see Field 5A.
W77-12005

MICROBIOLOGICAL CHARACTERISTICS OF CERTAIN TYPES OF MARSHY FORESTS OF THE TAVDA TRANSURAL REGION, (IN RUSSIAN),
G. S. Khrenova.
Tr Inst Ekol Rast Zhivotn Ural Fil Akad Nauk SSSR. 83, p 164-181, 1972.

Descriptors: Soil analysis, *Soil microbiology, *Marshes, Forests, *Microorganisms, Bacteria, Enzymes, Fungi, Seasonal, Soil moisture, Vegetation, Nutrients.
Identifiers: Actinomycetes, *USSR(Tavda transural region).

Soil samples were taken from 5 types of marshy forests in the Tavda transural region (USSR). Quantitative analysis of microorganisms revealed tens and hundreds of millions/g of dry soil. Ammonification occurred under all types of forests. Content of the main groups of microorganisms was higher in 1965 than in 1966, with the exception of spore-forming bacteria and some fungi, actinomycetes, and butyric acid bacteria. Nitrifying bacteria were absent. Seasonal variations in the number of microorganisms depended on the hydrothermic regime of the soil, state of the vegetation covering, presence of nutritive substances, and also varied over the course of the vegetation period. Changes in enzymatic activity were also observed. It is suggested after drainage of turfy-marshy soils under the specified types of vegetation, changes in the microflora occur, which are determined by deeper mineralization.—Copyright 1974, Biological Abstracts, Inc.
W77-12016

RECLAMATION OF A SALINE-SODIC SOIL BY THE HIGH SALTWATER-DILUTION METHOD,
Department of Agriculture, Lethbridge (Alberta). Plant Industry Div.
For primary bibliographic entry see Field 3C.
W77-12035

PRELIMINARY STUDY ON SOME SALINE SOILS OF PERU USING A HYDROPHOBIC EMULSION,
Pontificia Universidad Catolica del Peru, Lima.
For primary bibliographic entry see Field 3C.
W77-12044

EFFECTS OF VARIOUS SOIL PROPERTIES AND MANAGEMENT PRACTICES ON INFRARED SCAN AND PANCHROMATIC IMAGERY FROM PORTAGE LA PRAIRIE, MANITOBA,
Canada-Manitoba Soil Survey, Winnipeg.
W. Michalyna, and R. G. Eilers.
Can J Soil Sci. 53(4), p 445-457, 1973.

Descriptors: *Soil physical properties, Soil management, Remote sensing, Soil analysis, *Soil texture, Canada, *Soil structure, *Soil aggregates, Drainage.

Data and imagery are presented to show the effects of various soil factors, surface conditions, and soil management practices on the response on IR scan imagery. Generally, sandy soils could be differentiated from medium- and fine-textured soils; medium-textured soils could not be differentiated from the fine-textured ones. Drainage features could readily be differentiated but produced varying response depending on amount of surface moisture and surface structure. Soil structure and aggregation appear to affect response more than the size of the separates (i.e., the texture) in medium- to fine-textured soils. Salinity, silt wash, plat residue and grass anopy resulted in lower response on IR imagery than cultivated soils without these conditions. Salt efflorescence, silt wash and residue resulted in a higher response on panchromatic imagery.—Copyright 1974, Biological Abstracts, Inc.
W77-12064

A MULTI-LAYER MODEL FOR GRAVITY DRAINAGE OF UNSATURATED SOIL,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 2F.
W77-12093

A GENERALIZED STREAMFLOW SIMULATION SYSTEM,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 2A.
W77-12113

EXTENDED FIELD USE OF SCREEN-COVERED THERMOCOUPLE PSYCHROMETERS,
Intermountain Forest and Range Experiment Station, Ogden, Utah.
R. W. Brown, and R. S. Johnston.
Agronomy Journal, Vol. 68, No. 6, p 995-996, November-December 1976. 1 fig, 1 tab, 7 ref.

Descriptors: *Soil water, *Soil moisture, Data collection, Instrumentation.
Identifiers: Thermocouples, *Psychrometers, Soil water potential.

The use of screen-covered thermocouple psychrometers for in situ measurements of soil water potential has been criticized because of possible soil and microorganism contamination through the screen covering. Double-junction Peltier psychrometers with a screen covering were installed in the soil under field conditions for periods ranging from 2 to 40 months of continuous exposure, and were then removed and examined for evidence of loss of calibration sensitivity and contamination by soil particles and micro-organisms. The uncleaned psychrometers were recalibrated in the laboratory and then disassembled and examined under a microscope (250 times) for contamination. Although slightly more than half of the units lost some sensitivity after field exposure, the average decrease was less than 5%. The psychrometer cavities were all nearly free of soil particles, the thermocouple junctions were shiny, and no evidence of microbial attack was evident. It appears that long-term field exposure of screen-covered psychrometers is no more detrimental to

their performance than that of ceramic or other psychrometers. (Skogerboe,Colorado State)
W77-12116

SIMULATION MODEL FOR NUTRIENT UPTAKE FROM SOIL BY A GROWING PLANT ROOT SYSTEM,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
N. Caassen, and S. A. Barber.
Agronomy Journal, Vol. 68, No. 6, p 961-964, November-December 1976. 1 fig, 1 tab, 13 ref.

Descriptors: *Simulation analysis, *Mathematical models, Model studies, *Nutrients, Computer programs, Corn(Field), Potassium, Diffusion.
Identifiers: *Nutrient uptake(Soils).

Mathematical models of nutrient uptake by plants are useful for investigating the effect of various soil and plant factors on nutrient flux to plant roots. The objective of this research was to develop a model based on theoretical considerations of the processes of nutrient uptake by plant roots growing in soil and then to test the model experimentally. The soil and plant factors used in the model were to be measured independent of final nutrient uptake. The model for flux by mass flow and diffusion to the root was patterned after that of Nye and Marriott. The absorption kinetics of the root were assumed to follow Michaelis-Menten kinetics. The Nye-Mariott model gives the nutrient concentration at the root with time. From this accumulated uptake per sq cm of root surface with time was calculated. Rate of root growth was assumed exponential for the growth of the young plant. Uptake per sq cm of root with time was combined mathematically with rate of root growth to get total uptake with time by the plant. The present program assumes root hairs do not affect uptake and that roots do not compete for nutrients. (Skogerboe-Colorado State)
W77-12119

CORN GROWTH AS AFFECTED BY AMMONIUM VS. NITRATE ABSORBED FROM SOIL,
Potash Inst., Columbia, Mo. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W77-12124

IRRIGATION SCHEDULES FOR SUGARBEETS ON MEDIUM AND COARSE TEXTURED SOILS IN THE NORTHERN GREAT PLAINS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W77-12126

SOLUBILITY AND AVAILABILITY OF CADMIUM IN CADMIUM-SLUDGE AMENDED SOIL,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5B.
W77-12144

EFFECT OF COMPACTION AND MOISTURE CONTENT ON SPECIFIC HEAT AND THERMAL CAPACITY OF SOILS,
Udaipur Univ. (India).
M. R. Yadav, and G. S. Saxena.
J Indian Soc Soil Sci. 21(2), p 129-132, 1973.

Descriptors: *Moisture content, *Thermal capacity, *Specific heat, Soil moisture, Clays, Soil analysis.

A theoretical relation between thermal capacity and moisture content was derived and tested experimentally. Thermal capacity of moist soil was found to be a linear function of moisture content for sandy as well as clay soils. Compaction appeared to have no significant effect on specific heat of the soils. However, volumetric thermal capacity increased with moisture content.–Copyright 1974, Biological Abstracts, Inc.
W77-12161

SOLUTION OF THE ONE-DIMENSIONAL LINEAR MOISTURE FLOW EQUATION WITH IMPLICIT WATER EXTRACTION FUNCTIONS,
Arizona Univ., Tucson. Dept. of Mathematics.
D. O. Lomen, and A. W. Warrick.
Soil Science Society of America Journal, Vol. 40, No. 3, p 342-344, May-June 1976. 3 fig, 2 tab, 4 ref.
OWRT B-035-ARIZ(7).

Descriptors: *Model studies, Soil water, *Soil water movement, *Soil moisture, Irrigation, Irrigation effects, *Moisture content.
Identifiers: Matrix flux potential, Water extraction, *Moisture flow equation.

Analytical solutions of the one-dimensional steady-state moisture flow equation are presented for several functions modeling soil water extraction. These functions depend directly on the matric flux potential and thus are implicit with depth. A constant surface flux was assumed. Graphs of the matric flux potential and cumulative uptake are given depicting the effect of model parameters and comparing different water extraction functions. The results are useful in obtaining a variety of water extraction distributions. (Skogerboe-Colorado State)
W77-12170

CHLORIDE ACCUMULATION NEAR CORN ROOTS UNDER DIFFERENT TRANSPIRATION, SOIL MOISTURE, AND SOIL SALINITY REGIMES,
Punjab Agricultural Univ., Ludhiana (India). Coll. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-12171

LEACHING OF PHOSPHATE AND SELECTED CATIONS FROM SANDY SOILS AS AFFECTED BY LIME,
Ministry of Agriculture, Bangkok (Thailand). Agricultural Chemistry Div.
For primary bibliographic entry see Field 5B.
W77-12172

DIFFUSION AND MASS FLOW OF NITRATE-NITROGEN INTO CORN ROOTS GROWN UNDER FIELD CONDITIONS,
Ministry of Agriculture, Bangkok (Thailand). Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W77-12177

SUBSOIL CHISELING AND SLIP PLOWING EFFECTS ON SOIL PROPERTIES AND WHEAT GROWN ON A STRATIFIED FINE SANDY SOIL,
Agricultural Research Service, Brawley, Calif. Dept. of Soil Science.
M. T. Kaddah.
Agronomy Journal, Vol. 68, No. 1, p 36-39, January-February 1976. 3 fig, 2 tab, 14 ref.

Descriptors: *Soil physical properties, *Soil properties, *Wheat, Soil investigations, California, Crop response, Infiltration, Bulk density, Root development, Cultivation.
Identifiers: *Tillage practices, Deep tillage.

Positive crop growth response to deep tillage in sandy soils has been developed in Imperial Valley California. Very little information is available, however, on the effect of different deep tillage operations and the possible causes of the beneficial effects of deep tillage. The present field study was conducted on a stratified fine sandy soil to evaluate the effect of subsoil chiseling and slip plowing to a depth of 90 cm on wheat yield and soil properties. Conventional soil disking to 20 cm depth was compared with two subsoil chiseling and two slip plowing treatments. Subsoil chiseling was on 1-m centers in one and and in two directions, and slip plowing was on 2-m centers i one or two directions. The two directions of dee tillage were at right angles to each other. Signif cant increases in wheat yield resulted from dee tillage. Grain yield (metric tons/ha) were: 4.50 fc disking; 5.15 for subsoil chiseling in tw directions; 5.73 for slip plowing one direction; an 6.32 for slip plowing in two directions. (Skogerbo Colorado State)
W77-12178

SOIL PHYSICAL CONDITIONS AFFECTIN RICE ROOT GROWTH: BULK DENSITY AN SUBMERGED SOIL TEMPERATURE REGIM EFFECTS,
Indian Inst. of Tech., Kharagpur. Dept. of Agricu tural Engineering.
S. Kar, S. B. Varade, T. K. Subramanyam, and B P. Ghildyal.
Agronomy Journal, Vol. 68, No. 1, p 23-26, Janu ry-February 1976. 5 tab, 15 ref.

Descriptors: *Root development, *Rice, *So physical properties, Bulk density, Temperatur Greenhouse experiments, Growth rates, *Pla growth.

Information is lacking on the performance of t rice plant due to variations in temperature regim in association with other soil physical properti This investigation, carried out under controll greenhouse conditions, evaluate the influence temperature and mechanical impedance of soil, well as of their interaction, on root and sho growth of rice. Four submerged soil temperatu regimes thermoregulated in water baths, indicat that the maximum root and shoot growth of ri occurred at 37 and 25C. Irrespective of the bu density of soil, the total number of roots at t base and the dry weight and volume of the ri root system significantly increased as the su merged soil temperature regime increased from to 15C to 37 to 25C, but decreased at 42 to 30 (Skogerboe-Colorado State)
W77-12179

2H. Lakes

A YEARLY CYCLE OF CHANGES IN DYNA ICS OF PRODUCTION OF THE CHEMOA TOTROPHIC BACTERIA IN BOTTOM SE MENTS OF A WATER BODY,
Polish Academy of Sciences, Warsaw. Inst. of E perimental Biology.
For primary bibliographic entry see Field 5C.
W77-11505

ACTIVITY OF HYDROLYTIC ENZYMES WATER AND BIOMASS OF PLANKTONIC O GANISMS IN A RESERVOIR OF EUTROPHIC TYPE IN THE LAGOON OF KU SIU MARIOS, (IN RUSSIAN),
Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. Botany.
For primary bibliographic entry see Field 5C.
W77-11509

THE BIOMASS, ORGANIC MATTER CO TENTS AND CALORIFIC VALUES MACROPHYTES IN THE LAKES OF TH SZESZUPA DRAINAGE AREA,
Polish Academy of Sciences, Mikolajki (Polan Dept. of Applied Limnology.
For primary bibliographic entry see Field 5C.
W77-11511

MERCURY IN BOTTOM SEDIMENTS OF RIE VLEI RESERVOIR,
University of the Witwatersrand, Johannesbu (South Africa). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-11512

EFFECTS OF DISSOLVED OXYGEN ON SURVIVAL AND BEHAVIOR OF SELECTED FISHES OF WESTERN LAKE ERIE,
Tennessee Game and Fish Commission, Nashville.
For primary bibliographic entry see Field 5C.
W77-11514

LAKES SORELL AND CRESCENT - A TASMANIAN PARADOX,
New South Wales Inst. of Tech., Broadway (Australia). School of Life Sciences.
For primary bibliographic entry see Field 5C.
W77-11534

ANALYSIS OF THE TEMPORAL BEHAVIOUR OF THE LEVEL OF LAKE MALAWI,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Geography and Environmental Science.
T. G. Dyer.
South African Journal of Science, Vol. 72, No. 12, p 381-382, December 1976. 3 fig, 5 ref.

Descriptors: *Water level fluctuations, Water resources, *Time series analysis, Data analysis, Forecasting, Model studies, *Temporal distribution, Lakes.
Identifiers: Lake Malawi, Malawi, Southern Africa.

If Lake Malawi is to be tapped for irrigation purposes, knowledge of temporal level fluctuations are necessary. This paper analyses the time series of annual maximum lake levels. The results for minima are similar and are not presented. Records were obtained for the period 1895-1975. Apart from providing information useful in the utilization of water resources, these data also give an index of climate for that part of Africa. (So African Water Info Center)
W77-11565

EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS 3. ROODEPLAAT DAM,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5C.
W77-11568

EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS. IV. VAAL DAM,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5C.
W77-11575

SEVERAL MODELS FOR WATER-AIR TEMPERATURE RELATIONSHIPS OF SOME AFRICAN LAKES,
Rhodesia Univ., Salisbury. Dept. of Agriculture.
D. Clay.
Water SA., Vol. 2, No. 2, p 61-66, 1976. 5 tab, 1 fig, 14 ref.

Descriptors: *Water temperature, Forecasting, *Model studies, Africa, Lakes, *Model studies, *Air temperature.
Identifiers: Lake Kariba, Lake Kyle, Hardap Dam, Lake McIlwaine, Lake Tchad, Southern Africa, Rhodesia, South West Africa, Nigeria.

A series of models have been tested for prediction of average monthly water temperatures of lakes at one meter depth from air temperatures. Models for Lake Kariba, Rhodesia, Lake Kyle, Rhodesia and Hardap Dam, South West Africa have an average accuracy of better than, 75 C each month, while Lake McIlwaine, Rhodesia and Lake Tchad, Nigeria have an average accuracy of better than ,0 C each month. These and other models can be improved in time by routine observation. At present they allow an estimation to be made as to the heat energy available for biological production in a water body. (So African Water Info Center)
W77-11577

SCIENTIFIC INFORMATION IN THE DECISION TO DAM GLEN CANYON,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 8E.
W77-11583

PRELIMINARY EVALUATION OF WATER QUALITY OF PROPOSED LAFARGE LAKE, KICKAPOO RIVER, VERNON COUNTY, WISCONSIN,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W77-11584

BREAKING WAVE CRITERION ON A SLOPING BEACH,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 8B.
W77-11585

SUBSTANTIATION OF THE PRIESTLEY AND TAYLOR PARAMETER ALPHA = 1.26 FOR POTENTIAL EVAPORATION IN HIGH LATITUDES,
Atmospheric Environment Service, Downsview (Ontario).
For primary bibliographic entry see Field 2D.
W77-11599

SHORT-PERIOD INTERNAL WAVES IN THE VICINITY OF A RIVER-INDUCED SHEAR ZONE IN A FJORD LAKE,
Canada Centre for Inland Waters, Burlington (Ontario).
P. F. Hamblin.
Journal of Geophysical Research, Vol. 82, No. 21, p 3167-3174, July 20, 1977. 9 fig, 3 ref.

Descriptors: *Internal waves, *Lakes, *Canada, On-site investigations, Model studies, Mathematical models, Rivers, Mixing, Turbulence, Shear, Seiches, Turbidity, Temperature, Water temperature, Profiles, Frequency analysis, Statistical methods, Fjords.
Identifiers: *Kamloops Lake(British Columbia).

Observations of isotherm displacements in a lake through which a large river flows were used to study the behavior of short-period internal waves. Selected time series as well as spectra suggest a generating mechanism for short-period internal waves localized in the region of the inflowing water which may be associated with the formation of a mixed zone imbedded in the stratified column. The mixed zone, in turn, is considered to originate from turbulent instability due to vertical shear associated with the river inflow and long-period internal seiches. The model for the collapse of a mixed region by Schooley and Hughes accounts for observed spectral peaks at frequencies lower than the Brunt-Vaisala frequency. (Sims-ISWS)
W77-11609

THE EFFECT OF SALINITY OF QARUN LAKE ON THE ADJACENT SOIL,
Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
R. M. Abdel-Aal, A. Abd-El-Wahed, F. El-Bogdady, and M. S. Abd El-Gawad.
Agricultural Research Review (Cairo), Vol 54, No 4, April, 1976. p 177-187, 2 fig, 4 tab, 11 ref.

Descriptors: *Lakes, *Lake shores, *Soil properties, *Salinity, *Salts, Shales, Geomorphology, Sedimentary rocks, Clays, Water properties, Saline water, Saline soils, Lake basins, Anions, Cations, Inflow, Soil types, Arid lands, Calcium carbonate, Deserts, Geologic history, Topography, Gypsum, Calcareous soils, Limestones.
Identifiers: Fayoum depression, Nile River basin, Qarun lake, Mediterranean Sea, Egypt.

A study was undertaken to elucidate the effect of salt constituents and salinity of a lake fed from the Nile River on the characteristics of adjacent soil. Six water samples were taken from different locations in the lake, six representative soil profiles were obtained from the shore, and a sample was taken from the lake bottom. Particle size distribution analysis was carried out, calcium carbonate and organic matter contents were determined, and soil water extract and lake water tests were carried out for anions and cations. From analysis of the data it was concluded that the differences in soil characteristics reflected the effect of the parent material in three of the soil profiles, while the influence of the lake's saline water influenced soil characteristics in the other three profiles. (Ullery-Arizona)
W77-11625

GROWTH OF THE CICHLID FISH TYLOCHROMIS BANGWELENSIS IN LAKE BANGWEULU, ZAMBIA,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
J. S. Griffith.
Transactions of the American Fisheries Society, Vol 106, No 2, March 1977, p 146-150, 1 fig, 3 tab, 12 ref.

Descriptors: Animal growth, Fish, Lakes, *Growth rates, Temperature, Africa.
Identifiers: Scale examination, Annuli, Lake Bangweulu(Zambia).

Scale examinations were used to assess growth of the child fish, tylochromis bangwelensis. Discontinuities in circuli which appeared to be valid annuli were seen on the scales of yearling fish during August-October and on the scales of older fish later in the season. It was concluded that these discontinuities were due changes in lake temperatures. At the end of the first year, fish had obtained an average length of 6.8 cm. Growth in subsequent years averaged 2-3 cm until a maximum age of 7 years. Males grew slightly faster than females. Both sexes initially matured at a length of 11 to 12 cm and an age of 2 years, although most fish did not reproduce until 1 year and 3-4 cm later. (Chilton-ORNL)
W77-11646

EMERGENCE OF CHIRONOMIDAE (DIPTERA) FROM CHAR LAKE, RESOLUTE, NORTHWEST TERRITORIES,
Biol. Stn., Saint Andrews, N. B., Can.
For primary bibliographic entry see Field 5C.
W77-11652

LAKE ONTARIO ATLAS: CHEMISTRY,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 5C.
W77-11654

GUIDEBOOK TO GEOLOGIC AND BEACH FEATURES OF THE RACHEL CARSON SALT POND AREA, NEW HARBOR, MAINE,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
For primary bibliographic entry see Field 2L.
W77-11656

LIMNOLOGICAL STUDIES OF THE ONO RESERVOIR: THIRD REPORT, (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W77-11713

PRESSURE EFFECTS ON GREAT LAKES VERTICAL CONTROL,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
F. H. Quinn.
Journal of the Surveying and Mapping Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. SU1, p 31-37, December 1976. 2 fig, 6 tab, 3 ref.

Descriptors: *Great Lakes, *Lakes, Pressure, Effects, *Water levels, *Control, *Surveys, Atmospheric pressure.
Identifiers: *Pressure responses, *Vertical indicators, Gravitation, Surveying, Hydrostatic analysis.

Described is a study which investigated the warping effects of atmospheric pressure fields on the assumed level geopotential Great Lakes water surfaces during the 28-month period used in establishing the 1955 International Great Lakes Datum. The hydrostatic analysis used in the study indicated variations in lake water surface elevations up to 4 cm during the study period. These variations were compared with computed gravitational effects similar to those included in the 1955 International Great Lakes Datum establishment. The atmospheric pressure effects were found to be of the same order of magnitude as those resulting from the nonuniform gravitational forces. Thus, the assumption that the water surfaces of the Great Lakes are level geopotential surfaces is erroneous and atmospheric pressure corrections should be included when establishing and revising the vertical control on the Great Lakes. (Bell-Cornell)
W77-11782

A TIME-DEPENDENT MODEL OF THE LAKE-AVERAGED, VERTICAL TEMPERATURE DISTRIBUTION OF LAKES,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
W. A. Tucker, and A. W. Green.
Limnology and Oceanography, Vol 22, No 4, p 687-699, July 1977. 7 fig, 2 tab, 40 ref.

Descriptors: *Water temperature, *Lakes, *Lake Ontario, *Model studies, Mathematic models, Solar radiation, Energy, Mixing, Winds, Waves(Water), Hypolimnion, Profiles, Limnology, Foreign countries, Foreign research.
Identifiers: *Llyn Cwellyn(Wales), *Wales, Kinetic energy, *Vertical temperature distribution.

A model for predicting the time-dependent vertical thermal structure of lakes was presented. Radiative heating with depth, mixing induced by the surface wave field, and turbulent energy exchanges were included as lake-averaged processes. The model was designed to be applicable to a wide range of lake sizes. Comparison of predictions with horizontally averaged observations from Lake Ontario during IFYGL and unaveraged (local) observations from Llyn Cwellyn, Wales, showed good agreement. (Sims-ISWS)
W77-11799

INTERNAL FREE OSCILLATIONS IN LAKE ONTARIO,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
D. J. Schwab.
Limnology and Oceanography, Vol 22, No 4, p 700-708, July 1977. 4 fig, 1 tab, 12 ref.

Descriptors: *Internal waves, *Lake Ontario, *Model studies, Mathematic models, Waves(Water), Lakes, Mathematics, Limnology.
Identifiers: Kelvin-type waves, Poincare-type waves, Oscillations, Power spectra.

A numerical procedure was used to calculate some of the internal free modes of oscillation in a two-layer model of Lake Ontario, assuming a uniform equivalent depth. The modes fall into two categories, one set resembling Kelvin-type waves and the other resembling Poincare-type waves. Observational evidence from Lake Ontario agreed qualitatively with the properties of the two types of modes. (Sims-ISWS)
W77-11800

INCOMPLETE EXTRACTION OF RAPIDLY SETTLING PARTICLES FROM WATER SAMPLERS,
Woods Hole Oceanographic Inst., Mass. Joint Program in Oceanography.
For primary bibliographic entry see Field 2L.
W77-11801

A CLOSING, REPLICATE-SAMPLE, SEDIMENT TRAP,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 2J.
W77-11802

A THREE-DIMENSIONAL MODEL OF LAKE ONTARIO'S SUMMER CIRCULATION I. COMPARISON WITH OBSERVATIONS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
J. R. Bennett.
Journal of Physical Oceanography, Vol 7, No 4, p 591-601, July 1977. 10 fig, 19 ref, 1 append. NOAA 03-5-022-57.

Descriptors: *Lake Ontario, *Water circulation, *Water temperature, *Model studies, *Great Lakes, Mathematical models, Lakes, Circulation, Currents(Water), Mathematics, Coriolis force, Density, Heat transfer, Winds, Velocity, Limnology.

Observations of Lake Ontario during the International Field Year for the Great Lakes were used to develop a three-dimensional numerical model for calculating temperature and current. The model has a variable grid resolution and a horizontal smoothing which filters out small-scale vertical motion caused by truncation error but has little effect on the strong currents of the coastal boundary layer. Resolution of the shore zones and reduced horizontal smoothing improved simulation of both long-term mean flow and current reversals due to low-frequency waves. (Sims-ISWS)
W77-11808

A SIMPLE MODEL OF LAKE ONTARIO'S COASTAL BOUNDARY LAYER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
J. R. Bennett, and E. J. Lindstrom.
Journal of Physical Oceanography, Vol 7, No 4, p 620-625, July 1977. 6 fig, 1 tab, 14 ref. NOAA 03-022-57.

Descriptors: *Lakes, *Water circulation, *Winds, *Lake Ontario, *Model studies, Mathematical models, Circulation, Water temperature, Thermocline, Coasts, Currents(Water), Internal waves, Limnology.
Identifiers: Longshore transport, Wind forcing, Wind stress, International Field Year for the Great Lakes.

An empirical forced wave model of currents and thermocline displacements in the coastal zone of Lake Ontario was derived from data from the International Field Year for the Great Lakes (1972). The model consisted of three linear wave equations for predicting the depth of the thermocline, its slope, and the longshore volume transport from the wind. The empirical phase speeds were consistent with internal Kelvin wave and topographic wave theory, and the response to a unit longshore wind stress was consistent with cross section models of long lakes. (Sims-ISWS)
W77-11811

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULATIONS IN LAKES,
Wisconsin Univ.-Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C.
W77-11864

AUTOMATIC CATEGORIZATION OF LAND AND WATER COVER TYPES OF THE GREEN SWAMP, FLORIDA, USING SKYLAB MULTISPECTRAL SCANNER (S-192) DATA,
Geological Survey, Tampa, Fla.; Geological Survey, Miami, Fla. Water Resources Div.; and Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 7B.
W77-11875

LIMNOLOGICAL STUDIES OF THE ISLAND AREA OF WESTERN LAKE ERIE,
Ohio State Univ., Columbus.
N. W. Britt, J. T. Addis, and R. Engel.
Bull Ohio Biol Surv. 4(3), p 1-85, 1973.

Descriptors: *Lake Erie, *Limnology, Island, Canada, Surveys, Benthos, Oligochaete, Crustaceans, *Benthic fauna, Diptera, Zooplankton, Water pollution, Fisheries, Food chain, Nutrients.
Identifiers: Aphanizomenon, Chydorus sphaericus, Diaptomus siciloides, Dinoflagellates, Eurytemora affinis, Hexagenia, Microcystis, Oecetis, Oscillatoria, Pandorina morum, *Tanyopodinae.

This survey, carried out between 1959 and 196 was initiated following the decline of the fisheri in western Lake Erie (USA and Canada). Chang in the benthic fauna are very clear: the Hexageni Oecetis (Ephemeroptera and Trichoptera) comm nity has been virtually eliminated and the botto fauna is now dominated by Oligochaeta a Chironomidae. The population structure of t Diptera indicates that present conditions favor t pollution resistant Tanyopodinae over t Chironomidae. The decline of the Ephemeropte seems to be related to the occurrence of periods low oxygen concentrations in the bottom wate Changes are also noted in the plankton popul tions. Microcystis has replaced Aphanizomen and Oscillatoria as major constituents of t Cyanophyceae. Filamentous algae are appearing larger numbers and Pandorina morum is mo abundant than formerly. Dinoflagellates are al becoming a major component of the plankton. the zooplankton Eurytemora affinis has becom established in the area. Chydorus sphaericus is i creasing in abundance. in general, cladocera have increased in abundance since the 1930's. marked increase in the numbers of Diaptomus si loides has also occurred. The cause of the changes are probably increased quantities of fluents from man's activities in the la watershed. Although the surface waters in t center of the lake are of reasonable quality, in t inshore and deeper waters of the lake anaerob conditions arise due to the oxidation of the organ load in the lake. The addition of nutrients i creases production which adds further organ material - a form of self-pollution. This recycli of material makes it unlikely that pollution contr measures will show an immediate effect. Cop right 1974, Biological Abstracts, Inc.
W77-11926

CHANGES IN AQUATIC MACROPHYTES A COMPANYING PHOSPHORUS REDUCTION A EUTROPHIC LAKE IN NEW YORK STAT AN ASSESSMENT BASED ON REMOTEL SENSED AND OTHER DATA,
Cornell Univ., Ithaca, N.Y. Center for Enviro mental Research.

For primary bibliographic entry see Field 5A.
W77-11940

EFFECTS OF SALTON SEA WATER ON THE EGGS AND LARVAE OF BAIRDIELLA ICISTIA (PISCES: SCIAENIDAE),
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5C.
W77-12025

HEAVY-METAL CONTAMINATION BY ATMOSPHERIC FALLOUT OF SEVERAL FLIN FLON AREA LAKES AND THE RELATION TO FISH POPULATIONS,
Toronto Univ. (Ontario). Dept. of Geology,; Toronto Univ. (Ontario). Dept. of Chemistry; and Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
For primary bibliographic entry see Field 5B.
W77-12027

CONCENTRATION PATTERN OF CHEMICAL CONSTITUENTS IN A PAPER MILL'S EFFLUENT PLUME: DYNAMICS AND MODEL,
Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5B.
W77-12041

A CHARACTERIZATION OF THE SOURCES OF PETROLEUM HYDROCARBONS IN LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-12043

EFFECT OF PULP MILL EFFLUENT ON THE SURFICIAL SEDIMENTS OF WESTERN NIPIGON BAY, LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-12055

CHARACTERIZATION OF SUSPENDED PARTICLES IN SOME PULP AND PAPER MILL EFFLUENT PLUMES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W77-12058

PULP AND PAPER MILL EFFLUENT IN A FRESHWATER ENVIRONMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W77-12059

PERSISTENCE OF DISSOLVED ORGANIC COMPOUNDS IN KRAFT PULP AND PAPER MILL EFFLUENT PLUMES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W77-12065

CALORIC CHANGES ALONG PULP AND PAPER MILL EFFLUENT PLUMES,
Canada Centre for Inland Waters,
For primary bibliographic entry see Field 5B.
W77-12066

DISTRIBUTION OF DEHYDROABIETIC ACID IN SEDIMENTS ADJACENT TO A KRAFT PULP AND PAPER MILL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W77-12067

DISTRIBUTION OF SOME ORGANIC COMPOUNDS IN THE RECEIVING WATERS OF A KRAFT PULP AND PAPER MILL,
Canada Centre for Inland Waters, Burlington (Ontario),
For primary bibliographic entry see Field 5B.
W77-12068

A MATHEMATICAL MODEL FOR SIMULATING THE TEMPERATURE STRUCTURE OF STRATIFIED RESERVOIRS AND ITS USE IN RESERVOIR OUTLET DESIGN,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-12114

CALLAHAN RESERVOIR: I. SEDIMENT AND NUTRIENT TRAP EFFICIENCY,
Agricultural Research Service, Columbia, Mo. North Central Watershed Research Center.
For primary bibliographic entry see Field 5G.
W77-12149

CALLAHAN RESERVOIR: III. BOTTOM SEDIMENT-WATER-PHOSPHORUS RELATIONSHIPS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 5G.
W77-12150

VERTICAL GRADIENTS IN ARTIFICIAL SUBSTRATE-ASSOCIATED PROTOZOAN COMMUNITY STRUCTURE IN A STRATIFIED FRESHWATER LAKE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-12196

OBSERVATIONS OF AN ASH LAGOON SPILL ON THE NEW RIVER, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W77-12219

SYNCHRONOUS FLUORESCENCE SPECTROSCOPY AND ITS APPLICATION TO INDIGENOUS AND PETROLEUM-DERIVED HYDROCARBONS IN LACUSTRINE SEDIMENTS,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-12225

A 96-HOUR SEDIMENT BIOASSAY OF DULUTH AND SUPERIOR HARBOR BASINS (MINNESOTA) USING HEXAGENIA LIMBATA, ASELLUS COMMUNIS, DAPHNIA MAGNA, AND PIMEPHALES PROMELAS AS TEST ORGANISMS,
Heidelberg Coll., Tiffin, Ohio. Dept. of Biology; and Heidelberg Coll., Tiffin, Ohio. River Studies Lab.
For primary bibliographic entry see Field 5A.
W77-12240

2I. Water In Plants

FRESHWATER ALGAE OF SOUTHERN AFRICA:3. PLEUROTAENIUM BREVE RACIBORSKI VAR. ENGLERI (SCHMIDLE) KRIEGER AND PENIUM GONATOZYGIFORME CLAASSEN SP. NOV. FROM TRANSVAAL,
Pretoria Univ. (South Africa). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-11546

A BEW SPECIES OF MASTACEMBELUS (PISCES, MASTACEMBELIDAE) FROM THE UPPER ZAMBEZI RIVER, WITH A DISCUSSION OF THE TAXONOMY OF THE GENUS FROM THIS SYSTEM,
Albany Museum, Grahamstown (South Africa).
P. H. Skelton.
Annals of the Cape Provincial Museum (Natural History), Vol 11, No 6, p 103-116, December 1976. 3 fig, 5 tab, 24 ref.

Descriptors: *Fish populations, Distribution, Aquatic habitats, Biology, Color, *Systematics.
Identifiers: Zambezi River, *Mastacembelidae, Southern Africa.

The upper Zambezi River sub-system includes the Okavango River and Swamps as well as the Zambezi River itself and its tributaries above the Victoria Falls. Two Mastacembelus species are known and recognized from this region. Recent collections of fishes taken from the Zambezi River and its tributory and flood-plain system in the Eastern Caprivi area and sent to the Albany Museum, Grahamstown and the Queen Victoria Museum, Salisbury, include a species of Mastacembelus which cannot be referred to either M. mellandi or M. mutombotombo, or any other described species of this genus in Africa. The species is described as new to science. (So African Water Info Center)
W77-11556

THE LARVAL AND PUPAL STAGES OF UGANDATRICHIA MOSELY (TRICHOPTERA: HYDROPTILIDAE) FROM RHODESIA, WITH THE DESCRIPTION OF A NEW SPECIES,
National Inst. for Water Research, Pretoria (South Africa).
K. M. Scott.
Annals of the Cape Provincial Museum (Natural History), Vol 11, No 7, p 117-127, December 1976. 22 fig, 4 ref.

Descriptors: *Aquatic insects, Growth stage, Larvae.
Identifiers: Bundi River, Chimanimani, Ugandatrichia rhodesiensis, Trichoptera, Hydroptilidae, *Rhodesia, Southern Africa.

A new species of Ugandatrichia Mosely, U. rhodesiensis (Hydroptilidae), is described from the Chimanimani National Park in Rhodesia, as are its larval and pupal stages. The larval and pupal stages of this genus were previously unknown, as are the immature stages of Microptila Ris, with which it may be synonymous. The relationships of the young stages are briefly discussed. (So Africa Water Info Center)
W77-11557

WATER RELATIONS AND GROWTH OF SOYBEANS IN DRYING SOIL,
Agricultural Research Service, Stoneville, Mo.
L. G. Heatherly, W. J. Russell, and T. M. Hinckley.
Crop Science, Vol 17, No 3, p 381-386, May-June 1977. 7 fig, 1 tab, 28 ref.

Descriptors: *Soybeans, *Moisture stress, *Plant growth, *Crop response, *Drying, *Soil-water-plant relationships, Xylem, Soil moisture, Evaporation, Wilting, Vapor pressure, Root zone, Leaves.
Identifiers: Xylem pressure potential, Leaf diffusive resistance, Soil water potential, Vapor pressure deficit.

A study was conducted on soybean plants (Glycine max (L.) Merrill 'Hill') to determine the effect of a drying soil on xylem pressure potential (P), leaf enlargement, and leaf diffusive resistance. Plants were grown in moist soil in the greenhouse for 63 days, then subjected to a 9-day drying cycle. The xylem pressure potential, measured three times each day, decreased linearly with and was significantly related to decreasing base (presunrise) soil water potential (SWP) of drying soil. Results indicated the possibility of estimating P of plants in a drying soil from base values of SWP. The P levels of plants growing in wet soil were influenced by extremes in atmospheric demand and by SWP; the largest decline occurred between the presunrise and 1000 to 1200 hour time periods of each day in both soil environments. Presunrise wilting of plants in the drying soil occurred at day 7 when the corresponding base P was about -18 bars. Leaf enlargement declines occurred with a base P of about -4.5 bars, with cessation occurring between -10 and 12.9 bars. Leaf diffusive resistance increased as SWP and P decreased. (Jahns-Arizona)
W77-11622

EXPERIMENTAL EVALUATION OF A CROP CLIMATE SIMULATION MODEL FOR INDIAN CORN (ZEA MAYS L.),
Agricultural Univ., Wageningen (Netherlands). Dept. of Physics and Meteorology.
For primary bibliographic entry see Field 3F.
W77-11631

WATER REPELIENCY OF SOILS UNDER CITRUS TREES IN EGYPT AND MEANS OF IMPROVEMENT,
Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
B. G. Bishay, and H. K. Bakhati.
Agricultural Research Review (Cairo), Vol 54, No 4, April, 1976. p 63-74, 4 tab, 5 fig, 5 ref.

Descriptors: *Soil-water-plant relationships, *Soil moisture, *Water management(Applied), *Fruit crops, *Soil management, *Soil treatment, Soil dynamics, Infiltration, Moisture content, Irrigation, Irrigation practices, Induced infiltration, Land management, Arid lands, Semi-arid climates, Soil density, Soil structure, Trees, Citrus fruits, Adsorption, Alluvium, Clay loam, Agriculture soil amendments.
Identifiers: Leaf drip zone, Polyacrylamide, Egypt.

The effect of a long-time citrus plantation on the hydraulic transmission properties of an alluvial clay loam soil in Egypt was studied. Additionally, the effect of applying the hydrophilic soil conditioner Polyacrylamide (PAM) on the soil was determined in order to obtain an idea of the relative effects of materials used in research on water transmission modification. Two representative soil samples were collected, the first from inside the leaf drip zone and the second from outside the zone. Experimental results indicated no difference in moisture retention curves and pore size distribution between soil inside and outside the leaf drip zone. Due to more hydrophobic soil properties, the infiltration rate of soil inside the zone is smaller than outside the zone. Application of PAM to the soils increased diffusivity, sorptivity, angle of contact, and draining pores essential to land and water management. (Ullery-Arizona)
W77-11633

WATER STATUS AND DISTRIBUTION OF CYANIDIUM CALDERIUM IN SOIL,
California Univ., Los Angeles. Dept. of Bacteriology.
For primary bibliographic entry see Field 2G.
W77-11788

PRECIPITATION NUTRIENTS IN THE OPEN AND UNDER TWO FORESTS IN MINNESOTA,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2K.
W77-11831

LEAF CONDUCTANCE RESPONSE TO HUMIDITY AND WATER TRANSPORT IN PLANTS,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 3F.
W77-11943

STOMATAL RESPONSE TO LEAF WATER POTENTIAL AS AFFECTED BY PRECONDITIONING WATER STRESS IN THE FIELD,
Texas A and M Univ., College Station. Dept. of Soil and Crop Science.
For primary bibliographic entry see Field 3F.
W77-11959

YIELD AND MOISTURE USE PATTERN OF RABI CROPS GROWN UNDER RAINFED CONDITIONS OF EASTERN U.P.,
Banaras Hindus Univ., Varanasi (India). Dryland Agriculture Research Project.
For primary bibliographic entry see Field 3F.
W77-11992

NOTE ON DIVERGENCE IN SOME VARIETIES OF WHEAT GROWN UNDER RAIN-FED CONDITION,
Indian Agricultural Research Inst., New Delhi. Div. of Genetics.
For primary bibliographic entry see Field 3F.
W77-12004

THE MODEL OF THE WATER BALANCE AND NUTRIENT UPTAKE AS A BASIS FOR HYDROLOGICAL, AGRO-HYDROLOGICAL AND OTHER PROJECTS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 2A.
W77-12091

A SYSTEM AND PROGRAM FOR MONITORING CO2 CONCENTRATION, GRADIENT, AND FLUX IN AN AGRICULTURAL REGION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W77-12120

PHOTOSYNTHATE DISTRIBUTION IN NATURAL STANDS OF SALT WATER CORDGRASS,
Rhode Island Univ., Kingston. Dept. of Plant and Soil Science.
R. J. Hull, D. M. Sullivan, and R. W. Lytle, Jr.
Agronomy Journal, Vol. 68, No. 6, p 969-972, November-December 1976. 4 tab, 14 ref.

Descriptors: *Tidal marshes, Estuarine environment, Grasses, *Salt marshes.
Identifiers: *Cordgrass, Photosynthate.

Spartina alterniflora Loisel. is a major grass species of Atlantic coast tidal marshes which contributes heavily to the primary productivity of estuarine ecosystems. As human activity increases in marsh areas, the capability of marsh vegetation to withstand disturbance must be understood and constitute the basis for formulating sound management programs. Toward this end, the seasonal distribution of photoassimilated carbon was studied in S. alterniflora growing under natural conditions. Single culms were exposed to 14CO2 at various times during the 1970 and 1971 growing seasons. Plants were harvested 1, 3, and 7 days following exposure to 14CO2 subdivided into leaves, culm, rhizomes, and roots; and each portion assayed for 14C. Assimilate translocation reached a more or less stable distribution pattern within 24 hours. Throughout much of the growing season, most photosynthate was retained in leaf and culm tissue with less than 10% translocated to roots and rhizomes. Only during early autumn was substantial photosynthate translocated into rhizomes. This and seasonal carbohydrate levels within perennial organs indicate that the stability of S. alterniflora stands may be adversely affected by summer disturbance especially defoliation. (Skogerboe-Colorado State)
W77-12173

NITROGEN ACCUMULATION AND TRANSLOCATION IN CORN GENOTYPES FOLLOWING SILKING.
Guelph Univ. (Ontario). Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W77-12174

NITRATE-N AND TOTAL N CONCENTRATION RELATIONSHIPS IN SEVERAL PLANT SPECIES,
National Fertilizer Development Center, Muscle Shoals, Ala.
For primary bibliographic entry see Field 3F.
W77-12176

2J. Erosion and Sedimentation

METAL ENRICHMENT OF SEDIMENTS IN INLAND WATERS - THE JUKSKEI AND HENOPS RIVER DRAINAGE SYSTEMS,
Pretoria Univ. (South Africa). Dept. of Chemistry
For primary bibliographic entry see Field 5B.
W77-11578

STATISTICAL PROCEDURES FOR BED FORM ANALYSIS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-11582

NUMERICAL MODEL FOR DISCRETE SETTLING,
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-11593

VEGETAL COVER TO ESTIMATE SOIL EROSION HAZARD IN RHODESIA,
Hatcliffe Engineering Centre, Barrowdale (Rhodesia). Dept. of Conservation and Extension.
For primary bibliographic entry see Field 4D.
W77-11630

A PRELIMINARY OCEANOGRAPHIC SURVEY OF THE DAMARISCOTTA RIVER ESTUARY, LINCOLN COUNTY, MAINE,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
For primary bibliographic entry see Field 5B.
W77-11657

INTERNAL SEDIMENTARY STRUCTURES, VERTICAL STRATIGRAPHIC SEQUENCES AND GRAIN-SIZE PARAMETER VARIATION IN A TRANSGRESSIVE COASTAL BARRIER COMPLEX: THE ATLANTIC COAST OF DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies
J. J. Chacko.
Sea Grant Technical Report No. DEL-SG-10-7
1977. 303 p, 84 fig, 2 tab, 362 ref, append. $6.00.

Descriptors: *Delaware, *Sedimentary structures, *Barrier islands, Barriers, Atlantic Ocean.
Identifiers: *Stratigraphic sequences, Transgressive sequences, Regressive sequences.

Detailed information on the internal sedimentary structures, vertical stratigraphic sequences, and grain-size variations in a transgressive coastal barrier complex is provided. A 27-m long stretch on the Atlantic coast of Delaware, extending from Cape Henlopen in the north to Cottonpatch Hill in the south has been thoroughly investigated. Detailed sedimentary structures are presented, based on core photographs. Four major variations of the coastal transgressive barrier complex found within the area of study include (1) the Cape Henlopen spit-beach-dune complex; (2) barrier against marsh; (3) beach against pre-Holocene (Pleistocene) highland; and (4) barrier-tidal delta-lagoon, which included a baymouth barrier and a tidal inlet section. Each of these variations has its own characteristic vertical sequences. Evidence indicates that this barrier complex originated elsewhere further seaward and migrated to its present position. The greater thickness of transgressive sequence deposits in ancestral stream valleys crossing the barrier complex compared to that at other sections gives it a better potential for preservation under a cover of marine sediments. Vertical sedimentary sequences of coarse sediments over fine sediments occur in both transgressive and regressive coastal environmental sequences. (NOAA)
W77-11663

EROSION OF THE TARKIO DRAINAGE SYSTEM, 1845-1976,
Agricultural Research Service, Columbia, Mo.
R. F. Piest, L. S. Elliott, and R. G. Spomer.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 3, p 485-488, May-June 1977. 3 fig, 2 tab, 4 ref.

Descriptors: *Stream erosion, *Channel erosion, *Rivers, *Iowa, *Missouri, Runoff, Drainage, Soils, Soil texture, Loess, Degradation(Slope), Degradation(Stream), Scour, Cultivated lands, Agriculture, Gullies, Geomorphology, Slopes, Erosion, History.
Identifiers: *Tarkio River(Iowa-Mo).

Historic and geologic evidence indicated that channel and gully erosion was nearly nonexistent when the loess-mantled Tarkio Basin of southwestern Iowa and northwestern Missouri was settled about 1845. The pattern of channel development-gleaned from old land surveys, records from drainage districts, highway bridge surveys, and other documents-is related to the intensity of agriculture and is linked complexly to the general runoff regimen and to changes in soil water content along channel boundaries. Some channel enlargement during the post-settlement period, 1845-1976, is quantified. Channel profile changes during recent years, 1939-1976, were reconstructed. The excessive scour in a channel reach of West Tarkio Creek was explained tentatively on the basis of geomorphic principles and differences in substrata erodibility. (Sims-ISWS)
W77-11796

OCHRE AND SUBSURFACE DRAINAGE IN CULTIVATED ORGANIC SOILS OF WILLARD MARSH, OHIO,
Ohio State Univ., Columbus. Dept. of Agronomy.
L. S. Hundal, G. S. Taylor, and G. O. Schwab.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 3, p 489-492, May-June 1977. 3 fig, 3 tab, 11 ref.

Descriptors: *Subsurface drainage, *Tile drainage, *Sediments, *Ohio, *Organic soils, Iron, Iron compounds, Iron oxides, Manganese, Aluminum, Organic matter, Soils, Soil texture, Particle size, Hydrogen ion concentration, Sedimentation, Sampling, On-site investigations, Cultivated lands, Drainage, Agriculture.
Identifiers: *Willard Marsh(Ohio), Ochre, Ochre formation, Iron sludge.

Sediments in subsurface drainage systems were characterized in cultivated organic soils of the Willard Marsh. On-site inspections of sediment-affected drains were made, and soil permeability to water was measured in the field. Chemical analyses were made on drain sediments and soil for ferrous iron, total iron, manganese, aluminum, organic matter, mineral content, and pH. The permeability of the subsoil was quite low, ranging from 0.1 to 0.4 cm/hr. The plow layer permeability varied from about 1.5 to 2.5 cm/hr. Sediments from drains ranged from 100% organic material to a mixture of organic and mineral materials. A maximum iron content of 35% was found in an ochreous sediment. Ferrous iron in the soil increased markedly below drain depth. Subsurface drainage appears to be impeded by two principle factors: one is the low permeability of the subsoil, and the other factor is the accumulation of organic sediments and ochre (iron) in drains. (Sims-ISWS)
W77-11797

A CLOSING, REPLICATE-SAMPLE, SEDIMENT TRAP,
California Univ., Davis. Div. of Environmental Studies.
B. L. Kimmel, R. P. Axler, and C. R. Goldman.
Limnology and Oceanography, Vol 22, No 4, p 768-772, July 1977. 3 fig, 2 tab, 13 ref. NSF GB-19052, DEB76-19524.

Descriptors: *Sampling, *Sediments, *Seston, Equipment, Sedimentation, Lakes, On-site investigations, Limnology, Lake sediments.
Identifiers: *Sediment traps, Samplers.

A device for collecting sedimenting seston in pelagic systems was described. The device permits remote closure, sample replication, correction for attached growth, and use in vertical series. The data presented indicate a significant amount of horizontal heterogeneity in seston sedimentation within a small lake basin. (Sims-ISWS)
W77-11802

SEDIMENTATION AND CLIMATIC PATTERNS IN THE SANTA BARBARA BASIN DURING THE 19TH AND 20TH CENTURIES,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-11817

CONTROLS OF VARIATION IN SUSPENDED SEDIMENT CONCENTRATION IN THE RIVER ROTHER, WEST SUSSEX, ENGLAND,
King's Coll., London (England). Dept. of Geology.
For primary bibliographic entry see Field 4D.
W77-11824

SEDIMENT CONCENTRATION AND DURATION IN STREAM CHANNELS,
Denver Univ., Colo. Dept. of Geography.
J. E. Costa.
Journal of Soil and Water Conservation, Vol 32, No 3, p 168-170, July 1977. 4 fig, 15 ref.

Descriptors: *Sediment transport, *Channels, *Streams, *Maryland, Streambeds, Water quality, Groundwater, Hydrographs, Hydrology, Turbidity, Pollutant identification.
Identifiers: *Sediment concentration, Suspended sediment, Flood hydrographs.

Establishment of water quality standards for suspended sediment has been delayed partially by lack of information on sediment persistence in channels. In streams with dominantly suspended sediment loads, suspended sediment concentrations can be studied by correlating the concentrations with turbidity. In the stream studied, both discharge and sediment concentration increase downstream during floods because of the confluence of sediment-laden tributaries. Duration of suspended sediment concentrations in channels is reduced by higher rates of preceding flows, increased volumes of groundwater, and throughflow contributions to flood hydrographs, multipeaked hydrographs and sediment concentration peaks preceding water discharge peaks. (Lee-ISWS)
W77-11825

THE HYDROLOGIC HISTORY OF THE SAN CARLOS RESERVOIR, ARIZONA, 1929-71, WITH PARTICULAR REFERENCE TO EVAPOTRANSPIRATION AND SEDIMENTATION,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 2D.
W77-11870

SHORELINE CONFIGURATION AND SHORELINE DYNAMICS: A MESOSCALE ANALYSIS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2L.
W77-11893

CIRCULATION OBSERVATIONS IN THE LOUISIANA BIGHT USING LANDSAT IMAGERY,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2L.
W77-11895

SPATIAL AND TEMPORAL VARIATIONS IN THE INTERSTITIAL WATER CHEMISTRY OF CHESAPEAKE BAY SEDIMENTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 2L.
W77-11906

EFFECT OF PULP MILL EFFLUENT ON THE SURFICIAL SEDIMENTS OF WESTERN NIPIGON BAY, LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-12055

DISTRIBUTION OF DEHYDROABIETIC ACID IN SEDIMENTS ADJACENT TO A KRAFT PULP AND PAPER MILL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W77-12067

A NEW METHOD OF COMPUTATION OF THE SUSPENDED SEDIMENT LOAD,
Freiburg Univ. (West Germany). Geographisches Institut.
K-R. Nippes.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 659-666, 1974. 3 fig, 2 tab, 9 ref.

Descriptors: *Suspended solids, *Sediment load, *Model studies, Mathematical models, Sediments, Sediment discharge, Erosion, Geomorphology, Mountains, Watersheds(Basins), Rivers, Streams, Floods, Sediment transport.

Until now it was difficult to compute the suspended sediment load. A new method was

shown which needs only a small amount of measured data. A sufficiently precise computation of the suspended sediment load was possible by use of an area parameter. The suspended sediment transport occurs in smaller mountainous watercourses during times of increased discharge. A method was developed which determines the correlative connection between the discharge increase and the maximum suspended sediment concentration during the discharge increases. The method of computation was based on the following demonstrable conditions: (1) There is a close correlative connection between the maximum suspended sediment concentration during a discharge increase and the rate of increase. (2) The suspended sediment load during an increase in discharge can be computed sufficiently precisely as a function of the maximum sediment concentration, the discharge peak, and the time concerned. (3) The suspended sediment concentration is nearly constant during periods without floods. (See also W77-06708) (Sims-ISWS)
W77-12098

MATHEMATICAL MODEL OF THE RIVER-BED EROSION BELOW A DAM,
Technical Univ. of Krakow (Poland).
H. Witkowska.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 821-830, 1974. 1 fig, 2 tab, 19 ref.

Descriptors: *Erosion, *River beds, *Mathematical models, *Gradually varied flow, Model studies, Bed load, Sediment transport, Mathematical studies, Analytical techniques, Analysis, Sediment load, Flow, Hydrologic aspects, Foreign research, Foreign countries, Profiles, Degredation(Stream), Stream erosion.
Identifiers: *Poland, *Upper Vistula River(Poland).

The principles of choosing a mathematical model of river-bed erosion were discussed. According to these principles mathematical models were proposed based on the gradually varied flow equation and on (1) Meyer-Peter, (2) Meyer-Peter-Muller, and (3) Gontcharoff formulas for the bed load. The models were compared with the experimental data for the Upper Vistula River. The second model was found to have the best correspondence with measured values. It was concluded that: (1) The choice of mathematical model is determined by the geological, hydrological, and sedimentation characteristics. It cannot be general, and every practical use has to be carefully chosen. (2) The bed load formulas are of the greatest importance. Their choice is crucial to the results. (3) Three types of differential equations were derived, and their solutions by the Tinney trial-and-error method were shown. The method allows some basic assumptions to be avoided and allows the inclusion of additional parameters. (4) The final equilibrium equations were derived by the step method. (5) The calculations based on the field data showed that the chosen model gives very good results. It allows a nonregular variation of the x- coordinate of the sediment diameter, d, and varied slope (even with negative values) to be taken into account. (6) The armouring coefficient is not necessary if the final d is properly expressed as a function of x. (See also W77-06708) (Humphreys-ISWS)
W77-12111

CALLAHAN RESERVOIR: I. SEDIMENT AND NUTRIENT TRAP EFFICIENCY,
Agricultural Research Service, Columbia, Mo. North Central Watershed Research Center.
For primary bibliographic entry see Field 5G.
W77-12149

CALLAHAN RESERVOIR: III. BOTTOM SEDIMENT-WATER-PHOSPHORUS RELATIONSHIPS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 5G.
W77-12150

A 96-HOUR SEDIMENT BIOASSAY OF DULUTH AND SUPERIOR HARBOR BASINS (MINNESOTA) USING HEXAGENIA LIMBATA, ASELLUS COMMUNIS, DAPHNIA MAGNA, AND PIMEPHALES PROMELAS AS TEST ORGANISMS,
Heidelberg Coll., Tiffin, Ohio. Dept. of Biology; and Heidelberg Coll., Tiffin, Ohio. River Studies Lab.
For primary bibliographic entry see Field 5A.
W77-12240

ANALYSIS OF HEAVY METALS AND BACTERIA IN SEDIMENTS FROM DANISH LIGNITE PITS,
Copenhagen Univ. (Denmark). Inst. of Hygiene.
For primary bibliographic entry see Field 5A.
W77-12250

2K. Chemical Processes

INTERFACIAL REACTIONS AND THE FATE OF HEAVY METALS IN SOIL-WATER SYSTEMS,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5B.
W77-11524

VANADIUM AND OTHER ELEMENTS IN GREENLAND ICE CORES,
San Diego State Univ., Calif. Dept. of Chemistry.
For primary bibliographic entry see Field 2C.
W77-11586

RADIOACTIVITY IN MISSISSIPPI RIVER WATER,
Louisiana Water Resources Research Inst. Baton Rouge.
For primary bibliographic entry see Field 5A.
W77-11641

QUANTUM-MECHANICAL STUDIES OF ENVIRONMENTAL EFFECTS ON BIOMOLECULES: I. HYDRATION OF FORMAMIDE,
Consiglio Nazionale delle Ricerche, Pisa (Italy). Laboratori di Chimica Quantistica.
G. Alagona, A. Pullman, E. Scrocco, and J. Tomasi.
Int J Peptide Protein Res. 5(4), p 251-259, 1973.

Descriptors: *Environmental effects, *Molecular structure, *Hydration, Chemical properties.
Identifiers: *Formamide, Biomolecules.

As a first step in a general quantum-mechanical investigation of environmental effects on the structure and properties of biomolecules, the non-empirical ab initio self-consistent field molecular orbital method was employed for the determination of the principal hydration sites of formamide and of the essential characteristics of the monohydrates. In view of the extension of the study to more complex systems, the validity of a simplified treatment taking into account only the electrostatic parts of the interaction energy between formamide and water was also investigated. --Copyright 1974, Biological Abstracts, Inc.
W77-11645

EFFECTS OF SODIUM SULFATE AND SODIUM CARBONATE SOLUTIONS ON CHEMICAL AND PHYSICAL PROPERTIES OF A CHERNOZEM SOIL,
Department of Agriculture, Vegreville (Alberta). Solonetzic Soil Sub-Station.
R. R. Cairns, and I. Szabolcs.
Can J Soil Sci. 53(4), p 399-403, 1973.

Descriptors: *Sodium sulfate, Sodium compounds, Carbonates, Soils, Soil chemistry, *Chernozems, *Soil chemical properties, *Soil physical properties.
Identifiers: *Sodium carbonate.

Dilute solutions (0.01 N and 0.1 N) of Na2SO4 and Na2CO3 in comparison with water were allowed to penetrate columns of Chernozem Ah horizon soil, which were then subjected to the penetration of water. Although the Na2SO4 solution penetrated the soil columns slightly more readily than the Na2CO3 solutions, at equal concentrations they were just as or more effective in dispersing the soil and blocking the subsequent entry of water. Leaching with Na2SO4 caused downward displacement of Ca.--Copyright 1974, Biological Abstracts, Inc.
W77-11650

INVESTIGATIONS ON PRECIPITATION FROM VARIOUS LOCATIONS IN NORWAY 1965-71,
Direktoratet for Jakt, Viltstell og Ferskvannsfisk, Vollebekk (Norway). Fisheries Research Inst.
For primary bibliographic entry see Field 2B.
W77-11785

BUDGET OF SELECTED MINERAL NUTRIENTS FOR TWO WATERSHED ECOSYSTEMS IN THE SOUTHEASTERN PIEDMONT,
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 5B.
W77-11791

PRECIPITATION NUTRIENTS IN THE OPEN AND UNDER TWO FORESTS IN MINNESOTA,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
E. S. Verry, and D. R. Timmons.
Canadian Journal of Forest Research, Vol. 7, No. 1, p 112-119, March, 1977, 1 fig, 7 tab, 17 ref.

Descriptors: *Nutrient, *Precipitation(Atmospheric), *Minnesota, *Chemistry of precipitation, Throughfall, Nitrogen, Potassium, Calcium, Sodium, Magnesium.
Identifiers: Aspen, Black spruce, Nutrient load, Nutrient inputs.

Concentrations of N, P, K, Ca, Mg, and Na were measured in rain and snow in the open and throughfall and stemflow under black spruce and aspen forests in north-central Minnesota. Concentrations of total P in rain and black spruce throughfall were inversely related to storm size. Annual precipitation nutrient inputs to the forest floor were calculated for each site. In general, nutrient contributions from snow were less than 10% of the annual nutrient input from precipitation at each site, and differences in snow nutrient input between sites were minimal. Rainfall nutrient input differed significantly between sites. Rain and snow passing through both forest canopies were enriched with nutrients except inorganic nitrogen. Total annual nutrients added to the forest floor under the black space stand averaged 1.7 times that added in the open; the annual amount added under the aspen stand averaged 5.2 times that in the open. (Forest Service)
W77-11831

THE DIFFERENTIATION OF INORGANIC AND ORGANOMERCURY SPECIES IN AQUEOUS SAMPLES,
North Dakota Univ., Grand Forks. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-11936

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT - PHASE III,
Washington Univ., Seattle, Coll. of Forestry.
For primary bibliographic entry see Field 4C.
W77-11941

MASS TRANSFER STUDIES IN SORBIN POROUS MEDIA: II. EXPERIMENTAL EVALUATION WITH TRITIUM (3H20),
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-11983

MASS TRANSFER STUDIES IN SORBING POROUS MEDIA: III. EXPERIMENTAL EVALUATION WITH 2,4,5-T,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-11984

GROUNDWATER CHEMISTRY AND THE TRANSPORT EQUATIONS,
Princeton Univ., N.J. Water Resources Program.
For primary bibliographic entry see Field 2F.
W77-12112

DENITRIFICATION MEASURED DIRECTLY FROM NITROGEN AND NITROUS OXIDE GAS FLUXES,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. E. Rolston, M. Fried, and D. A. Goldhamer.
Soil Science Society of America Journal, Vol 40, No 2, p 259-266, March-April 1976. 8 fig, 2 tab, 17 ref.

Descriptors: *Denitrification, *Nitrogen, Fertilization, Soils, Soil water, Lysimeters, Diffusion, Leaching.
Identifiers: Soil columns, Ryegrass, *Nitrogen transport(Soils), *Nitrous oxide.

The amount of denitrification is generally the unknown in attempts to evaluate the fate of N fertilizers applied to soils. Substantial error can result when denitrification is determined from the difference between measurements of plant uptake, residual soil N, leaching, and the amount of N applied. An independent, direct measure of denitrification potentially has merit by containing only the error from direct measurement and not a cumulative error from several measurements. Nitrate at a rate of 300 kg of N/ha and enriched with 20 and 10 atom percent excess N-15 was applied to laboratory columns and a field plot, respectively. The columns were maintained at soilwater pressure heads of -22 and -70 cm. The field plot was maintained at a soil -water pressure head of approximately -10 cm in the upper 10 cm of soil. The field plot was cropped with perennial ryegrass. The columns and field plot were instrumented with tensiometers, soil solution samplers, and gas samplers. The concentration and isotopic ratio of N03, N2, and N20 were measured as a function of soil depth and time. The gaseous concentration gradients and measured apparent diffusion coeffi-cients were used to calculate the fluxes of (N-15) 2 and (N-15)20 gas from the soil. Residual soil N, plant uptake, and leaching were measured in order to calculate denitrification determined directly compared favorably with that determined by difference. (Skogerboe-Colorado State)
W77-12180

DEVELOPMENT OF ORGANIC SOLUTE AND TOTAL ORGANIC CARBON MONITORS,
Life Systems, Inc., Cleveland, Ohio.
For primary bibliographic entry see Field 5A.
W77-12199

2L. Estuaries

DAILY VERTICAL DISTRIBUTION OF ZOOPLANKTON IN SOME LAKES IN THE EASTERN PART OF THE BOL'SHEZEMEL'SKAYA TUNDRA (IN RUSSIAN),
Nature Conservation, Game Preserves and Hunting, Moscow (USSR). Central Lab.
N. V. Vekhov.
Biol Nauki 18(12), p 29-36, 1975.

Descriptors: *Spatial distribution, *Zooplankton, *Tundra, Daphnia, Lakes, Light, Oxygen, Plankton, Temperature.
Identifiers: Asplanchna-priodonta, Bol'shezmel'skaya, Chydorus-sphaericus, Colotheca-mutabilis, Conochilus-unicornis, Cyclops-strenuus, Daphnia-longiremis, Daphnia-longispina, Euchlanis-dilatata, Eudiaptomus-graciloides, Heterocope-appendiculata, Heterocope-gibberum, Kellicottia-longispina, Keratella-cochlearis, Leptodora-kindtii, USSR, Polyarthra-dolichoptera, Russian-SFSR.

Studies in 2 tundra lakes (maximum depth: 6.5 m) NW of Vorkuta (Russian SFSR, USSR) showed that plankters migrated in vertical direction and that specific plankton distribution, which was most dense in upper 2 m, remained unchanged even with strong winds. Daily migration and distribution depended on food concentration, temperature, light intensity and O2 supply. The following rotifers, copepods and Cladocera were found: Asplanchna priodonta Gosse, Kellicottia longispina (Kellicott), Keratella cochlearis (Gosse), Synchaeta pectinata Ehrenberg, Polyarthra dolichoptera Idelson, Conochilus unicornis Rousselet, Colotheca mutabilis (Hudson), Leptodora kindtii (Focke), Daphnia Longiremis Sars, Chydorus sphaericus (O.F. Mueller), Daphnia longispina (O.F. Mueller, Eudiaptomus graciloides Lillieborg, Heterocope appendiculata Sars, Cyclops strenus Fischer, Euchlanis dilatata dilatata Ehrenberg and Heterocope gibberum.–Copyright 1977, Biological Abstracts, Inc.
W77-11501

THE COMMON MUSSEL MYTILUS EDULIS AS INDICATOR FOR THE LEAD CONCENTRATION IN THE WESER ESTUARY AND GERMAN BIGHT, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5A.
W77-11520

TRACE ELEMENTS IN ACARTIA CLAUSI FROM ELEFSIS BAY OF THE UPPER SARONIKOS GULF, GREECE,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
For primary bibliographic entry see Field 5C.
W77-11521

EFFECTS OF DREDGING OPERATIONS ON ESTUARINE BENTHIC MACROFAUNA,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5C.
W77-11525

CONTENT OF PLUTONIUM, THORIUM AND PROTACTINIUM IN SEA WATER AND RECENT CORAL IN THE NORTH PACIFIC,
Kanazawa Univ. (Japan). Radiochemistry Lab.
For primary bibliographic entry see Field 5A.
W77-11527

VITAMIN B12 CONTENTS IN SEA WATER ALONG THE COAST OF FUKUYAMA IN 1970 AND 1971,
Hiroshima Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-11535

UPTAKE OF ZINC, LEAD, AND CADMIUM BY YOUNG WHITING IN THE SEVERN ESTUARY,
Bath Univ. (England).
For primary bibliographic entry see Field 5C.
W77-11537

ALUMINUM-26 IN DEEP-SEA SEDIMENT,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivites.
For primary bibliographic entry see Field 5B.
W77-11538

VIBRIO PARAHAEMOLYTICUS - A MARINE PATHOGEN DETECTED IN SOUTH AFRICAN COASTAL WATERS,
South African Inst. for Medical Research, Port Elizabeth.
For primary bibliographic entry see Field 5C.
W77-11553

NOTES ON THE CONSERVATION OF UMNGAZANA ESTUARY,
Cape Town Univ. (South Africa). Dept. of Zoology.
G. M. Branch.
South African Journal of Science, Vol 72, No 12, p 363-364, December 1976.

Descriptors: Conservation, Limnology, Mangroves, Swamps, Saline lakes, Ecology, Invertebrates, Water birds, Fish, Silting, Phytoplankton, Estuarine environment, Water quality.
Identifiers: Zostera, Upogebia, Scylla, Mugilidae, Umngazana River, Transkei, Southern Africa.

The Transkei coastline comprises a 290 km long mosaic of forest, grassland and estuaries. Much of the area has been denuded by shifting agriculture, veld burning, overgrazing and erosion. Many estuaries are degraded due to a heavy silt load. With increased development, further pressures will be placed on the coastline, and there is an urgent need to develop a masterplan for future township development, tourism, industry and conservation. The present report is a contribution towards this and presents the case for conservation of the Umngazana Estuary. Physical data indicate a stable and equable habitat suitable for long-term conservation. A perennially open mouth, freedom from silting, normal salinities, high oxygen tensions and considerable tidal flushing all contribute towards ideal estuarine conditions. The flora include the southern-most congregation of three mangrove species, forming the largest mangrove forests in Southern Africa. Salt marshes are the major primary producers of the system. Rich forests on the surrounding hills prevent erosion and silting. A rich invertebrate fauna of 140 species was recorded. 39 species of fish were netted, and 103 bird species were recorded in winter. The proclamation of the area as a nature reserve is urgently recommended. (So African Water Info Center)
W77-11563

BREAKING WAVE CRITERION ON A SLOPING BEACH,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 8B.
W77-11585

OCEAN TIDES AND WEATHER-INDUCED BOTTOM PRESSURE FLUCTUATIONS IN THE MIDDLE-ATLANTIC BIGHT,
Woods Hole Oceanographic Institution, Mass.
R. C. Beardsley, H. Mofjeld, M. Wimbush, C. N. Flagg, and J. A. Vermersch, Jr.
Journal of Geophysical Research, Vol. 82, No. 21, p 3175-3182, July 20, 1977. 5 fig, 3 tab, 15 ref. NOAA 01-5-022-471, NSF GA-41075, DES74-03001, OCE76-01813.

Descriptors: *Oceans, *Tides, *Pressure, *Atlantic Ocean, Weather, Storms, Winds, Instrumentation, Fluctuations, Waves, Ocean waves, On-site investigations, Data processing, Frequency analysis, Frequency curves, Oceanography.
Identifiers: *Middle-Atlantic Bight, *Bottom pressure, Subtidal pressure fluctuations.

Five bottom pressure gages were deployed in the Middle-Atlantic Bight during late winter of 1974. Analysis of the resulting pressure series and neighboring coastal tide gage series showed that tides are the dominant pressure signal in this section of the continental shelf. Most of the remaining pressure fluctuations appear to be forced by meteorological transients. During March 21, 1974, a developing cyclone moving up the coast excited a coherent group of sea level oscillations with characteristic periods of 5-7 hours, which were interpreted here as coastal-trapped edge waves. Spectra of the nontidal pressure series are red, however; most of the nontidal variability is caused by lower-frequency (subtidal) components. The subsurface pressure (SSP) fluctuations do appear coherent over the spatial extent of the array in the most energetic subtidal frequency bands, and estimates made of the relative horizontal SSP gradients indicated that cross-shelf gradient variations are significantly larger than alongshore gradient variations. Some consequences of the large weather-induced gradient fluctuations on the shelf circulation were discussed. (Sims-ISWS)
W77-11610

FEEDING ECOLOGY OF EELGRASS FISH COMMUNITIES,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5C.
W77-11644

TIDE PRINTS: SURFACE TIDAL CURRENTS IN PUGET SOUND,
Washington Univ., Seattle. Div. of Marine Resources.
N. McGary, and J. H. Lincoln.
Sea Grant Report No. WSG-77-1, 1977. 51 p. 2 ref. Also Published by Univ. Washington Press, Seattle, $4.95.

Descriptors: *Tides, *Estuaries, Washington.
Identifiers: *Surface currents, *Tidal currents, *Puget Sound(Wash), Tidal charts.

These charts--or 'tide prints'--portray the surface currents in Puget Sound at eight stages during a tidal day and all are referenced to the tide stage at Seattle. Absolute or true speeds are not shown because of the strong dependence of currents on tide range and height, although the portrayal is designed to indicate approximate relative speeds are not shown because of the strong dependence of currents on tide range and height, although the portrayal is designed to indicate approximate relative speeds and flow directions. These charts are intended to supplement the Tidal Current Charts of Puget Sound and the Tidal Current tables published by the National Ocean Survey of the National Oceanic and Atmospheric Administration. (NOAA)
W77-11653

OBSERVATIONS OF CRASSOSTREA VIRGINICA CULTURED IN THE HEATED EFFLUENT AND DISCHARGED RADIONUCLIDES OF A NUCLEAR POWER REACTOR,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
For primary bibliographic entry see Field 5C.
W77-11655

GUIDEBOOK TO GEOLOGIC AND BEACH FEATURES OF THE RACHEL CARSON SALT POND AREA, NEW HARBOR, MAINE,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
V. T. King, and B. W. Nelson.
Maine Sea Grant Bulletin No. 10, 1977. 18 p. 11 fig, 6 ref.

Descriptors: *Maine, *Ponds, *Geology, *Beaches.
Identifiers: *Salt ponds, *New Harbor(Maine).

The Rachel Carson Salt Pond Preserve is managed by the Maine Chapter of the Nature Conservancy. This organization is concerned with the preservation of unique or essential natural features. The Salt Pond area is a particularly good area for viewing certain geologic features. The rocks are well exposed and many features are duplicated along a proposed excursion route. The length of the route is about 1,170 feet (approximately 357 meters) on the north side of the Salt Pond. Total time of the field trip is a minimum of 60-75 minutes. Photographs are provided of each suggested stop. These photographs allow you to find key geological features with minimum delay. At the end of each numbered descriptive paragraph, the distance from the Rachel Carson monument is given in meters and feet. A glossary of terms is provided. (NOAA)
W77-11656

A PRELIMINARY OCEANOGRAPHIC SURVEY OF THE DAMARISCOTTA RIVER ESTUARY, LINCOLN COUNTY, MAINE,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
For primary bibliographic entry see Field 5B.
W77-11657

ANNUAL PHYSICAL AND CHEMICAL OCEANOGRAPHIC CYCLES OF AUKE BAY, SOUTHEASTERN ALASKA,
National Marine Fisheries Service, Seattle.
H. E. Bruce, D. R. McLain, and L. Wing.
For sale by Superintendent of Documents, U.S. Govt Printing Office, Washington, DC 20402. NOAA Technical Report NMFS SSRF-712, May 1977. 14 p, 16 fig, 1 tab, 25 ref.

Descriptors: *Oceanography, *Nutrients, *Estuaries, *Alaska.
Identifiers: *Physical oceanography, *Chemical oceanography, Annual cycles.

The annual cycles of physical and chemical oceanographic conditions in Auke Bay, a small estuary in southeastern Alaska, showed a consistent pattern over an 8-yr period (1961-68). The cycles closely followed seasonal climatological and atmospheric events. Increased insolation in the spring caused general warming of the surface water and the air, which in turn increased the freshwater input into Auke Bay from melting snow and ice. The fresh water lowered surface salinities and together with warming of the surface waters caused a density stratification of the water column, which increased as the spring-summer season progressed. Maximum stratification occured in August, follwed by a general decay of stratification in September. Vertical mixing of the top 30 m of the water column by fall storms in September and colling of surface water resulting from decreased insolation set up a thermohaline circulation that continued through the fall and early winter. The water column became homogeneous by January and remained throughly mixed from January through March or early April. Auke Bay was rich in the inorganic nutrients phosphate, silicate, and nitrate. Spring phytoplankton blooms followed the onset of stratification and drastically reduced the concentration of all three nutrients in the surface water. Nitrate was essentially depleted and remained so throughout the summer. Low nitrate availability was undoubtedly one of the important factors limiting primary production in Auke Bay. (NOAA)
W77-11658

NEW ENGLAND OFFSHORE MINING ENVIRONMENTAL STUDY (PROJECT NOMES),
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
NOAA Special Report, April 1977. 152 p, 57 fig, 30 tab, 95 ref, 4 append. John W. Padan (Ed.).

Descriptors: *Environmental effects, *Dredging, *Resource development, *Baseline studies, *Mining, Sands, Gravels, *New England.
Identifiers: *Outer Continental Shelf, Project NOMES, Hydraulic dredging, Environmental impact.

Findings of a study, established to investigate the potential hazard to the environment of offshore sand and gravel mining but prematurely terminated, are presented as a baseline for further studies. Included are the determination of the kinds of environmental impacts likely to result from hydraulic dredging; a research strategy to measure such impacts; and specific investigations to implement that strategy in four oceanographic aspects--biological (benthos, phytoplankton, turbidity experiments), geological (bathmetry, stratigraphy, core samples), chemical (nutrients, suspended solids), and physical (temperature and salinity, currents and dispersion, and light penetration). Detailed findings of completed studies are presented. Appendices provide a description of the complete process of offshore mining, from exploration to transportation to market; lists of Project NOMES Advisory Committees; and baseline data regarding benthic communities. (NOAA)
W77-11660

NEW YORK BIGHT PROJECT. PROJECT DEVELOPMENT PLAN AND TECHNICAL DEVELOPMENT PLAN.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W77-11661

INTERNAL SEDIMENTARY STRUCTURES, VERTICAL STRATIGRAPHIC SEQUENCES, AND GRAIN-SIZE PARAMETER VARIATIONS IN A TRANSGRESSIVE COASTAL BARRIER COMPLEX: THE ATLANTIC COAST OF DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2J.
W77-11663

CONCRETE PROPERTIES AT OCEAN DEPTHS,
Civil Engineering Lab. (Navy), Port Hueneme Calif. Ocean Structures Div.
For primary bibliographic entry see Field 8F.
W77-11779

SOME REMARKS ON COMPUTER MODELING OF COASTAL FLOWS,
California Univ., Berkeley. Dept. of Civil Engineering.
H. B. Fischer.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the Amer

can Society of Civil Engineers, Vol 102, No. WW4, p 395-406, November 1976. 6 fig, 29 ref.

Descriptors: *Coastal engineering, *Estuaries, Dispersion, *Computer models, *Simulation nalysis, Currents(Water), Mass transfer, Momenum transfer, Tidal waters, Equations, Systems nalysis, Velocity, California.
dentifiers: Computation, Transport model.

imitations on the ability of numerical models to nodel flow and dispersion of pollutants in coastal reas due to fundamental restriction in knowledge f exchange coefficients are covered. Specific mitations result from the effects of stratification n the control of flow and mixing rates, and form a ck of understanding of the transverse exchange rocess. Examples of specific computer models re given, with emphasis on why some models give eliable results despite the limitations previously entioned. (Bell-Cornell)
77-11781

NCOMPLETE EXTRACTION OF RAPIDLY ETTLING PARTICLES FROM WATER SAMLERS,
Voods Hole Oceanographic Inst., Mass. Joint Proram in Oceanography.
. D. Gardner.
imnology and Oceanography, Vol 22, No 4, p 54-768, July 1977. 3 fig, 2 tab, 6 ref.

escriptors: *Sampling, *Particle size, *Oceans, Lakes, Equipment, Water sampling, On-site inestigations, Settling velocity, Filtration, Limology, Oceanography.
dentifiers: Niskin bottles, Particle concentration, mpling techniques.

any particles captured in water bottles settle low the sampling spigots and escape detection hen the sampler design does not allow for moval of all the enclosed water. Particles lost om 30-liter Niskin bottles can increase the meared total concentration of particulate matter by a ctor of 1.1-1.7 in open ocean samples. Large mbers of particles as small as 4 micrometers are st. Scanning electron microscopy showed a sigficant loss of diatoms, Acantharia, oraminifera, coccospheres, dinoflagellates, fecal llets, organic matter, carapaces, and aggregates particles. (Sims-ISWS)
77-11801

N THE VARIABILITY OF SURFACE TENON WITH MEAN WIND SPEED,
mburg Univ. (West Germany). Institut fuer Orische Chemie und Biochemie.
Huhnerfuss, W. Walter, and G. Kruspe.
rnal of Physical Oceanography, Vol 7, No 4, p 7-571, July 1977. 3 fig, 5 tab, 25 ref.

scriptors: *Surface tension, *Winds, *Oceans, lonomolecular films, *Atlantic Ocean, On-site vestigations, One-site data collections, Ships, reign research, Biological communities, Plank, Temporal distribution, Oceanography.
ntifiers: *North Sea, Slicks, Organic films, ological productivity.

situ measurements of surface tension obtained R. V. Gauss under coastal (North Sea off the nd of Sylt) and by R. V. Meteor under open sea nditions (GATE area) were compared with time iations of the surface mean wind speed. The ults indicated that the surface tension of the sea face may attain values which are 21 dyn/cm ow the values obtained from the Flemingelle formula, if the mean wind speed decreases ddily to less than 5 m/s and the biological ductivity within the upper layers of the water is nificant. (Sims-ISWS)
7-11807

OCEAN SURFACE DRIFT VELOCITIES,
Cooperative Inst. for Marine and Atmospheric Studies, Miami, Fla.
E. B. Kraus.
Journal of Physical Oceanography, Vol 7, No 4, p 606-609, July 1977. 4 ref. NSF ATM75-22940.

Descriptors: *Aquatic drift, *Oceans, *Ocean circulation, *Model studies, Mathematical models, Oil spills, Air-water interfaces, Pressure, Coriolis force, Ocean currents, Velocity, Oceanography.
Identifiers: *Drift velocities.

Symmetry considerations indicate that in steady-state conditions, and in the absence of a sea current, a horizontal interface must move in the direction of the surface geostrophic wind. With currents present, the interface velocity is the vector mean of the surface geostrophic wind and the current velocity, weighted respectively by the fluid masses per unit surface area which are affected by the viscous diffusion of vorticity upward and downward from the interface. In turbulent flow with neutral stratification, the ratio of the masses equals the square root of the density ratio. In transient conditions, the surface drift velocity has components in the direction of the isallobaric gradient and down a steeping surface slope. Wave action is responsible mainly for the spreading and the breakup of surface films. (Sims-ISWS)
W77-11810

CIRCULATION AND TEMPERATURE STRUCTURE IN LARGE MARINE ENCLOSURES,
Marine Lab., Aberdeen (Scotland).
J. H. Steele, D. M. Farmer, and E. W. Henderson.
Journal of the Fisheries Research Board of Canada, Vol 34, No 8, p 1095-1104, August 1977. 14 fig, 18 ref. NSF OCE73-09763 A04.

Descriptors: *Water circulation, *Water temperature, *Dye dispersion, Mixing, Dye releases, Fluorescent dye, Dye concentrations, Circulation, Temperature, On-site investigations, Phytoplankton, Algae, Chlorophyll, Oceanography, Estuaries.
Identifiers: *Marine enclosures.

Certain physical measurements intended to shed light on the circulation in large plastic enclosures (60-2000 cu m) induced by the changing environment in which they are moored were described. Layers of dye generally were seen to diffuse vertically, although some important advection effects also were observed. Estimates of an average coefficient of turbulent diffusivity yielded values in the range .05-.26 sq m/s. Measurements taken with recording thermistor chains both inside and outside the enclosures showed strong damping of external fluctuations with periods significantly less than 1 day. Various possible sources of mixing energy were considered, and it was concluded that thermal forcing through the wall may be significant and could account for the observed range of coefficients. The significance of the observed mixing and circulation to the ecology of the enclosures was discussed. Of particular importance is the vertical mixing of nutrients that influences phytoplankton sinking rates and thus plays a crucial role in determining variations in algal concentration at different depths. (Sims-ISWS)
W77-11816

SEDIMENTATION AND CLIMATIC PATTERNS IN THE SANTA BARBARA BASIN DURING THE 19TH AND 20TH CENTURIES,
Scripps Institution of Oceanography, La Jolla, Calif.
A. Soutar, and P. A. Crill.
Geological Society of American Bulletin, Vol 88, No 8, p 1161-1172, August 1977. 12 fig, 11 tab, 36 ref. NSF GA-40157.

Descriptors: *Sedimentation, *Climatology, *Dendrochonology, *Basins, *California, Rainfall, Sediments, Sedimentology, Documentation, Climates, Cores, Sampling, Varves, Histograms, Time lag, Analysis, Evaluation, Data collections, Deposition(Sediments), Correlation analysis, Temperature, Seasonal, Analytical techniques, Regression analysis, Statistical methods.
Identifiers: *Santa Barbara Basin(Calif), Climatic patterns.

The thickness of annual sediment laminations in the Santa Barbara Basin was compared to southern California drought-resistant tree growth and to regional indices of rainfall and temperature. The rate of sedimentation was found to be independent of temperature, but it is highly correlated with rainfall and tree growth. It was suggested that sedimentation, like tree growth, is a function of the amount of rainfall in the prior seasons as well as in the current season. The natural filter displayed by the sedimentation and tree-growth records can be described by a simple mathematical model, which, in the case of sedimentation, can be related to upstream aggradation or to distributional processes on the shelf. The pair of laminae that constitute a single year's sediment accumulation are related directly. This suggests that the process of detrital sediment delay and redistribution operates primarily in the marine environment. The density difference that distinguishes 'winter' laminae and 'summer' laminae was ascribed to the interaction of the seasonal rate of deposition and the growth of a mat-forming organism endemic to the surface sediment of the Santa Barbara Basin. (Humphreys-ISWS)
W77-11817

THE APPLICATION OF NONSTRUCTURAL MEASURES TO COASTAL FLOODING,
Cheney, Miller, Ellis, and Associates, Inc., Putnam, Conn.
P. B. Cheney, and H. C. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 750, Price codes: A05 in paper copy, A01 in microfiche. Prepared for the New England River Basins Commission, Boston, Mass., Report NERB-30, June 30, 1975. 84 p, 8 tab, 8 plates, 14 ref.

Descriptors: *Non-structural alternatives, *Institutional constraints, *Coasts, *Flooding, Relocation, Floodproofing, Warning systems, Flood plain zoning, Flood plain insurance, Planning, Building codes, Flood forecasting, Easements.
Identifiers: *Coastal management, *Coastal flooding, *National Flood Insurance Program, Fee simple acquisition, Subdivision regulation, Dune protection, Tax incentives, Encroachment lines, National Coastal Zone Management Act.

Major flood losses occur in New England that are associated with coastal flooding rather than riverine flooding. The adequacy for coastal flood control of nonstructural measures and the conceptual approach formulated in the Connecticut River Basin Flood Management Study are assessed. The study area includes Westerly, Rhode Island, and Stonington, Connecticut. The study contains a description of the conceptual framework for formulating nonstructural plans for coastal flood plains, a description of the situation in the communities studied, and a discussion of the application of nonstructural measures to this specific area. The study concludes that: nonstructural approaches often have no structural substitute on the coast; people who can afford coastal property are often willing to take the risk of flood losses; in the coastal zone, it is essential that flood plain management take place in the context of comprehensive planning; although the National Flood Insurance Program is working counter to good flood plain management in certain cases, it can be a prime in developing effective coastal flood plain management programs; and enforcement of flood plain regulations in Connecticut and Rhode Island has been hampered by staffing limits. Thus, economic pressures often influence decisions. Examples of unwise beach development are cited. (Nessa-NC)

W77-11852

CARRYING CAPACITY: A BASIS FOR COASTAL PLANNING.
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6B.
W77-11853

THE CALIFORNIA COASTAL PLAN: A CRITIQUE,
Institute for Contemporary Studies, San Francisco, Calif.
For primary bibliographic entry see Field 6B.
W77-11855

FLOOD-PRONE AREAS AND LAND-USE PLANNING--SELECTED EXAMPLES FROM THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.; Geological Survey, Menlo Park, Calif. Conservation Div.; and William Spangle and Associates, Portola Valley, Calif.
For primary bibliographic entry see Field 4A.
W77-11871

COMPARATIVE UTILITY OF LANDSAT-1 AND SKYLAB DATA FOR COASTAL WETLAND MAPPING AND ECOLOGICAL STUDIES,
American Univ., Washington, D. C. Dept. of Biology; and Geological Survey, Reston Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-11874

NUTRIENTS IN THE NEUSE RIVER ESTUARY.
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-11886

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. NORTHEAST GULF OF ALASKA.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-11887

SOCIAL COST OF OIL POLLUTION,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5G.
W77-11892

SHORELINE CONFIGURATION AND SHORELINE DYNAMICS: A MESOSCALE ANALYSIS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, B. P. Hayden, and J. E. Heywood.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-21633, Price codes: A02 in paper copy, A01 in microfiche. Report to the National Aeronautics and Space Administration, 1976. 23 p, 7 fig, 13 ref. NAS5-20999.

Descriptors: *Barrier islands, *Beaches, *Erosion, *Deposition, Shores, North Carolina, Storm surge.
Identifiers: *Coastal processes, *Shoreline configuration.

Atlantic coast barrier-island shorelines are seldom straight, but rather sinuous in plan view. These shoreline curvatures range in size from cusps to capes. Significant relationships exist between the orientation of shoreline segments within the larger of these sinuous features (10 to 15 km between apexes) and shoreline dynamics, with coefficients ranging up to .9. Orientation of the shoreline segments of Assateague Island (60 km) and the Outer Banks of North Carolina (130 km) was measured from LANDSAT II imagery (1:80,000) and high-altitude aerial photography (1:120,000). Longterm trends in shoreline dynamics were established by mapping shoreline and storm-surge penetration changes from historical aerial photography spanning four decades. (Sinha - OEIS)
W77-11893

CIRCULATION OBSERVATIONS IN THE LOUISIANA BIGHT USING LANDSAT IMAGERY,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
L. J. Rouse, and J. M. Coleman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 731, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 215, Reprinted from: Remote Sensing of Environment, Vol 5, p 55-66, 1976. 7 fig, 1 tab, 21 ref. N00014-75-C-0192.

Descriptors: *Louisiana, *Circulation, *Turbidity, *Baseline studies, *Resources development, Suspended load.
Identifiers: *Outer Continental Shelf, Radiance, Coastal processes, Environmental conditions.

A method for quantifying the turbidity of offshore water masses using LANDSAT imagery is discussed and the results of a laboratory experiment correlating radiance with concentrations of suspended Mississippi River sediment are presented. The results of the experiment are used to plot suspended sediment contours on eight LANDSAT images of the Louisiana Bight. these contours are observed to depend on the speed and direction of the wind as well as the amount of fresh water discharged by the Mississippi River. The presence of a clockwise circulation in the bight is also indicated by the contours. (Sinha - OEIS)
W77-11895

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, CHEMICAL OCEANOGRAPHY.
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Atmospheric Labs.
For primary bibliographic entry see Field 5B.
W77-11896

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME I: AN OVERVIEW,
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6G.
W77-11897

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME II: APPENDICES,
North Carolina Univ. at Chapel Hill. Urban Services Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6G.
W77-11898

ALABAMA PUBLIC MEETING SERIES ON COASTAL ZONE BOUNDARIES, NOVEMBER - DECEMBER, 1975. INTERPRETATIONS,
Alabama Development Office, Montgomery.
For primary bibliographic entry see Field 6E.
W77-11900

A STUDY ON THE EFFECTS OF MAINTENANCE DREDGING ON SELECTED ECOLOGICAL PARAMETERS IN GULFPORT HARBOR, MISSISSIPPI.
Water and Air Research, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5C.
W77-11901

SIGNIFICANCE OF LOW MOLECULAR WEIGHT HYDROCARBONS IN EASTERN GULF WATERS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W77-11902

APPLICATION OF LANDSAT-2 TO THE MANAGEMENT OF DELAWARE'S MARINE AND WETLAND RESOURCES,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W77-11903

TIDE AND FAIR-WEATHER WIND EFFECTS IN A BAR-BUILT LOUISIANA ESTUARY,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
B. Kjerfve.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-031 552, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 222, December 1976. Reprinted from: Estuarine Research, Vol II Geology and Engineering, 1975. 17 p, 8 fig, 26 ref. N00014-69-A-0211-0003.

Descriptors: *Tides, *Wind pressure, *Water levels, *Estuaries, *Louisiana, Coasts.
Identifiers: *Wind effects.

An in-depth, fair-weather field study in July 1972 provided information about the response of the water level of Caminada Bay, an extremely shallow bar-built Louisiana estuary. the water surface elevation was recorded at three locations in the bay along the other parameters, an equipotential surface was established, and the time-dependent variations of a slope vector along the surface gradient were computed. It was found that the instantaneous fair-weather wind stress induced a slowly oscillating set-up around a time-averaged slope magnitude. This constituted less than 50% of the measured time-averaged slope. The remaining time-averaged slope is accounted for by tidal nonlinearities. The instantaneous slope vector was found to rotate or oscillate in the horizontal plane with a diurnal period. Tidal input through two entrances governed this behavior, while the wind stress and atmospheric pressure gradients served only to modify the direction of the surface slope. In general, on the diurnal scale, tidal rather than wind effects dominate the dynamics of Caminada Bay. However, the mean water level responded to the wind direction on a time-scale longer than one day. Wind parallel rather than normal to the coast controlled the water elevation, indicating an Ekman effect. (Sinha-OEIS)
W77-11904

A SHIPBOARD OIL-IN-WATER CONTENT MONITOR BASED ON OIL FLUORESCENCE,
Baird-Atomic, Inc., Bedford, Mass. Government Systems Div.
For primary bibliographic entry see Field 5A.
W77-11905

SPATIAL AND TEMPORAL VARIATIONS IN THE INTERSTITIAL WATER CHEMISTRY OF CHESAPEAKE BAY SEDIMENTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
G. Matisoff, O. P. Bricker, III, G. R. Holdren, Jr., and P. Kaerk.

Available from the National Technical Information Service, Springfield, VA 22161 as COO-27918, Price codes: A02 in paper copy, A01 in microfiche. Report to AEC, CONF-750410-7. 1975) 16 p, 16 fig, 1 tab, 24 ref. AEC - AT(11-1)-292.

Descriptors: *Chesapeake Bay, *Sediments, Estuarine environment.
Identifiers: *Interstitial water, Temporal variations, Spatial variations, Mass balance.

The calculation of chemical mass balance relations n an estuarine environment requires a careful valuation of the material fluxes within the sedi-ent and across the sediment-water interface. The apid response of the estuarine environment to ariations in temperature, salinity and sediment eposition rates makes this type of assessment ery difficult. One approach is to examine the in-grated results of these effects in terms of the patial and temporal variability of the concentra-ons of dissolved species in the sediment. Spatial ariations define the limits which may be placed pon the instantaneous concentrations of chemical pecies as a function of location. Temporal varia-ons interpreted within the framework of the spa-al limits may be used to assess the long-term ef-cts of temperature, salinity and sediment deposi-on rates, thus enabling the more accurate calcula-ons of chemical fluxes. (Sinha-OEIS)
77-11906

RGANOCHLORINES AND HEAVY METALS I THE HARBOUR SEAL PHOCASVITULINA ROM THE GERMAN NORTH SEA COAST,
iel Univ. (West Germany). Institut fuer Haustier-nde.
or primary bibliographic entry see Field 5C.
77-12015

BNORMAL TERNS, SICK SEA AND SHORE RDS, ORGANOCHLORINES AND AR-OVIRUSES IN THE INDIAN OCEAN,
erdeen Univ. (Scotland). Seabird Group.
r primary bibliographic entry see Field 5C.
77-12034

ILORINATED COOLING WATERS IN THE ARINE ENVIRONMENT: DEVELOPMENT OF FLUENT GUIDELINES,
oods Hole Oceanographic Institution, Mass.
r primary bibliographic entry see Field 5G.
77-12036

WER PLANTS AND PLANKTON,
ripps Institution of Oceanography, La Jolla, lif.
r primary bibliographic entry see Field 5C.
7-12039

NG-TERM FLUCTUATIONS OF BENTHIC FISH AND INVERTEBRATE PULATIONS IN APALACHICOLA BAY, ORIDA,
rida State Univ., Fla. Dept. of Biological ence.
primary bibliographic entry see Field 5C.
7-12053

IOTE ON TOXAPHENE IN ENVIRONMEN-SAMPLES FROM THE CHESAPEAKE REGION,
tinghouse Ocean Research Lab., Annapolis,

primary bibliographic entry see Field 5B.
-12062

OBSERVATIONS ON THE FISH FAUNA ASSOCIATED WITH OFFSHORE PLATFORMS IN THE NORTHEASTERN GULF OF MEXICO,
College of South Jersey, Camden. Dept. of Biology.
R. W. Hastings, L. H. Ogren, and M. T. Mabry.
Fishery Bulletin, Vol. 74, No. 2, p. 387-402, 1976. 4 fig, 3 tab, 32 ref.

Descriptors: *Seasonal, *Biorhythms, *Diurnal, *Nocturnal, Animal groupings, *Fish migration, Offshore platforms, *Diel migration, *Gulf of Mexico, Thermal stratification, Aquatic populations, Fish populations, Coastal structures, Water temperature, Habitats, Aquatic habitats, Florida.
Identifiers: *Pelagic environment, *Faunal composition, Artificial reef habitat.

The fish fauna associated with two U.S. Navy research platforms was studied at irregular intervals from 1970 to 1974. Such platforms function as artificial reef habitats and support diverse and abundant fish populations not normally characteristic of the open sandy bottoms in the area. A total of 101 taxa (identified to family or species) was recorded at the two platforms. The greater number of species recorded at the shallower location may be more a result of the greater number of observations made there than of differences in the two habitats. The number of species present at the platforms varies considerably at different times of the day and year. Species numbers are greatest during the summer and fall, but many species begin to move offshore or southward as the water temperature drops, and only about 50-60% of those recorded at the platform remain in December. Major species occupying the platform habitats include fishes usually characteristic of pelagic, inshore (coastal or estuarine), and rocky reef environments. For some of the species, the platform provides food and shelter, while for others, it only offers shelter. Some species may be present only to feed on the numerous fishes and other organisms concentrated there. Diel rhythms of activity are obvious for many of the fishes. (Katz)
W77-12072

A KINEMATIC REFERENCE FRAME FOR ESTUARIES OF ONE DIMENSION,
University Coll., Dublin (Ireland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-12109

INFLUENCE OF VARIOUS CONCENTRATIONS OF ORTHOPHOSPHATE ON THE DIVISION RATE OF AN ESTUARINE BENTHIC DIATOM, NAVICULA ARENARIA, IN CULTURE,
Groningen Rijksuniversiteit (Netherlands). Dept. of Systematic Biology.
For primary bibliographic entry see Field 5C.
W77-12186

BENTHIC MACROFAUNAL DYNAMICS, PRODUCTION, AND DISPERSION IN AN OXYGEN-DEFICIENT ESTUARY OF WEST SWEDEN,
Swedish Water and Air Pollution Research Lab., Gothenberg.
For primary bibliographic entry see Field 5C.
W77-12216

THE EFFECTS OF THE WATER SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE SURVIVAL AND BEHAVIOR OF COASTAL AND OCEANIC ZOOPLANKTON,
Texas Univ. at Austin, Port Aransas. Marine Science Lab.
For primary bibliographic entry see Field 5C.
W77-12227

RESIDUES OF CHLORINATED HYDROCARBONS IN NORTH SEA ANIMALS IN RELATION TO BIOLOGICAL PARAMETERS,
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5B.
W77-12229

MESENCHYMAL TUMORS OF SOME ESTUARINE FISHES OF THE NORTHERN GULF OF MEXICO. I. SUBCUTANEOUS TUMORS, PROBABLY FIBROSARCOMAS, IN THE STRIPED MULLET, MUGIL CEPHALUS,
Air Force Medical Center Keesler, Keesler AFB, Miss.
For primary bibliographic entry see Field 5C.
W77-12236

MERCURY IN THE SESTON OF THE SAN FRANCISCO BAY ESTUARY,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W77-12238

NEW YORK'S MARINE FISHERIES: CHANGING NEEDS IN A CHANGING ENVIRONMENT,
New York State Dept. of Environmental Conservation, Stony Brook. Div. of Marine and Coastal Resources.
For primary bibliographic entry see Field 6B.
W77-12247

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SYSTEMS FOR SOLAR DISTILLATION,
MacDonald Coll., Montreal (Quebec). Brace Research Inst.
T. A. Lawand.
Annals of Arid Zone, Vol 15, No 3, p 177-205, September, 1976. 18 fig, 1 tab, 15 ref.

Descriptors: *Solar distillation, *Distillation apparatus, *Distillation processes, *Solar radiation, *Solar stills, Equipment, Distillation, Costs, Saline water, Salinity, Water purification, Water treatment, Desalination plants, Saline water systems, Water sources.

The history of solar distillation is traced and evaluated, and the experiences with operating solar stills presented. A list of the most important solar distillation plants throughout the world is given, and a review of some research on solar distillation is presented. Improvements are constantly being made which hopefully will reduce the costs and increase the productivity of solar stills. The Manual of Solar Distillation of Saline Water, the most complete document to date describing the different solar stills which have been built to date in various parts of the world, is described. The materials used in the construction of solar distillation systems are described in detail and evaluated, and a procedure for estimating costs is presented. The advantages of solar distillation presented include: (1) units can be built from easily available material; (2) the local labor force can undertake all the principle jobs in the construction, installation, operation, and maintenance of the system; and (3) apart from the amortization of the capital investment, the cost of the operation is not high. (Jamail-Arizona)
W77-11618

THIN CELL ELECTROMEMBRANE SEPARATOR,
Department of the Interior, Washington, D.C.
B. M. Schneider.

Department of the Interior Patent Application, Serial Number 627,810, October 31, 1975. 18 p, 3 fig.

Descriptors: *Patents, *Desalination, *Waste water treatment, *Membrane processes, Separation techniques, Membranes, Polymers, *Electrodialysis, Desalination apparatus.

A method for fabricating separators, particularly thin cell electro-membrane separators used in electrodialysis, transport depletion and other related electrochemical operations for the desalination of seawater, desalination of brackish water, brine concentration and other ion modification operations is described. The separators are positioned between an ion and cation exchange membranes in a stacked sheet arrangement and are designed to direct the orderly flow of ion-containing solutions through the stack. Because the efficiency of the stack is reduced by increased thickness of the separators, separator thickness is preferably minimized. The method includes placing a master stencil or mask on top of a plastic mesh which is laid out on a rigid backing sheet and pouring massive amounts of a curable polymer such as silicone rubber through the hole pattern formed in the stencil. The polymer is then spread out to fill the pattern, the stencil removed and a cover sheet applied. The polymer is then pressed into the pores of the mesh using a roller applied against the cover sheet. The sandwich of the mesh and cover and backing sheets is placed into a pile between metallic sheets, and the pile is compressed during the curing of the polymer. The cover and backing sheets are then scraped off and the polymer impregnated mesh die cut to produce the required edge shape and flow holes. (Sinha - OEIS)
W77-11917

SEMIPERMEABLE MEMBRANES AND THE METHOD FOR THE PREPARATION THEREOF,
Department of the Interior, Washington, D.C.
W. J. Wrasidlo.
Patent Serial No. 615,252, Filing Date 22 September, 1975. 18 p.

Descriptors: *Patents, *Membranes, *Semipermeable membranes, *Desalination, Films, Reverse osmosis, Water purification, Water quality.

Semipermeable membranes which are useful in reverse osmosis processes are prepared by forming a polymeric ultra-thin film which possesses semipermeable properties on a microporous support. An example of the composite semipermeable membrane comprises an ultra-thin film formed by contacting an amine modified polyepihalohydrin with a poly-functional agent. This film is deposited on one surface of a mocroporous substrate. It is also contemplated within the scope of this invention that the dried compostie semipermeable membrane may be subjected to an additional step whereby a protective coating is placed on the surface of the ultra-thin film. The protective coating may be a water soluble organic polymer. Examples of these water soluble organic polymers include polyvinyl alcohol, polyvinyl pyrrolidone, polyacrylamide, polyacrylic acid, etc. (Sinha - OEIS)
W77-11918

RECURRENT PROBLEMS OF WATER SUPPLY IN MALTA,
Dundee Univ. (Scotland).
A. S. Tricker.
Geography, Vol 62, No 275, Pt 2, April, 1977, p 118-121, 1 fig.

Descriptors: *Water supply, *Aquifers, *Saline water, *Desalination plants, *Water quality, *Saline water intrusion, Distillation, Salinity, Groundwater, Groundwater availability, Water conservation, Water demand, Pumping, Groundwater mining, Foreign countries, Water resources development, Water shortage, Water table aquifers.
Identifiers: *Malta.

High salinity of groundwater has been a recurrent problem in Malta. The major aquifer is in direct contact with saline waters of the Mediterranean and excessive pumping has, especially in the last ten years, brought a dangerous threat to water quality for non-agricultural use. To meet increased consumption with an adequate supply of high quality water, four seawater distillation plants had been put into operation by 1970. However, as a result of the 1973 rise in oil prices, three distillers were shut down and pumping increased, thus encouraging further intrusions of saline water. Despite the building of several storage reservoirs and small dams to help reduce agricultural demand for groundwater and the imposition of water tariffs for swimming pool owners, Malta may soon find it difficult to satisfy the water requirements for its expanding economy. (Ullery-Arizona)
W77-11988

WATER AND DEVELOPMENT IN SAUDI ARABIA,
Durham Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 4B.
W77-11991

3B. Water Yield Improvement

ROOF DRAINAGE OF LARGE BUILDINGS IN SOUTH AFRICA,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
H. I. Schwartz, and P. T. Culligan.
The Civil Engineer in South Africa, Vol 18, No 8, p 171-176, August 1976. 12 fig, 11 ref.

Descriptors: *Rainfall, Thunderstorms, Pipes, Roofs, *Drainage systems, Drainage engineering, Capacity, Rainwater conduits, Hydrology, Design criteria, Maintenance, Storage tanks, Leaks, Waterproofing.
Identifiers: *South Africa.

Short-duration high-intensity rainfall is experienced in many regions of South Africa, causing substantial damage to stock and machinery in buildings as a result of the inadequate capacity of roof drainage systems. Hydrologic and hydraulic aspects of roof drainage systems are considered with special reference to large buildings. Research findings based on hydraulic analyses and laboratory investigations are presented. Publications which cover the essential aspects of roof drainage system design are listed. (So African Water Info Center)
W77-11555

EMPIRICAL PREDICTORS FOR NATURAL AND SEEDED RAINFALL IN THE FLORIDA AREA CUMULUS EXPERIMENT (FACE), 1970-1975,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Biondini, J. Simpson, and W. Woodley.
Journal of Applied Meteorology, Vol. 16, No. 6, p 585-594, June 1977. 2 fig, 4 tab, 30 ref. NSF GI-43746.

Descriptors: *Weather modification, *Cloud seeding, *Florida, Model studies, On-site investigations, Silver iodide, Nucleation, Rainfall, Precipitation(Atmospheric), Aircraft, Clouds, Cloud physics, Mathematical models, Forecasting, Analytical techniques, Weather, Meteorology.
Identifiers: *Florida Area Cumulus Experiment(FACE).

The data obtained from the Florida Area Cumulus Experiment in the years 1970-75 were analyzed statistically. Specifically, a set of empirically derived predictors for both seeded and unseede rainfall was identified. In this paper, first the e periment was described briefly, and the data we given. The concept of echo motion categories w presented. The responses to be predicted and t variables used as predictors were listed a described, and the methods for obtaining the pr diction models were given. Next came a listing the model equations obtained by the describ methods, along with some commentary on the possible physical meaning. Examples illustrat the use of some of the prediction models for es mating seeding effects and possible bias in sele tion of experimental days. A discussion of t echo motion covariate and the basic predictor va ables, their histories, rationales, and so theoretical indications of their importan completed the main body of the paper. (Sim ISWS)
W77-11596

EVALUATING WEATHERING CHARA TERISTICS OF WATER-HARVESTIN CATCHMENTS FROM RAINFALL-RUNO ANALYSES,
Agricultural Research Service, Phoenix, Ar Water Conservation Lab.
D. H. Fink, and G. W. Frasier.
Soil Science Society of America Journal, Vol. No. 3, p 618-622, May-June 1977. 7 fig, 1 tab, ref.

Descriptors: *Rainfall-runoff relationships, *S treatment, *Repellents, Rainfall, Runo Watersheds(Basins), Soil sealants, Waterproofi Seepage, Sealants, Weathering, Water harvesti Arid climates, Roofing materials, Water conser tion, Water yield improvement, Surface seali Thin films.
Identifiers: Hydrophobics, Wax, Silicone, Par fin, Butyl rubber.

Better ways are needed to evaluate the weather properties of water-repellent and membra covered water-harvesting field catchments. N mally, only the ratio of runoff to precipitati from natural storms (percentage of runoff) is c culated, which provides useful information treatment efficiency and durability, but wh gives little information about why or how a tre ment failed. Linear regression analyses precipitation vs runoff-yield data collected o several years (storms with no runoff omitted) w used to obtain (1) threshold values, i.e., minimal rainfall needed to produce runoff, and the runoff-efficiencies of treatments a threshold. The analyses showed that silicone wax-treated water-repellent catchme weathered quite differently. The silicone tre ment showed a uniform deterioration through the treated zone, while the wax treatment show a progressive deterioration beginning at the top the treated profile. A gravel-covered membr catchment gradually increased runoff thresh from 1- and 2-mm water, which was ascribed t gradual accumulation of dust entrapped in gravel. The weathering properties of several ot common type catchments were evaluated us the technique. A brief discussion was included the application of the technique to evaluate the curacy of precipitation- and runoff-measur devices in water-harvesting systems. (Sims-ISW
W77-11612

CONNECTIONS BETWEEN CLIMATE A DESERTIFICATION,
Toronto Univ. (Ontario). Inst. for Environme Studies.
For primary bibliographic entry see Field 2B.
W77-11629

WATER YIELD IMPROVEMENT BY VEGET TION MANAGEMENT,
Arizona Univ., Tucson. Coll. of Agriculture.
P. F. Ffolliott, and D. B. Thorud.

Water Resources Bulletin, Vol. 13, No. 3, p 563-571, June 1977. 1 fig, 1 tab, 8 ref.

Descriptors: *Water yield improvement, *Vegetation effects, *Management, *Water supply, Precipitation, *Watersheds(Basins), Evaporation control, Streamflow, Runoff, *Arizona, Assessment, Conifers, Mixed forests, Ponderosa pine trees, Chaparral, Upstream.
Identifiers: Conversion, Multiple uses, Silvicultural treatments.

Vegetation management aimed at increasing the amount of usable water yield from precipitation falling on upstream watersheds may be one alternative for supplementing water supplies. Indications are that water yields can be increased within a multiple-use framework, which can benefit, or simply fit with, other natural resource objectives. Through changes in vegetation on a watershed, one can reduce evaporation losses only slightly but can significantly increase streamflow runoff. In an assessment of potentials for water yield improvement in Arizona, experimental studies on various vegetation zones are reviewed. Because of either limited acreage or limited rainfall, the alpine, grassland, aspen, and desert shrub vegetation zones are not realistic management areas for Arizona. Furthermore, manipulation of pinyon-juniper woodlands does not appear promising at this time. Conversion of chaparral to grasses and forbs does appear to be a possible treatment for water yield improvement, as well as various silvicultural treatments of mixed conifer and ponderosa pine forests. Streamflow increases are given for experiments in chaparral, mixed conifer, and ponderosa pine vegetation zones, but complete information on possible constraints for these zones is not currently available. Specific assessment of water yield management options for riparian vegetation is difficult to make, due to incomplete knowledge of water yield changes and other constraints for this zone. Prior to the final adoption of management practices, results of experimental work must be coupled with economic and social considerations. (Bell-Cornell)
W77-11770

THE HYDROLOGIC HISTORY OF THE SAN CARLOS RESERVOIR, ARIZONA, 1929-71, WITH PARTICULAR REFERENCE TO EVAPOTRANSPIRATION AND SEDIMENTATION,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 2D.
W77-11870

CONSERVATION IN KANO,
For primary bibliographic entry see Field 4B.
W77-11993

C. Use Of Water Of Impaired Quality

SOIL AERATION, NITRATE REDUCTION AND FLOODING TOLERANCE IN HIGHER PLANTS,
Sevilla Univ. (Spain). Dept. of Ecology.
J. Garci-novo, and R. M. M. Crawford.
New Phytol. 72(5), p 1031-1039, 1973.

Descriptors: *Soil aeration, *Nitrates, Flooding, Plant growth, Roots, Leaves, Amino acids.
Identifiers: Anaerobiosis, NADH2, *Nitrate reductase activity, *Flood tolerance(Plants), Hypoxia.

Flood-tolerant species from natural habitats differ from flood-intolerant species by being able to make more effective use of NO3 as an alternative electron acceptor to O2 during periods of partial anaerobiosis. When flooded, tolerant species show marked increases in nitrate reductase activity in roots and leaves. A greater ability to synthesize amino-acids under anoxia was also found in the tolerant species than in the intolerant. It is suggested that these properties enable the flood-tolerant species to facilitate the re-oxidation of NADH2 under conditions of anoxia and that this is associated with the greater ability of the species to withstand a reduction in the partial pressure of O2.—Copyright 1974, Biological Abstracts, Inc.
W77-11517

SALT AND SODIUM AFFECTED SOILS IN RELATION TO NITROGEN UTILIZATION BY WHEAT,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
K. B. Hummadi.
Ph.D. Dissertation, 1977. 83 p, 12 fig, 9 tab, 83 ref, 1 append.

Descriptors: *Nitrogen, *Sodium, *Crop response, *Salts, *Wheat, Soils, Salinity, Saline salts, Plant growth, Crop production, Crops, Soil treatment, Irrigation, Irrigation water, Arid lands, Fertilizers, Environmental effects.

The presence of a large amount of soluble salts in soils of arid and semi-arid regions is an important factor in limiting agricultural productivity. The primary source of these salts is either the continuous use of poor quality irrigation water or evaporation in areas having a high saline water table. Nitrogen is an important element in determination of crop yield and quality. Research concerned with the growth, yield, and nitrogen utilization of wheat under saline and sodic conditions was conducted with the following objectives: (1) to evaluate the effect on nitrogen uptake of wheat of mixed salts, including sodium, in the soil solution or irrigation water, (2) to evaluate the effects of variable nitrogen fertilizer levels and mixed salinity and sodium on grain and straw yields; (3) to examine the nitrogen status of wheat as reflect by NO3 content of leaves under a range of salinity and exchangeable sodium regimes; and (4) to determine effects of the level of salinity and exchangeable sodium on the beneficial response to nitrogen fertilizer. The results are presented. (Jamail-Arizona)
W77-11623

RESTRICTED DRAINAGE AND ITS EFFECT ON RISING GROUND WATER TABLE AND SOIL SALINITY,
Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
For primary bibliographic entry see Field 4B.
W77-11627

STUDIES ON DRAINAGE WATER OF BEHIRA GOVERNORATE: THE SUITABILITY OF EL-KHYRI GROUP DRAINS,
Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
M. M. El-Banna, M. H. Selim, B. Sh. Zikry, W. A. Abou-Zeid, and S. A. Gafar.
Agricultural Research Review (Cairo), Vol 54, No 4, April 1976. p 23-33, 3 fig, 4 tab, 7 ref.

Descriptors: *Saline water, *Drainage water, *Irrigation effects, *Water quality, *Soil-water-plant relationships, Irrigation, Irrigation water, Water quality standards, Salinity, Water analysis, Adsorption, Water properties, Drainage effects, Available water, Arid lands, Alkalinity, Leaching, Alkaline water, Crops production, Diversion, Solubility, Salts.
Identifiers: *Egypt.

The practice of diverting saline water for irrigation of virgin land in Egypt requires water quality information. Monthly water samples from different sites along four main drains were taken and analyzed for irrigation suitability. Data on electrical conductivity, sodium adsorption ratio, and residual sodium carbonate of the water samples showed the drainage waters to be of medium salinity and low alkalinity. Water quality generally indicated suitability for irrigating. Moderate to high salt tolerant crops on medium textured soils can be maintained with adequate drainage and leaching. (Ullery-Arizona)
W77-11634

EFFECT OF SODIUM CHLORIDES AND SODIUM SULFATE ON PLANT COMPOSITION, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
V. V. Kabanov, and Zh. Otegenov.
Fiziol Rast. 20(4), p 806-814, 1973.

Descriptors: *Sodium sulfate, Plant physiology, Peas, Beans, Sodium compounds, Crops, Tomatoes, Leaves, Roots.
Identifiers: Ash, Glasswort, Halophytes, Mung, *Sodium chloride.

The content of ash residue, water and organic substances was studied in the roots, stems and leaves of legumes (pea, Phaseolus, bean and mung bean), tomato and glasswort. The dynamics of mineral accumulation showed that the ash residue played only a small role in the total balance of components, but the ratio between organic substances and water changed sharply with excess of Na+, Cl- or SO4(2-). Five-113% of ash/g organic substance accumulated in the plant if 0.3% NACl or Na2SO4 were contained in the nutrient solution. Different organs of various halophytes, growing under natural conditions, contained 13-62% (our data) or 3-120% (data of other authors) of the ash residue. Calculation of the hydrophilic coefficient of organic substance for extreme points, taking into consideration the degree of water binding by the ash residue, suggested that water supply for metabolic processes can decrease both during SO4 and Cl salinization. The method of calculation allows comparable data to be obtained for all organs and tissues of any biological object. From 3-13 g of water can be utilized in metabolism by 1 g of organic substance in functioning tissues of the studied plants. Plants belong to salt-accumulating systems according to their accumulation coefficient (g of the ash residue in the substrate/g of the ash residue in the plant). The curves for the content of the ash residue, water and organic substance in the tissues of the studied plants are of the extreme character; the minima of the content of organic substance coincide with the points where the ionic resistance of the plants change.—Copyright 1974, Biological Abstracts, Inc.
W77-11832

THE USE OF POLLUTED SOURCES FOR WATER SUPPLY,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5F.
W77-11858

SALINITY EFFECTS ON NITROGEN USE BY WHEAT CULTIVAR SONORA,
Soil Testing Labs., Junagadh (India).
For primary bibliographic entry see Field 3F.
W77-11946

COMPARISON OF MODIFIED MONTMORILLONITE TO SALTS AND CHELATES AS CARRIER FOR MICRONUTRIENTS FOR PLANTS: I. SUPPLY OF COPPER, ZINC, AND MANGANESE,
Hebrew Univ., Rehovoth (Israel). Dept. Soil and Water Science.
A. Banin, and J. Navrot.
Agronomy Journal, Vol. 68, No. 2, p 353-358, March-April 1976. 4 fig, 7 tab, 16 ref.

Descriptors: *Nutrients, Fertilizers, Fertilization, *Copper, *Zinc, *Manganese, Clays, Tomatoes, Beans, Crop response, *Montmorillonite, Salts, Chelates.
Identifiers: Micronutrients.

The purpose of the study was to compare the effectiveness of a novel micronutrient fertilizer, modified montmorillonite clay, to the conventionally used salts and chelates as carriers of micronutrients to plants. Three elements--Cu, Zn, and Mn -- in combination in various rates, and in three forms, as sulphates, EDTA chelates, or attached to montmorillonite clay, were applied to two micronutrient deficient sandy soils. Tomato and beans were grown under controlled greenhouse conditions in the treated soils. The application of micronutrient elements, in all of the forms used, significantly increased plant yields. In addition, the supply of micronutrients significantly increased the elemental concentrations of the plants. However the highest concentration of elements found in the plants did not always correspond to the highest yields. Generally the lower levels of addition of combined micronutrients improved the growth conditions considerably and the higher ones were less effective. The clay carrier was similar to the expensive chelates and generally more efficient than the salts in element supply and this resulted in better yield responses. The optimal rate of application of the combined elements for dry yield production in tomato plants in the soils studied appeared to be: 0.5 mg Cu, 1.6 mg Zn, and 2.5 mg Mn per kg of soil for the clay and chelate forms and somewhat higher for the salts. (See also W77-11955) (Skogerboe-Colorado State)
W77-11954

COMPARISON OF MODIFIED MONTMORILLONITE TO SALTS AND CHELATES AS CARRIER FOR MICRONUTRIENTS FOR PLANTS: II. SUPPLY OF IRON,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
J. Navrot, and A. Banin.
Agronomy Journal, Vol. 68, No. 2, p 358-361, March-April 1976. 2 fig, 5 tab, 7 ref.

Descriptors: *Iron, *Nutrients, Fertilizers, Fertilization, Copper, Zinc, Manganese, Clays, Tomatoes, Beans, Crop response, *Montmorillonite, *Salts, *Chelates.
Identifiers: Micronutrients.

Symptoms of iron deficiency appear very frequently in the calcarcous soils which represent a major part of the agricultural soils of Israel; therefore a search for novel carriers of iron is constantly conducted. Previous studies showed that Cu, Zn, and Mn, attached to modified montmorillonite, can effectively replace salts and chelates as carriers for micronutrient elements for plants. In this research, the effect of iron attached to montmorillonite clay on element uptake and yield of plants was compared to that of commonly used iron sulphate or EDTA and EDDHA chelates. In the greenhouse, beans were grown in two calcareous, iron deficient soils and were treated with either FeSO49 Fe(+3)-EDTA, Fe(+3)-EDDHA, or Fe(+2) bound to montmorillonite clay. The rates of iron added varied from 15 to 60 mg Fe/kg soil for the salt and 3 to 12 mg Fe/kg soil for the chelates and the clay forms. It was found that Fe(+2)-clay and Fe(+3) in chelates, added at equivalent rates, supplied iron in comparable amounts; FeSO49 added at the conventional rates which are five to ten times higher than that added as clay- and chelate-bound iron, caused similar or lower uptake and yields. Moreover, the slow release of iron from Fe-clay, even when supplied in high rates, prevented excessive iron uptake which otherwise, as in the case of the chelate FeEDDHA, interfered with plant development. It is suggested that iron attached to mortmorillonite clay can be used as an efficient source of iron for plants grown in calcarcous soils. (See also W77-11954) (Skogerboe-Colorado State)
W77-11955

ADVANTAGES OF USING HIGH SALT-SODIUM WATERS IN THE RECLAMATION OF GYPSIFIED HEAVY-TEXTURED SOIL,
Ministry of Agriculture, Cairo (Egypt). Soil and Water Research Inst.
For primary bibliographic entry see Field 2G.
W77-11994

EFFECT ON IRRIGATION WATER QUALITY, SULFURIC ACID AND GYPSUM ON PLANT GROWTH AND ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF PIMA SOIL,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
B. J. Alawi.
Ph.D. Dissertation, 1977. 127 p, 24 fig, 14 tab, 78 ref. 1 append.

Descriptors: *Salinity, *Alkalinity, *Water quality, *Infiltration, *Irrigation water, Infiltration rates, Irrigation, Irrigation practices, Physical properties, Chemical properties, Gypsum, Hydrogen, Sulfide, Plant growth, Crop growth, Mathematical models, Cation exchange, Calcareous soils, Arid lands, Semiarid climates, Sudangrass, Soil analysis, Leaching.
Identifiers: Pima soil.

Salinity and alkalinity are major and ever present threats to the permanence of irrigation agriculture in arid and semiarid regions. Quality of irrigation water is one of the most important factors which influence soil water management practices, plant growth, and plant yields. Field and laboratory experiments to determine the effects of the quality of water and chemical amendments (gypsum and sulfuric acid) on growth and yields of sundangrass, total soluble salt and ionic distribution, and the infiltration rates of a Pima soil were conducted at the University of Arizona Experimental Farm, Safford, Arizona, over a period of five years. Three types of water--well, river and city--were utilized. During the last two years, gypsum and sulfuric acid were added to the water. The results are presented. Sulfuric acid increased infiltration rates significantly with all water treatments; gypsum increased infiltration only with well water treatment. Regression equations were developed to predict the time and depth of water required to leach one foot of Pima soil column to a specific electrical conductivity with a given quality of water and a given type and rate of chemical amendments. (Jamail-Arizona)
W77-11998

EFFECT OF DEPTH AND QUALITY OF GROUND WATER ON SOIL SALINIZATION: A FIELD STUDY WITH A FLUCTUATING WATER TABLE,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2G.
W77-12000

RECLAMATION OF A SALINE-SODIC SOIL BY THE HIGH SALTWATER-DILUTION METHOD,
Department of Agriculture, Lethbridge (Alberta). Plant Industry Div.
H. S. A. Vander Pluym, J. A. Toogood, and R. A. Milne.
Can J Soil Sci. 53(4) p473-480, 1973.

Descriptors: *Saline soils, *Alkaline soils, Dispersion, Salts, Montmorillonite, *Sodium, *Adsorption, Permeability, Solubility, Conductivity, Soil moisture, *Land reclamation.

Changes in the permeability and the swelling of a montmorillonite-rich soil were measured for a range of Na adsorption ratio (SAR) ad electric conductivity (EC) values of the leachant. Concentrations, related to a 20% drop in hydraulic conductivity (HC) and the start of a rapid swelling process, were between 40 and 400 meg/1, and were caled 'threshold' and 'jump-off' concentration respectively. The initial leaching of the soil cor with highly saline solutions gave high HC valu for the leachants with high SAR's and low H values for the leachants with low SAR's. Su sequent tests with diluted solutions reversed t situation; solutions with high SAR's lowered t HC of the soil drastically to HC values well belo those of the soil cores treated with low SA leachants. Solutions with a low EC or a high SA or both, maintained in their leachates EC and SA values above and below, respectively, the e pected equilibrium values. Increased solubility the 40.6 t/ha of gypsum accounted for the disc pancy.--Copyright 1974, Biological Abstracts, In
W77-12035

PRELIMINARY STUDY ON SOME SALI SOILS OF PERU USING A HYDROPHOB EMULSION,
Pontificia Universidad Catolica del Peru, Lima.
A. Flores.
Meded Fac Landbouwwet Rijksuniv Gent. 37(3) 1066-1075, 1972.

Descriptors: *Saline soils, *Soil treatme Methodology, Land reclamation, Soil analys Hydraulic conductivity, Emulsions.
Identifiers: *Peru, *Hydrophobic emulsions.

A method of soil treatment was tried to impro the soil structure of these soils in a shorter amou of time than required by present reclamati methods. Soils samples were treated with a bi menous emulsion in the laboratory. Hydraulic co ductivity was increased 7-9 times in 3 of treated samples, but was only doubled in a fou sample. The latter sample was lower in clay th the others.--Copyright 1974, Biological Abstrac Inc.
W77-12044

RESPONSES OF THREE PEANUT CULTIVA TO GYPSUM,
Georgia Coastal Experiment Station, Tifton. De of Agronomy.
For primary bibliographic entry see Field 3F.
W77-12129

SALT TOLERANCE OF PROSTRATE SUMM CYPRESS (KOCHIA PROSTRATA),
Agricultural Research Service, Riverside, Ca Salinity Lab.
L. E. Francois.
Agronomy Journal, Vol 68, No 3, p 455-456, M June 1976. 2 tab, 9 ref.

Descriptors: Salinity, Saline soils, *Salt toleran Greenhouse experiments, Sodium, Chloride, R gelands.
Identifiers: *Cypress.

Prostrate summer cypress, a widely distribu perennial shrub in Russia, was imported into USA to determine its potential as an accepta forage on the western rangelands. Since conside ble acreage of its possible habitat contains salt- fected soils, a salt tolerance study was done determine how well suited it was to these sal areas. Two accessions of prostrate summ cypress were tested using soil cultures in greenhouse. Salinity levels used were 2, 7, 11, 17 mmho/cm. The plants were harvested six tim over a 3-year period. Both accessions proved to very salt tolerant but one was significantly m productive than the other at all salinity lev Although sodium and chloride contents proached 50 and 85 meq/100 g dry matter, resp tively, no salt injury symptoms were visible. So um uptake increased proportionately with incre ing salinity, whereas chloride uptake was less pendent on salt concentration and appreci greater than that of sodium. Since both accessio proved to be highly salt tolerant, they should well adapted for planting in the salt-affec western rangelands. (Skogerboe-Colorado State

W77-12133

3D. Conservation In Domestic and Municipal Use

WATER CONSERVATION FOR DOMESTIC USERS, WITH SPECIAL REFERENCE TO WARM DESERT CLIMATES.
Arizona Univ., Tucson; and Arizona State Water and Sewer Dept., Tucson.
Handbook prepared by the University of Arizona for the City of Tucson, Department of Water and Sewers, 1977. 32 p, 13 fig, 6 tab, 4 append.

Descriptors: *Water conservation, *Water utilization, *Water users, *Arizona, *Water consumption(Except consumptive use), Domestic water, Competing uses, Conservation, Water reuse, Arid lands, Water requirements, Water supply, Irrigation, Irrigation systems, Deserts.
Identifiers: *Tucson, Drip irrigation.

Water should be regarded as a precious commodity, yet in many households it is over-used or wasted. This booklet is designed to aid residential water users, especially those in warm desert climates, in detecting areas where domestic water can be conserved and in effecting appropriate and economical conservation measures. Following the introductory section, various indoor water uses are described, with some tips on where and when water use can be reduced. Outdoor water uses are considered, with particular attention given to landscape irrigation since most consumptive use of residential water supply occurs in the watering of lawns, gardens, trees, and shrubs. Various irrigation methods are discussed. Water reuse is also evaluated and the future outlook for water conservation is presented. Recommendations for future research are outlined and include: (1) monitoring water conservation practices to determine how effective they are, (2) city and county government consideration of water conservation regulatory measures, and (3) implementation of an educational program concerned with water conservation. (Jamail-Arizona)
W77-11636

NEW GROWTH CENTERS--A ROLE FOR THE BUREAU OF RECLAMATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W77-11775

USER MANUAL FOR SEWER AND WATER ACCOUNTS PROCESSING MODULE.
For primary bibliographic entry see Field 5G.
W77-11856

WATER AND SEWER RATES IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6C.
W77-11868

AN OPTIMIZATION MODEL FOR EFFICIENT MANAGEMENT OF URBAN WATER RESOURCES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W77-12165

3C. Conservation In Industry

FUTURE NEEDS FOR DRY OR PEAK SHAVED DRY/WET COOLING AND SIGNIFICANCE TO NUCLEAR POWER PLANTS,
General Electric Co., San Jose, Calif.
W. V. Clukey, M. J. McNelly, and R. C. Mitchell.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 630, Price codes: A07 in paper copy, A01 in microfiche. Prepared for Electric Power Research Institute, Palo Alto, CA, Report EPRI NP-150, February, 1976. 122 p, 14 tab, 37 fig, 34 ref, 3 append. NP-150 Res. Proj. 516-1.

Descriptors: *Nuclear powerplants, *Water cooling, *Water conservation, Consumptive use, Costs, Reclaimed water, Evaporation control, Water management.
Identifiers: *Peak shaved dry/wet cooling, Wet cooling, Dry cooling.

U.S. requirements for uncommitted nuclear installations in water scarce areas are minimal, falling in the range of 6000 to 2300 megawatts of electricity (MWe). Plant cooling for nuclear power plants in these areas will require innovative systems such as water reclamation or transportation which makes water available for evaporative use in sufficient quantities, or cooling system designs which greatly conserve water usage. In order to evaluate how water scarce areas might best be serviced for their plant cooling needs, three representative sites were selected which had typically high summer dry bulb temperatures but substantially different wet bulb temperatures. All three were near potential load growth centers where water limitations exist. The sites include Reno, Nevada, Raleigh, North Carolina, and Lubbock, Texas. The study evaluates the costs and water consumption of three cooling systems: dry, wet, and peak shaved dry/wet with separate towers. The three cooling systems were matched to four kinds of nuclear power plants: light water reactors, high temperature gas cooled reactors (HTR) with steam turbines, HTR with gas turbines, and liquid metal fast breeder reactors. The study concludes that light water reactors can operate at any U.S. location with peak shaved dry cooling systems and conventional turbine units. (Nessa-NC)
W77-11848

SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACTS OF COAL GASIFICATION AND LIQUEFACTION PLANTS,
AME Technology, Inc., Lexington, Ky.
For primary bibliographic entry see Field 6G.
W77-11851

POTENTIAL OF TIDAL AND GULF STREAM POWER SOURCES,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
J. A. Savage, E. E. Weynand, and W. G. Wyatt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 350, Price codes: A04 in paper copy, A01 in microfiche. Submitted to Texas Governor's Energy Advisory Council, Austin, January 15, 1975, 49 p, 4 tab, 11 fig, 20 ref. N/T-9.

Descriptors: *Electric power production, *Tidal powerplants, *Thermal powerplants, *Electric power costs, *Texas, *Gulf of Mexico, Capital costs, Aluminum, Pumped storage.
Identifiers: *Propane heat cycle, Wave action generator, Aluminum smelting.

Three basic methods exist for generating electricity in the Gulf of Mexico. These are: (1) a floating propane heat cycle that makes use of the temperature difference between surface and bottom water; (2) a pumped storage hydroelectric installation on Padre Island; and (3) a wave action generator powering an air turbine that drives an alternator to produce electrical energy. Of these three, the most promising is the floating power plant that makes use of propane as a working fluid, with a capital investment of about $445/KW of capacity. If this is used with a floating aluminum smelting plant, there would be no need for an undersea power cable. The hydroelectric plant would have a capital cost of approximately $2,800/KW of capacity. This cost can be reduced to $1,800/KW with the use of dual purpose pump and turbine units. The wave action generator, with a capital investment of about $12,500/KW of capacity, has been used for small amounts of power. A combined use of the three methods by 1985 would produce 651,000 KW at a capital cost of $844/KW of capacity. Most of this energy would be used for the production of aluminum. By the year 2000 about ten times as much power as in the year 1985 could be produced. (Nessa-NC)
W77-11854

3F. Conservation In Agriculture

STUDIES ON APPEARANCE MECHANISM OF RICE PLANT DAMAGE BY IRRIGATION WATER POLLUTED WITH NITROGEN COMPOUNDS, (IN JAPANESE),
Tokai-Kinki National Agricultural Experiment Station, Tsu (Japan).
For primary bibliographic entry see Field 5B.
W77-11515

APPLICATION OF HERBICIDES THROUGH A MICROJET IRRIGATION SYSTEM,
Citrus and Subtropical Fruit Research Inst., Nelspruit (South Africa).
G. S. Bredell, C. J. Barnard, and A. P. Vincent.
The Citrus and Subtropical Fruit Journal, p 17-18, May 1975. 3 fig.

Descriptors: *Herbicides, Trees, *Irrigation systems, Irrigation, Plant growth, Weed control, Paraquat, Wetting agent, Agriculture, Farm wastes, Application rates.
Identifiers: South Africa.

Attempts were made to apply a registered contact herbicide namely PARAQUAT through a microjet irrigation system. Several aspects had to be considered before attempting this operation. These include the possible effects of the weedkiller on the trucks of the trees, times of application in relation to applying irrigation water, and concentration required for effective action against weeds. One-year-old citrus, avocado, mango, litchi and macadamia trees were used in this field trial. From the preliminary observations it seems reasonable to conclude that weeds can be effectively controlled when using this approach. Since no harmful symptoms have been noticed on the trees, it also appears as if the method is perfectly safe. Applying the herbicide at a concentration of 4 l/ha, the cost per tree amounts to 1,25 cent. At an estimated application frequency of seven times per year, it should be possible to control weeds at 9 cent per tree per year. About 15 minutes is all that is required to apply herbicides to 300 trees. Using a tractor and spray pump, the same operation would take about 9 hours. (So Arican Water Info Center)
W77-11558

MICRO IRRIGATION OF SUBTROPICAL FRUIT CROPS,
Citrus and Subtropical Fruit Research Inst., Nelspruit (South Africa).
G. S. Bredell, and C. J. Barnard.
The Citrus and Sub-Tropical Fruit Journal, No 497, p 5-10, 1975. 6 fig, 2 tab, 18 ref.

Descriptors: Irrigation design, Irrigation practices, Irrigation, Soil-water-plant relationships, Water requirements, Groundwater movement, Droughts, Soil moisture, Fertilizers, Trees, Water distribution(Applied), Tensiometers, Plant growth.
Identifiers: South Africa.

The favourable response of subtrophical fruit trees to conditions of low soil moisture tension has become an established fact. Two ways of achieving low moisture tension in the upper 15 cm of soi where most of the feeder roots are found, are, either by mulching and apply relatively large quan-

tities of water at fairly widely spaced intervals of time, or by applying small amounts of water at short intervals. The latter process is called micro irrigation. Certain problems were encountered with drip irrigation. These were, poor lateral distribution of soil moisture, accmulation of salts on the wet-dry interface, and the inability to carry insoluble fertilizers which are broadcast on the soil surface, into the rootzone. Where microjets were used, these problems were eliminated. Moreover, the latter is a more flexible system in that it can easily be manipulated to accommodate tree size. Water can therefore be applied over the exact area of root distribution. The magnitude of soil moisture fluctuation in the feeder root zone was studied in an orchard where both micro irrigation and conventional longer cycle sprinkler irrigation, so called macro irrigation, were applied. Where micro irrigation was applied, soil moisture varied within the limits of readily availabe water. When macro irrigation cycle lengths extended to periods of more than 20 days, readily available moisture was completely depleted. Exact management of irrigation applications in the case of micro irrigation was found to be more accurate than with conventional systems. The implementation of a home-made evaporation plan in managing irrigation according to evapotranspirative demand is discussed. (So African Water Info Center)
W77-11559

MANAGEMENT CRITERIA FOR MINIMIZING WATER LOSSES AND WILTING UNDER DRIP IRRIGATION SYSTEMS,
Soil and Irrigation Inst. Pretoria (South Africa).
A. Streutker.
The Citrus and Subtropical Fruit Journal, p 13-16, May 1975. 5 fig.

Descriptors: Irrigation practices, Soil-water-plant relationship, Water requirements, Groundwater movement, Moisture content, Droughts, Plant growth, Soil moisture, Drip irrigation, Gravimetry, Tensiometers, Management, Moisture deficit.
Identifiers: South Africa.

One year after changing to a drop system several nine year-old Valencia trees, in a section of an orchard near Groblersdal, started to show signs of moisture stress. The soil moisture percentage was measured gravimetrically in February, at different distances and depths in the red sandy clay loam soil (Shorrocks series of 20% clay, underlain by gravel at 0.5 m) underneath a healthy as well as under a poor tree, and points having the same value were joined to produce a soil moisture profile. From the soil moisture profiles beneath the healthy tree (both parallel and normal to the drip line) it is evident that a uniform moisture distribution in the shallow soil was obtained by means of a combination of a 0.6-0.9 m spacing between drippers, and drip intensity of 2.3 1/h, an irrigation period of five hours and an irrigation frequency of every second day. In contrast therewith the soil moisture profiles beneath the poor tree show a 0.6 m gap of dry soil between two drippers. Under the preceding conditions the distance of 1.5 m between two drippers was too large. (So African Water Info Center)
W77-11560

ANALYSIS OF THE TEMPORAL BEHAVIOUR OF THE LEVEL OF LAKE MALAWI,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Geography and Environmental Science.
For primary bibliographic entry see Field 2H.
W77-11565

ESTIMATION OF NET WATER DEMAND OF CROPS IN THE UPPER BERG RIVER VALLEY,
Soils and Irrigation Research Inst., Potchefstroom (South Africa).
A. L. Du Pisani, and H. W. Weber.
Water SA., Vol. 2, No. 2, p 77-85, 1976. 10 tab, 5 fig, 5 ref.

Descriptors: *Water demand, Evapotranspiration, *Soil moisture, *Crop production, *Estimating, Climatic data.
Identifiers: Berg River, Greater Boland Water Project, South Africa.

The development and implementation fo a soil moisture budget approach is described whereby good estimates were obtained for both effective rainfall and new water demand (NWD) in the Upper Berg River valley for two crop canopies, i.e., clean-clutivated orchards and vineyards and a crop totally shading the soil surface. Net water demand was affected by both geographical location (an increase from south to north, and westward away from the mountains) and total available soil moisture capacity. Both factors combined produced a variation of only about 20 per cent, so that a median value of 650 mm NWD should suffice for most situations. (So African Water Info Center)
W77-11580

EVALUATION OF THEORETICALLY PREDICTED THERMAL CONDUCTIVITIES OF SOILS UNDER FIELD AND LABORATORY CONDITIONS,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soil and Water.
For primary bibliographic entry see Field 2G.
W77-11611

DRIP IRRIGATION--A NOVEL METHOD TO SAVE WATER,
Tamil Nadu Agricultural Univ., Coimbatore (India). Dept. of Soil and Water Conservation.
R. K. Sivanappan, and D. Chandrasekaran.
Irrigation and Power, Vol 33, No 4, p 495-501, October 1976. 4 fig, 1 tab, 5 ref.

Descriptors: *Irrigation systems, *Irrigation effects, *Irrigation efficiency, *Water conservation, *Irrigation operation and maintenance, Crop production, Water management(Applied), Operating costs, Economic efficieny, Saline water, Saline soils.
Identifiers: *Drip irrigation, *India.

Drip irrigation keeps the soil moisture level at field capacity, saves up to 70% of the irrigation water compared with other methods, and increases the yield of certain crops. The method is suited to all terrains and soil types and is now being introduced in India where water scarcity and population growth are especially acute problems. Construction and operation of the system are described, including methods of achieving uniform flow distribution by adjusting emitters and making various pipe adjustments. Row crops like chilly, brinjal, radish, beet root and tomato can be irrigated by the drip method; irrigation uniformity up to 90% can be achieved, resulting in higher yield. Other advantages include minimum weed growth, no need for land levelling, and reduced labor cost; highly saline soil or saline water can be utilized in conjunction with this method. (Jahns-Arizona)
W77-11621

WATER RELATIONS AND GROWTH OF SOYBEANS IN DRYING SOIL,
Agricultural Research Service, Stoneville, Mo.
For primary bibliographic entry see Field 2I.
W77-11622

A STUDY ON THE MOISTURE AVAILABILITY AND OTHER CONDITIONS OF UNSTABILISED DUNES IN THE CONTEXT OF PRESENT LAND USE AND THE FUTURE PROSPECTS FOR DIVERSIFICATION,
Central Arid Zone Research Inst., Jophpur (India).
For primary bibliographic entry see Field 4D.
W77-11628

EXPERIMENTAL EVALUATION OF A CROP CLIMATE SIMULATION MODEL FOR INDIAN CORN (ZEA MAYS L.),
Agricultural Univ., Wageningen (Netherlands). Dept. of Physics and Meteorology.
C. J. Stigter, J. Goudriaan, F. A. Bottemanne, J. Birnie, and J. G. Lengkeek.
Agricultural Meteorology, Vol 18, No 3, p 163-186, June 1977. 12 fig, 2 tab, 31 ref.

Descriptors: *Micrometeorology, *Canopy, *Corn(Field), *Model studies, *Crop production, Climatic data, On-site tests, Thermal conductivity, Radiation, Turbulence, Wind velocity, Transpiration, Microclimatology, Soil surfaces, Air temperature, Humidity, Profiles.

A micrometeorological model is outlined and evaluated through extensive measurements of the microclimate in a corn crop. The simulation model is composed of a number of interacting submodels, the main features of which are discussed; soil characteristics that must be known are thermal conductivity and heat capacity. Dynamic simulation involves radiation, turbulence and wind, leaf assimilation and transpiration, balances at the soil surface and heat movement in the soil. Comparison of measured and simulated characteristics of the microclimate indicated that the absorption of radiative energy and the leaf and boundary layer resistances are adequately simulated so that the model represents a basis for simulation models of crop production. Air temperature and humidity profiles are also reasonably simulated but can be improved by a better incorporation of spatial and temporal variations of turbulence and wind as a function of the canopy characteristics. Data from field experiments in 1972 and 1973 are presented. (Jahns-Arizona)
W77-11631

WATER REPELIENCY OF SOILS UNDER CITRUS TREES IN EGYPT AND MEANS OF IMPROVEMENT,
Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
For primary bibliographic entry see Field 2I.
W77-11633

CONTROLLED-ENVIRONMENT AGRICULTURE AND THE DEVELOPING COUNTRIES,
Arizona Univ., Tucson. Environmental Research Lab.
For primary bibliographic entry see Field 6B.
W77-11640

OCHRE AND SUBSURFACE DRAINAGE IN CULTIVATED ORGANIC SOILS OF WILLARD MARSH, OHIO,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 2J.
W77-11797

DIURNAL SOIL WATER REGIME IN THE TILLED PLOW LAYER OF A WARM, HUMID CLIMATE,
Southern Piedmont Conservation Research Center, Watkinsville, Ga.
For primary bibliographic entry see Field 2G.
W77-11826

A PERSPECTIVE ON FLOOD PROTECTION OF AGRICULTURAL LANDS.
Development and Resources Corp., Sacramento Calif.
For primary bibliographic entry see Field 6F.
W77-11850

DISPERSAL OF PHYTOPHTHORA PALMIVORA SPORANGIA BY WIND-BLOWN RAIN,
New York State Agricultural Experiment Station Geneva. Dept. of Plant Pathology.

J. E. Hunter, and R. K. Kunimoto.
Phytopathology. 64(2), p 202-206, 1974.

Descriptors: *Path of pollutants, Rain, Wind, *Spores, Orchards, *Fruit crops, *Plant diseases, Humidity, Hawaii.
Identifiers: *Carica papaya, Phytophthora infestans, *Phytophthora palmivora, Sporangia.

Sporangia of P. pamivora produced on papaya (Carica papaya L.) could not be recovered on Hirst spore trap slides, even though infected fruits surrounding the trap or in wind tunnels were subjected to a wide range of meteorological conditions suitable for release of dry sporangia of P. infestans from potato leaves. However, wind-blown rain collected from severely diseased orchards contained sporangia. Rain-splash experiments showed that sporangia are readily released in splash-droplets formed when rain drops impact on disease lesions. Detached sporangia held at relative humidities lower than 100% dehydrated in 2-4 min and failed to germinate when placed in water. There was an inverse relationship between temp. and survival of detached sporangia. Sporangia attached to papaya fruits can survive drying conditions, therefore these spores serve as a source of inoculum which can be dispersed by wind-blown rain. Intermittent showers capable of detaching sporangia are common during the night in Hawaii and survival of the sporangia would be expected because the humidity is usually 100% for 8-9 h each night of the year. Thus, wind-blown rain is an ideal spore release and dispersal mechanism for survival of this species. Copyright 1974, Biological Abstracts, Inc.
W77-11927

AN EPIDEMIOLOGICAL STUDY OF MUMMY BERRY DISEASE OF HIGHBUSH BLUEBERRY,
Michigan State Univ., East Lansing. Dept. of Botany.
D. C. Ramsdell, J. W. Nelson, and R. Meyers.
Phytopathology. 64(2), p 222-228, 1974.

Descriptors: *Epidemiology, *Plant diseases, *Blueberries, Fruit crops, Michigan, Humidity, Germination, Leaves, Spores.
Identifiers: Monilinia vaccinii corymbosi, *Mummy berry disease, Vaccinium corymbosum, *Ascopores.

A Burkard recording volumetric spore trap was operated in a highbush blueberry (Vaccinium corymbosum L.) field in Michigan April 19-June 15, 1972. Ascospores of Monilinia vacciniicorymbosi (incitant of mummy berry disease) were trapped from April 28-May 11, a period during which the bushes progressed from green tip to pink bud prebloom stage. Ascospore discharge occurred mostly during daylight when relative humidity (RH) was < 100%; very few spores were trapped at night when RH was 100%. Ascospore discharge was inversely correlated with RH and wind speed (P = < 0.001 and < 0.01, respectively). Nocturnal periods of continuous leaf wetness ranged from 5.5-12.0 h which, according to germination studies on glass slides, could allow primary infection to occur. Bushes had a mean of 92 visible leaf and shoot infections by May 23. Triarimol sprays applied 72 h after the 1st major ascospore discharge on May 4, while bushes were still at the green tip stage, and again on May 15, were much more effective in reducing primary infection than sprays applied only on May 15. Trapping of conidia commended May 19, when bushes were at 20% pink bud prebloom stage, and ended June 3 at petal fall. Large numbers of conidia were trapped both during day and night. Release of conidia was inversely correlated with leaf wetness (P = < 0.1) and directly correlated with wind speed (P = < 0.1). Continuous leaf wetness at night ranged from 1.5-12.0h during the period conidia were trapped. Copyright 1974, Biological Abstracts, Inc.
W77-11928

EFFECT OF SOIL MOISTURE TENSION AND AMENDMENTS ON YIELDS AND ON HERBAGE N, P, AND S CONCENTRATIONS OF ALFALFA,
Department of Agriculture, Saskatoon (Saskatchewan).
W. F. Nuttall.
Agronomy Journal, Vol. 68, No. 5, p 741-744, September-October 1976. 5 tab, 9 ref.

Descriptors: *Alfalfa, Soil types, Nutrients, *Soil moisture, Soil water, Soil texture, Crop response, *Nitrogen, *Phosphorus, *Sulfur, Barley, Farm wastes.
Identifiers: Ammonium nitrate.

Low protein concentration has been observed in alfalfa herbage grown on Gray Wooded Luvisol soils, particularly in cool, wet years. Nutrient deficiencies of N, P, and S also occur on these soils. The objectives of this experiment were to determine how soil moisture and soil type interact with amendments to increase yield and change N, P, and S concentrations in alfalfa herbage grown in the greenhouse. Three Gray Wooded Luvisols, typic Cryoboralf (Arborfield clay, Garrick clay loam, Mollic Cryoboralf, and Waitville loam) and one Dark Gray Luvisol soil (Nipawin sandy clay loam) times two soil moisture tensions (100 and 151 millibars) were main treatments. Amendments of cattle manure, sedge peat, and wheat straw were applied on subplots at 2.5% of soil weight. Additional subplots of a control and ammonium nitrate were added. Yield of alfalfa was significantly related to moisture use. Moisture use by alfalfa was higher with cattle manure incorporated in the heavier textured Garrick clay loam and Arborfield clay soils than for other amendments or soil types. The manure treatment applied to Garrick clay loam and Arborfield clay soils under low soil moisture tension produced the highest herbage yields. (Skogerboe-Colorado State)
W77-11942

LEAF CONDUCTANCE RESPONSE TO HUMIDITY AND WATER TRANSPORT IN PLANTS,
California Univ., Riverside. Dept. of Plant Sciences.
A. E. Hall, and G. J. Hoffman.
Agronomy Journal, Vol. 68, No. 6, p 876-881, November-December 1976. 6 fig, 23 ref.

Descriptors: Stomata, *Humidity, *Leaves, Photosynthesis, Transpiration, Vapor pressure, Plant physiology.
Identifiers: *Leaf conductance, Leaf water, Sunflowers, Pinto beans, Leaf water potential.

Stomatal response to humidity is a potentially important adaptive characteristic. The possibility that stomata may respond to humidity independently of changes in bulk leaf water status was tested. Also the basis for reported differences in leaf water potential response to transpiration was investigated. Simultaneous measurements of in situ leaf water potential, transpiration, and net photosynthesis were made in controlled environments using sunflower and pinto bean. Responses of leaf conductance and leaf water potential to changes in ambient humidity and root medium water potential were determined. (Skogerboe-Colorado State)
W77-11943

RELATIONSHIP BETWEEN NITROGEN ANALYSIS OF SOYBEAN TISSUES AND SOYBEAN YIELDS,
Kentucky Univ., Lexington. Dept. of Agronomy.
U. R. Pal, and M. C. Saxena.
Agronomy Journal, Vol. 68, No. 6, p 927-932, November-December 1976. 4 fig, 2 tab, 12 ref.

Descriptors: *Nitrogen, Nutrients, *Soybeans, Crop response, Fertilization.
Identifiers: Seed yields.

In order to determine the applicability of N analysis of plant tissues as a diagnostic tool for N nutrition, it is essential to study the N status of soybean plants under varying N supply. Field experiments were conducted to determine the effect of N fertilization at the rates of 0, 25, 50, 100, and 200, and 300 different plant parts of nodulating (inoculated and uninoculated) and non-nodulting isolines of 'Clark' and 'Harosoy' soybeans at various stages of growth and to correlate the N status of soybean plants with yields. (Skogerboe-Colorado State)
W77-11944

LONG-TERM RESIDUAL FERTILITY AND CURRENT N-P-K APPLICATION EFFECTS ON SOYBEANS,
Georgia Experiment Station, Experiment.
F. C. Boswell, and O. E. Anderson.
Agronomy Journal, Vol. 68, No. 2, p 315-318, March-April 1976. 2 fig, 6 tab, 19 ref.

Descriptors: *Soybeans, Fertilizers, *Fertilization, *Nitrogen, *Phosphorus, *Potassium, Legumes, Crop response, Crop production.
Identifiers: Residual fertilizers.

Soybean yield response to currently applied fertilizers, especially N, has been erratic while responses to residual P and K have been more consistent. This study was conducted to determine if residual N-P-K fertilizers applied over a period of years to other non-leguminous crops would influence soybean fertilizer requirements. Soybeans were planted on a Rarden sl soil where plots had received the same rates of P and K for 13 years. Previous N levels were 56 or 112 kg/ha, depending on the crop. Since legumes had not grown on the area for at least 16 years, significant responses to 56 kg/ha of N occurred each year at the high level of P and K. A greater yield response occurred from the P application than from K. The fertilizer times year interaction effects on yield was greatest for P as compared to N or K interactions when fitted to a regression model equation. The highest rates of N-P-K resulted in significantly larger soybean seed, better quality (seed index), and higher crude protein content than low N-P-K rates or control plots. Crude protein was inversely related to total oil content. Even though relatively high levels of P and K were applied to certain plots for 16 years and crop residues remained on the soil surface each year, high levels of extractable (double acid) P or K were not found in the soil. (Skogerboe-Colorado State)
W77-11945

SALINITY EFFECTS ON NITROGEN USE BY WHEAT CULTIVAR SONORA,
Soil Testing Labs., Junagadh (India).
K. L. Jadav, E. F. Wallihan, R. G. Sharpless, and W. Printy.
Agronomy Journal, Vol. 68, No. 2, p 222-226, March-April 1976. 3 fig, 4 tab, 7 ref.

Descriptors: *Nitrogen, Fertilizers, Fertilization, Nutrients, *Wheat, *Salinity, Saline soils, Crop production, Crop response.

The importance of N nutrition to fulfilling the high production potential of some semidwarf wheat cultivars under irrigation culture raises problems of balance between N and salinity. Inasmuch as growth may be limited in salt affected soils, thereby reducing total N requirement, the usual rates of fertilizer application may be excessive and thus contribute to the salinity problem. This study was 'Sonora 64' wheat was done to measure the effects of salinity and stand density on plant growth and grain yield, to estimate N uptake in relation to salinity and the stage of plant development, and to evaluate leaf-N as a basis for diagnosing the N status of the plant. (Skogerboe-Colorado State)
W77-11946

ESTIMATING EVAPORATION AND TRANSPIRATION FROM A ROW CROP DURING INCOMPLETE COVER,

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
C. B. Tanner, and W. A. Jury.

Agronomy Journal, Vol. 68, No. 2, p 239-243, March-April 1976. 2 fig, 2 tab, 25 ref.

Descriptors: Model studies, *Evapotranspiration, *Evaporation, *Transpiration, Potatoes, Lysimeters, Crop response, Crop production, *Estimating.

In order to model the evapotranspiration (ET) from a crop with incomplete cover, the evaporation (E) is estimated separately from the transpiration (T) since E and T usually do not vary proportionately. Our objective was to develop and test an ET model based on the 'potential' E and T estimates that are consistent with the potential ET estimate. When E is less than the potential E (the falling rate phase), it is estimated by two approaches based on E falling as the square root of t; however, the model assumes transpiration is at the 'potential' rate. ET estimates during cover development of potato for 2 years were compared with lysimeter measurements. The standard error of estimate varied from 0.40 to 0.94 mm/day depending on the method for estimating E. The estimate of cumulative ET for 4 weeks varied from the lysimeter a maximum of 1 cm in 9.7 cm ET. (Skogerboe-Colorado State)
W77-11947

NUTRIENT UPTAKE BY CORN AND GRAIN SORGHUM SILAGE AS AFFECTED BY SOIL TYPE, PLANTING DATE, AND MOISTURE REGIME,

Tennessee Univ., Knoxville. Dept. of Plant and Soil Science.
H. A. Fribourg, W. E. Bryan, G. M. Lessman, and D. M. Manning.

Agronomy Journal, Vol. 68, No. 2, p 260-263, March-April 1976. 4 tab, 6 ref.

Descriptors: *Corn(Field), *Grain sorghum, *Soil moisture, *Soil water, Tennessee, Nutrients, Nitrogen, Phosphorus, Potassium, Calcium, Manganese, Fertilizers, *Soil types, Moisture content.

Few data have been published on whole-plant nutrient removal by silage crops as influenced by soil types and species. In order to quantify nutrient removals by corn and grain sorghum silage crops, early (30 April-15 May) and late (2-12 June) plantings of 'Funk G-4831' corn and 'AKS 614' sorghum were grown in 1969 in 34 environments on 12 soil types, two soils at each of six locations in Tennessee. Non-irrigated plots of the two plantings were grown on all soils, and irrigated plots were added to five of the soils. The corn was harvested for silage when 80 to 90% of the kernels were dented, and grain sorghum when the oldest seeds were in the soft dough stage. Tissue samples were collected and analyzed for N, P, K, Ca, and Mg. Total seasonal uptake was calculated by multiplying percent composition of each element by dry matter yield/ha. Corn silage yields ranged from about 6 to 28 metric tons/ha, and sorghum silage yields ranged from about 7 to 18 metric tons/ha. Nutrient uptake generally increased linearly with yield. Mean total uptake of N, P, K, Ca, and Mg were, for corn silage, 192, 28, 144, 39, and 37 kg/ha; and, for grain sorghum silage, 169, 26, 143, 40, and 35 kg/ha, respectively. (Skogerboe-Colorado)
W77-11948

WATER TRANSPORT IN WHEAT PLANTS IN THE FIELD,

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
O. T. Denmead, and B. D. Millar.

Agronomy Journal, Vol. 68, No. 2, p 297-303, March-April 1976. 5 fig, 5 tab, 27 ref.

Descriptors: *Wheat, *Transpiration, *Evapotranspiration, Water vapor, Model studies.
Identifiers: Leaf water potential.

Most previous studies of water transport in crops have been based on simplified models of plant anatomy and canopy transpiration. Usually changes in the water potential of a particular leaf have been related to the water loss from the whole canopy. We present a more detailed analysis of plant water transport which accounts for the spatial distribution of water flows and transpiration losses throughout the canopy, and use it to estimate flow resistances in different segments of the pathway. Micrometeorological measurements of the flux densities of water vapor in the canopy were used to infer water fluxes through roots, stem sections, leaves, and ears of wheat plants in the field. Simultaneous measurements of soil and leaf-water potentials permitted calculation of flow resistances in roots, stems, and leaves. The study shows clearly how the water loss from one part of the canopy influences the development of water potentials in other parts and points up the difficulties of simplified transport models. (Skogerboe-Colorado State)
W77-11949

GROWTH AND MINERAL COMPOSITION OF RICE AT VARIOUS SOIL MOISTURE TENSIONS AND OXYGEN LEVELS,

Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
W. H. Patrick Jr, and W. J. Fontenot.

Agronomy Journal, Vol. 68, No. 2, p 325-329, March-April 1976. 9 fig, 16 ref.

Descriptors: *Rice, *Crop production, Crop response, *Soil moisture, Soil water, Manganese, Iron, Phosphorus, *Oxygen.
Identifiers: Soil columns.

The better growth of rice in a flooded soil as compared to an upland soil has been attributed to the reducting conditions caused by submergence. No study has been carried out, however, in which the effects of the soil moisture status has been separated from the effect of the oxidation-reduction conditions of the soil. In the study reported here, the effect of soil oxidation-reduction conditions on early growth and mineral composition of lowland rice was determined by growing plants in artificially packed soil columns maintained under different soil moisture tension and oxygen conditions. Since soil aeration is largely governed by the moisture status of the soil, this study was designed to separate these effects by subjecting the rice plant to different aeration conditions while at the same time attempting not to limit moisture supply. In one experiment different redox conditions were established by maintaining soil columns at soil moisture tensions rangiang from 0 to 80 cm during growth of the plants. In a second experiment plants were grown at soil oxygen levels of 0, 3, 8, and 12% while soil moisture was maintained at 10 cm moisture tension. Vegetative growth of rice was greater under reduced conditions than under oxidized conditions in both experiments. The P concentration of the plant was much higher under reduced conditions than under oxidized conditions. Reduced conditions increased the solubility of P, Fe, and Mn in the soil although no consistnet effect of reducing conditions on plant uptake of Fe and Mn was observed. (Skogerboe-Colorado State)
W77-11950

EFFECT OF INCREASING FOLIAGE AND SOIL REFLECTIVITY ON THE YIELD AND WATER USE EFFICIENCY OF GRAIN SORGHUM,

Volcani Inst. of Agriculture Research, Bet-Dagan (Israel). Div. of Agricultural Meteorology.
G. Stanhill, S. Moreshet, and M. Fuchs.

Agronomy Journal, Vol. 68, No. 2, p 329-332, March-April 1976. 1 fig, 3 tab, 5 ref.

Descriptors: *Grain sorghum, Crop production, *Crop response, Soils, Water utilization.
Identifiers: *Soil reflectivity, *Foliage.

The effect of increasing foliage and soil reflectivity on yield and water use efficiency of grain Sorghum crops grown under arid conditions with stored water only, was studied during 3 years of randomized block field experiments. Suspensions of kaolin were sprayed on the soil and/or foliage at different growth stages to select the most effective placement and timing for the treatment. Soil-only applications were ineffective in increasing yields but canopy sprays resulted in an additional yield of 446 kg/ha, or 11% over the unsprayed controls, averaged over the 3 years of experimentation. The most effective period for foliage sprays started seven weeks after seedling emergence and ended 10 days later, immediately before the panicles emerged. During this period, known to be critical for Sorghum grain yield response to water status, the yield response averaged 2 kg grain/1 kg kaolin applied. Neither the total seasonal water use nor the rate of soil water depletion was affected by the foliage reflectance treatment. It is concluded that under arid conditions, kaolin suspensions sprayed twice on the foliage of unirrigated grain Sorghum crops during the prepanicle-emergence stage shows promise as an effective method of increasing grain yield. (Skogerboe-Colorado State)
W77-11951

NON-UNIFORM INFILTRATION UNDER POTATO CANOPIES CAUSED BY INTERCEPTION, STEMFLOW, AND HILLING,

Wisconsin Univ., Madison. Dept. of Soil Science.
P. G. Saffigna, C. B. Tanner, and D. R. Keeney.

Agronomy Journal, Vol. 68, No. 2, p 337-342, March-April 1976. 4 fig, 2 tab, 38 ref.

Descriptors: *Sprinkler irrigation, Irrigation practices, Irrigation effects, *Infiltration, *Potatoes, Leaching, Soil water, Deep percolation, Model studies.

It is generally assumed that infiltration of sprinkler irrigation and rainfall under potato is uniform. However we observed non-uniform infiltration beneath the hills of sprinkler-irrigated potatoes grown of Plainfield loamy sand (Typic Udipsamment; sandy, mixed, mesic). The objective of this field study was to determine the effects of foliage interception and hilling on non-uniform infiltration, since concentrating water in local zones would increase deep drainage and nitrogen leaching. To do this we traced the rainfall and irrigation infiltration pattern with Rhodamine WT dye and collected the stemflow in stem collars. Throughfall of rainfall, the soil water content, and soil water tension also were measured. From 20 to 46% of the irrigation and from 4 to 23% of the rainfall on the canopy flowed down the stems. Stemflow increased the soil water content around the stems and moved Rhodamine dye deep beneath the soil surface. Deep movement of dye beneath the furrows was caused by runoff from the hill and by leaf drip from the outer foliage. The results obtained suggest that irrigation and fertilizer management could be improved by taking this non-uniform infiltration pattern into account. Smaller irrigations should improve water use efficiency and minimize nitrate leaching. Further evaluation of solute movement by soil sampling should consider the spatial variation introduced by the non-uniform infiltration. Finally, predictive leaching models should account for non-uniform infiltration. (Skogerboe-Colorado State)
W77-11952

NITROGEN NUTRITION AND YIELD OF SUGARCANE AS AFFECTED BY N-SERVE,

Weeds (M. J.) and Associates, Dublin (Ireland).
M. Prasad.

Agronomy Journal, Vol. 68, No. 2, p 343-346, March-April 1976. 4 fig, 3 tab, 13 ref.

Descriptors: *Sugarcane, Fertilizers, Fertilization, *Nitrogen, Irrigation effects, Irrigation practices, Nitrification, *Nutrients, *Crops response.
Identifiers: *Nitrification inhibition.

Very few experiments have been conducted to evaluate N-Serve formulated with N fertilizer for sugarcane. N-Serve when formulated with N-fertilizer increased sugarcane yields in the Philippines and in Louisiana but failed to do so in Puerto Rico and in Mauritius. In view of the relatively few experiments conducted with N-Serve for sugarcane and the conflicting nature of the results, a pot experiment in drums and a field experiment were conducted to study the effect of N-Serve formulated with solid ammonium sulfate (AS) on sugarcane ('HJ 5741') yield, leaf N content, tillering, and on soil N. In the pot experiment two soils, a clayey loam and a loamy sand were used combined with a high and low irrigation treatment. There were two rates of AS with and without N-Serve. A control treatment was also included. N-Serve was applied at a flat rate of 24 liter/ha. (Skogerboe-Colorado State)
W77-11953

COMPARISON OF MODIFIED MONTMORILLONITE TO SALTS AND CHELATES AS CARRIER FOR MICRONUTRIENTS FOR PLANTS: I. SUPPLY OF COPPER, ZINC, AND MANGANESE,
Hebrew Univ., Rehovoth (Israel). Dept. Soil and Water Science.
For primary bibliographic entry see Field 3C.
W77-11954

COMPARISON OF MODIFIED MONTMORILLONITE TO SALTS AND CHELATES AS CARRIER FOR MICRONUTRIENTS FOR PLANTS: II. SUPPLY OF IRON,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 3C.
W77-11955

INFLUENCE OF NITROGEN, NARROW ROWS, AND PLANT POPULATION ON COTTON YIELD AND GROWTH,
Council for Scientific and Industrial Research, Kumasi (Ghana). Dept. of Agronomy.
S. E. Koli, and L. G. Morrill.
Agronomy Journal, Vol. 68, No. 6, p 897-901, November-December 1976. 3 fig, 8 tab, 18 ref.

Descriptors: *Cotton, *Crop response, *Fertilization, Fertilizers, *Nitrogen, Plant population, *Crop production.
Identifiers: Row spacing.

Narrow row planting of cotton has the potential for improving yield and production efficiency. Fertilizer needs and other production technology for narrow row cotton have received little attention, especially the nitrogen (N) requirement. The objective of this study was to ascertain if N fertilizer, narrow row, and high population, has any effect on growth and yield of dryland cotton. The relationship between petiole NO(-)3(-)N at various stages of development and yields was also investigated. Row spacing (25, 51, and 76-cm), plant populations (123,550 and 173,000 plants/ha), and N rate (0, 45, and 90 kg/ha) variables were placed in a factorial arrangement of a randomized, complete block design with four replications. Low N treatments (45 kg/ha) produced no significant change in yield, but higher N rates reduced yield significantly. The 25 and 51-cm row spacings produced significantly higher yield than 76-cm rows. The range of plant populations used did not materially affect yield, but there was a significantly N-population interaction. Narrow rows reduced plant height. NO(-)3(-)N levels in petioles increased with increased N rate, being highest at the square stage of plant growth and decreasing sharply at the flower and boll stages. There was no significant correlation between petiole NO(-)3(-)N and yield. Narrow row cotton can result in higher yield and is especially of interest where the length of growing season is not optimum. (Skogerboe-Colorado State)
W77-11956

NITRIFICATION INHIBITOR WITH FALL-APPLIED VS. SPLIT NITROGEN APPLICATIONS FOR WINTER WHEAT,
Georgia Univ., Experiment. Dept. of Agronomy.
F. C. Boswell, L. R. Nelson, and M. J. Bitzer.
Agronomy Journal, Vol. 68, No. 5, p 737-740, September-October 1976. 1 fig, 5 tab, 11 ref.

Descriptors: *Nitrification, Nutrients, Fertilization, *Nitrogen, Crop response, Crop production, *Wheat, Georgia, Soil analysis.
Identifiers: Soil fertility.

Since numerous small grain producers desire to make fall application of efficient levels of N for maximum yields, studies are needed to determine the efficiency of fall-applied N (with and without an inhibitor) vs. split N applications. Field studies were conducted at two locations each year over a 3-year period with the objective of evaluating the response of wheat to N rates, time of application, and effect of a nitrification inhibitor on soils of different characteristics. Yields, tissue concentrations of various elements, grain analyses, and soil NH4(-) and NO3(-)N were evaluated. Splitting the N, 28 kg/ha in the fall and 56 kg/ha topdressed in the spring, was superior to applying all the N in the fall. The inclusion of the nitrification inhibitor, 2-chloro-6-(trichloromethyl) pyridine (N-Serve), with ammonium sulfate in the fall at the rate of 84 kg/ha did not influence yields or N levels in the tissue or grain. The inhibitor had no effect on elements other than N. Although the nitrification inhibitor influenced the retention of the NH4(-)N in the soil until the January sampling, this retention was not evident for either soil at the March sampling. Therefore, we concluded that the N applied as a part of the complete fertilizer at the rate of 28 or even 84 kg/ha in the fall is inadequate for maximum wheat yield in either the coastal plain or piedmont regions of Georgia. A nitrification inhibitor applied with the ammonium sulfate was ineffective in preventing nitrification of the ammonium nitrogen or to increase yields. (Skogerboe-Colorado State)
W77-11957

SULFUR AND NITROGEN REQUIREMENTS OF SUGARCANE,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
R. L. Fox.
Agronomy Journal, Vol. 68, No. 6, p 891-896, November-December 1976. 9 fig, 3 tab, 25 ref.

Descriptors: *Sugarcane, *Nitrogen, *Sulfur, Nutrients, Fertilizers, Fertilization.
Identifiers: Nitrogen-sulfur ratio.

The internal S requirement of sugarcane is not well defined and there are no published data on the external SO1-S requirements. The objectives of this study was to provide data on sulfur distribution and N:S ratios in sugarcane. Sugarcane was grown in solution cultures and in potted soil material which provided several concentrations and ratios of NO3 and SO1 in solution. External S and N requirements were estimated from plots of yield vs. SO4 or NO3 concentrations in solution cultures and in artificial soil solutions. The external S requirement at age 35 days was about 9 ppm. After 70 days the requirement was about 5 ppm when N was adequately supplied. The external S requirement for early growth was 0.36% S in the whole plant and 0.24% for leaf blades 3 through 6. When plants were 70 days old, 0.10% S in leaf blades or 0.08% S inleaf sheaths was sufficient. Sulfur-deficient, field-grown sugarcane 18 months old contained 0.075% S in leaves 3 through 6 and 0.072% S in the corresponding leaf sheaths. Sulfur fertilized sugarcane contained 0.138% and 0.232% for the same tissues. Ratios N:S differed for various tissues of the same plant. Distribution of S in the plant may be a valuable tool for assessing the S status of sugarcane. When S is deficient, old leaf blades contain more S than corresponding leaf sheaths, and blades and sheaths of leaves 3 to 6 contain about equal concentrations of S. Good S nutrition was associated with an elevated concentration of S in leaf sheaths as compared with leaf blades. (Skogerboe-Colorado State)
W77-11958

STOMATAL RESPONSE TO LEAF WATER POTENTIAL AS AFFECTED BY PRECONDITIONING WATER STRESS IN THE FIELD,
Texas A and M Univ., College Station. Dept. of Soil and Crop Science.
J. C. Thomas, K. W. Brown, and W. R. Jordan.
Agronomy Journal, Vol. 68, No. 5, p 706-708, September-October 1976. 4 fig, 13 ref.

Descriptors: *Grain sorghum, *Cotton, Crop response, Moisture stress, *Stomata, Crop production, Irrigation, Irrigation effects, Irrigation practices, Soil water, Leaves.
Identifiers: *Leaf water potential.

Previous research has shown that stomatal response to decreasing soil water potential of chamber-grown sorghum and cotton posure to previous water stress. This work was undertaken to determine if stomatal response of field-grown plants is also altered by previous water stress. Stoneville 213 cotton was grown in the field under movable rainshelters and was subjected to three treatments: control—well watered, one period of water stress, and two periods of water stress. After this preconditioning period, all plants underwent a final stress during which stomatal response to leaf water potential was measured. The periods of preconditioning water stress were characterized by decreased cumulative growth as measured by leaf area per plant. Leaf areas for the control, one soil water stress plants, and two soil water stress plants were 5,200, 2,200, and 1,200 sq cm, respectively. Lower stomates of preconditioned field-grown plants remained open to lower leaf water potentials (-28 to -30 bars) during the final stress than those of plants which were not preconditioned (-22 bars). These results were similar to those found previously on chamber-grown plants which had been exposed to more frequent but shorter stresses. The 6 to 8 bar adjustment in leaf water potential vs. stomatal resistance as a result of previous water stress indicates a need for caution in interpreting data from plants of unknown water stress history. (Skogerboe-Colorado State)
W77-11959

NEMATICIDE APPLICATION THROUGH POROUS SUBSURFACE IRRIGATION TUBING,
Georgia Univ., Athens. Dept. of Agricultural Engineering.
J. L. Chesness, J. R. Dryden, and U. E. Brady Jr.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 105-107, Special Edition 1976. 6 fig, 5 ref.

Descriptors: *Nematocides, *Nematodes, Subsurface irrigation, *Irrigation practices, Irrigation systems.
Identifiers: Drip irrigation, Trickle irrigation, *Vydate, *Nemacur.

The low translocation characteristics of Nemacur would not make it suitable for field application through a porous tube applicator. Vydate however, does offer some definite possibilities for field application through a porous tube applicator. Nematode populations are generally the highest in

the surface or upper soil region. A lethal Vydate concentration (according to its manufacutres) is 5 ppm. This minimal concentration in the Vydate test was attained as far out as 60 cm horizontally (from the applicator) at a 23 cm depth. With multiple laterals on a 120 cm spacing the overlap effect in the water distribution pattern should provide a 5 ppm or greater Vydate concentration in a major portion of the soil profile. The above 'field application inference' is just that: an inference based on laboratory tests. The affects upon the nematicide distribution patterns of high initial soil water contents and reduced initial concentrations must be field evaluated before the inference label can be removed. (Skogerboe-Colorado State)
W77-11960

APPLICATION OF A TWO-VARIABLE MITSCHERLICH FUNCTION IN THE ANALYSIS OF YIELD-WATER-FERTILIZER RELATIONSHIPS FOR CORN,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
R. W. Hexem, V. A. Sposito, and E. O. Heady.
Water Resources Research, Vol. 12, No. 1, p 6-10, February 1976. 4 fig, 3 tab, 6 ref.

Descriptors: *Model studies, Fertilizer, *Fertilization, *Corn(Field), Colorado, Kansas, Simulation analysis, Crop response, Nutrients, Crop production.
Identifiers: *Mitscherlich models.

Variations of models developed by E.A. Mitscherlich in the early part of this century are periodically used for estimating input-output relationships for plants. Mitscherlich's work focused on a single variable. While these exponential models incorporate features of theoretical appeal, the procedures for quantifying the models are relatively complex when two or more independent variables are included. In fits of Mitscherlich and polynomial forms to yield-water-fertilizer data for corn grown under experimental conditions in Colorado and Kansas, test statistics for the polynomial forms are as good as or better than those for the more complex Mitscherlich models. (Skogerboe-Colorado State)
W77-11961

SUBSURFACE AND FURROW IRRIGATION EVALUATION FOR BEAN PRODUCTION,
Pahlavi Univ., Shiraz (Iran). Dept. of Irrigation.
A. R. Sepaskhah, S. A. Sichani, and B. Bahrani.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 1089-1092, Special Edition, 1976. 4 fig, 3 tab, 19 ref.

Descriptors: *Subsurface irrigation, *Furrow irrigation, Irrigation, Irrigation practices, *Beans, Crop production, Water conservation.
Identifiers: Drip irrigation, Trickle irrigation.

The water use efficiency, yields of beans and economic feasibility of furrow and subsurface irrigation systems were compared in field experiments. Subsurface irrigation required 55 percent less water to produce a yield of beans comparable to that obtained with furrow irrigation. Water use efficiencies of 81.9 and 37.5 kg of beans per cm of water were obtained for the treatments irrigated with subsurface and furrow irrigation systems, respectively. Spacing for subsurface irrigation laterals was obtained from a laboratory experiment and was 84 percent of the theoretical spacing. If the usable life of the porous pipe can be extended to 3 yr, the price of the subsurface system could be comparalbe to that of the furrow irrigation system when water cost is $0.0135/cu m. (Skogerboe-Colorado State)
W77-11962

RELATIONSHIP BETWEEN POTATO YIELD AND OXYGEN DIFFUSION RATE OF SUBSOIL,
Department of Agriculture, Fredericton (New Brunswick). Research Station.
G. R. Saini.
Agronomy Journal, Vol. 68, No. 5, p 823-825, September-October 1976. 1 fig, 1 tab, 24 ref.

Descriptors: *Potatoes, Crop response, *Crop production, Soil physical properties, Soil compaction, Organic matter, Soil properties, Soil moisture, Field capacity, Oxygen.
Identifiers: *Oxygen diffusion rate(Soils).

Numerous studies in the past have been made of the effects of soil compaction on potato yield by deliberately packing the soil in small experimental plots. Since information obtainable from such experiments has limited value in the economic assessment of crop production of an area, a study was conducted on 10 different farmer's fields to find out which soil physical property (or a combination of properties) may best define the prevailing productive capacity of a soil for potatoes. Various soil properties (stones, sand, silt, clay, bulk density, penetrometer readings, and orgainc matter) were measured according to the methods given by Black (1965) at a depth of 20 to 28 cm (8 to 11 inches) where the compact soles usually occur. Oxygen diffusion rate, however, was determined at a moisture content of field capacity by the platinum microelectrode method (Lemon and Erickson, 1952) using a rate meter manufactured by Jensen Instruments, Tacoma, Washington. Stepwise multiple regression analysis of potato yields of cultivar 'Netted Gem' and the soil properties indicated that oxygen diffusion rate of subsoil was one single factor which highly correlated with marketable yield (r = +0.82). The correlation coefficient was significant at the 1% level of probability. Further addition of other properties did not improve the r value significantly. The study indicates the oxygen diffusion rate of subsoil is useful criteria to diagnose the prevailing physical condition of the soil which in turn, could be related to the relative productive capacity of soil for potato production in New Brunswick, Canada. (Skogerboe-Colorado State)
W77-11963

EVAPOTRANSPIRATION AND WATER USE EFFICIENCY BY SOYBEAN LINES DIFFERING IN GROWTH HABIT,
Fort Valley State Coll., Ga. Div. of Agriculture.
B. P. Singh, and E. N. Whitson.
Agronomy Journal, Vol. 68, No. 5, p 834-835, September-October 1976. 2 fig, 4 ref.

Descriptors: *Soybeans, *Evapotranspiration, *Crop response, *Canopy, Eddies, Crop production, Water vapor, Air circulation, *Water utilization.
Identifiers: Canopy morphology, Water use efficiency.

Determinate and indeterminate soybeans differ in canopy morphology due to a difference in their growth habits. Canopy morphology may affect receipt and loss of radiation, air circulation, and eddy turbulence. These factors may in turn influence heat and water vapor transfer, thereby possibly influencing plant water use. The objective of this study was to determine the effects of soybean growth habits on evapotranspiration and water use efficiency. The daily evapotranspiration rate for both lines was maximum at the early reproductive stage. Water extraction by both lines extended to a 122-cm soil depth, the lowest depth measured. The totai evapotranspiration by the determinate line was 41.2 cm as compared to 39.2 cm for the indeterminate line. The difference in growth habits amounted to only a small fraction of the total evapotranspiration. The determinate line produced 24.9% more grain than the indeterminate line by utilizing only 5.6% more water. This accounted for an 18.1% greater water use efficiency of the determinate line. These values suggest that growth habits affect water use efficiency primarily by controlling grain yield. (Skogerboe-Colorado State)
W77-11965

YIELDS AND SUGAR CONTENT OF SUGARBEETS AS AFFECTED BY DEFICITY HIGH-FREQUENCY IRRIGATION,
Agricultural Research Service, Prosser, Wash. Western Region.
D. E. Miller, and J. S. Aarstad.
Agronomy Journal, Vol. 68, No. 2, p 231-234, March-April 1976. 2 fig, 5 tab, 7 ref.

Descriptors: *Sprinkler irrigation, *Sugar beets, Crop response, Crop production, Evapotranspiration, Irrigation effects, Irrigation practices, Irrigation engineering, Irrigation systems, Operating costs, Installation costs.
Identifiers: *High frequency irrigation.

Installation and operating costs of irrigation systems are related to system capacity and amount of water applied. If sprinkler systems can be designed for less than usual peak evapotranspiration rates, initial costs will be less. If less water is applied, operating expenses will decrease. Previous work indicated that sugarbeets can be grown satisfactorily under high-frequency deficit irrigation (daily or more often at rates less than evapotranspiration) with soil water supplying part of the irrigation deficit. A field study was conducted, using solid-set sprinklers, with the objective of determining the minimum amount of irrigation water that must be applied during peak use periods to avoid reduction in sugar yields. Treatments involved irrigation each morning at rates equivalent to various proportions of evaporation the previous day from a Class A Weather Bureau pan. The soil indicates that with soils with adequate available waterholding capacity and crops that will tolerate deficit high-frequency irrigation, systems can be designed for less capacity and total water application may be reduced. Soil water will be used to reduce the irrigation deficit. (Skogerboe-Colorado State)
W77-11966

MOISTURE USE EFFICIENCY OF DRYLAND CROPS AS INFLUENCED BY FERTILIZER USE, IV. GRAIN LEGUMES,
Central Arid Zone Research Inst. Jodhpur (India). Dry Farming Research Main Centre.
R. P. Singh, and Y. S. Ramakrishna.
Annals of Arid Zone, Vol 15, No 4, p 285-290, December, 1976. 8 tab, 4 ref.

Descriptors: *Dry farming, *Moisture availability, *Crop response, *Legumes, *Beans, *Fertilization, Rainfall, Fertilizers, Agronomic crops, Crop production, Wheat, Water supply, Consumptive use, Phosphorus, Soybeans, Arid lands, Application methods.
Identifiers: India, Mung beans, Moth beans, Chick peas.

Studies were conducted on the response of various grain legumes to fertilizer use under rainfed conditions at two locations in India. The objective was to study the relative moisture use efficiency of pulse crops as influenced by different levels of phosphorus and different methods of application. Additional experiments were conducted on five grain legumes, both with fertilized and unfertilized treatments, in a low rainfall area of Jodhpur, India. The relative performance of these crops under different rainfall conditions is discussed. The results are presented and show that under Delhi conditions pigeon pea exhibited the highest moisture use efficiency, followed by mung beans. Soybean and chick peas responded to lower doses of fertilizer and to the placement method of fertilizer application, while mung beans responded to higher levels of fertilizer. At Jodhpur mung beans, moth bean and cluster beans exhibited higher moisture use efficiency and responded well to fertilizer application. (Jamail-Arizona)
W77-11987

EFFECT OF IRRIGATION AND FERTILIZE ON YIELD AND QUALITY OF SEED COTTO

(GOSSYPIUM HIRSUTUM L.) IN WESTERN RAJASTHAN,
Central Arid Zone Research Inst. Jodhpur (India).
A. Singh.
Annals of Arid Zone, Vol 16, No 1, March 1977, p 67-72, 2 tab, 1 fig, 2 ref.

Descriptors: *Crop response, *Cotton, *Irrigation effects, *Fertilization, *Soil-water-plant relationships, Fibers(Plant), Arid lands, Application methods, Crop production, Water requirements, Flowering, Seeds, Irrigation, Fertilizers, Irrigation practices.
Identifiers: Short duration cotton, Double cropping, *Rajasthan(India) branching.

A field experiment was conducted for two consecutive seasons in India on a short duration seed cotton in order to obtain information in its response to irrigation and fertilizer application. Yield increased with increasing irrigation. Fertilization application did not significantly increase yield. The best quality cotton fibre was obtained when irrigations were applied at the stages of branching, flowering, and seed formation. (Ullery-Arizona)
W77-11989

METHOD AND TIMING OF NITROGEN APPLICATION IN RAINFED BAJRA,
Central Arid Zone Research Inst. Jodhpur (India).
S. D. Singh.
Annals of Arid Zone, Vol 15, No 4, December, 1976. p 305-312, 1 fig, 2 tab, 5 ref.

Descriptors: *Fertilization, *Fertilizers, *Application methods, *Crop response, *Nitrogen, Foliar application, Timing, Water requirements, Arid lands, Ureas, Leaching, Topsoil, Crop production, Soil-water-plant relationships, Planting management.
Identifiers: Bajra, Rajasthan, *India.

To determine the time and method of applying nitrogen for efficient fertilizer use on hybrid bajra (variety HB3), as well as to determine the optimum dose, field experiments were conducted on a farm at Jodhpur during the rainy seasons from 1968-1970. Treatments of various basal, topdressing, and foliar spray doses of N fertilizer supplied through urea were tested. Results indicated 30 kg/ha of N can be added at sowing and 15 kg later as topdressing during normal rainfall years, or as a spray in moderately dry seasons. In dry seasons only 30 kg/ha basal N without later topdressing is recommended. On light soils under conditions of uncertain rainfall, foliar spray can have some advantages over topdressing. (Ullery-Arizona)
W77-11990

YIELD AND MOISTURE USE PATTERN OF RABI CROPS GROWN UNDER RAINFED CONDITIONS OF EASTERN U.P.,
Banaras Hindus Univ., Varanasi (India). Dryland Agriculture Research Project.
R. A. Singh, O. P. Singh, H. C. Sharma, and M. Singh.
Annals of Ariz Zone, Vol 16, No 1, March 1977. p 1-66, 2 tab, 2 ref.

Descriptors: *Dry farming, *Consumptive use, Soil-water-plant relationships, *Crop production, Crops, Plant growth, Root distribution, Crop response, Water requirements, Arid lands, Barley, Wheat, Agriculture, Soil moisture, Grains(Crops), Legumes.
Identifiers: Linseed, Gram, India.

An investigation was carried out to evaluate grain production of varieties of wheat, barley, gram, and linseed under dryland conditions in eastern Utah Pradesh. Field experiments were conducted during three consecutive rabi seasons. Average grain yield showed gram to be the top yielder, followed by barley, wheat, and linseed. Higher gram yield resulted from its deeper root penetration and longer crop duration. While gram used the most stored soil moisture, barley was the most efficient user of soil moisture. (Ullery-Arizona)
W77-11992

DRIP IRRIGATION OF PEANUTS (ARACHIS HYPOGAEA L.) ON A STUDY SOIL,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
S. Feldman, and A. Hartzook.
Annals of Arid Zone, Vol 15, No 4, p 301-304, December, 1976. 2 fig, 2 tab, 7 ref.

Descriptors: *Irrigation efficiency, *Irrigation systems, *Peanuts, *Crop production, Crop response, Irrigation, Agriculture, Arid lands, Water conservation, Soil types, Loam, Sands, Sprinkler irrigation.
Identifiers: *Israel, *Drip irrigation.

Because of a serious shortage of water for irrigation in Israel, the application of water to agricultural crops using drip irrigation has become widespread. This study evaluates the effect of two drip irrigation rates on the yield and quality of peanuts grown on a sandy loam soil in the southwestern region of the northern Negev desert in Israel. Experiments were conducted and the results presented show that a significant saving in water application by the drip method could be obtained without lowering yields. Since peanuts are produced extensively in Israel and there is a demand on the world market for the high quality produced there, the drip irrigation method merits further investigation in terms of water savings, weed and disease control, and labor efficiency. (Jamail-Arizona)
W77-11995

AGRICULTURAL RESPONSE TO CHANGING WATER PRICES IN ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6C.
W77-11997

A NOTE ON THE IRRIGATION AND FERTILITY LEVELS ON THE YIELD AND NUTRIENT UPTAKE OF DWARF BARLEY CULTIVAR RDB-1,
Udaipur Univ. (India). Dept. of Agronomy.
M. R. Bajpai, and H. S. Mertia.
Annals of Arid Zone, Vol 16, No 1, March, 1977, p 153-156, 3 tab.

Descriptors: *Irrigation effects, *Fertilization, *Nutrient requirements, *Irrigation, *Soil-water plant relationships, *Barley, Crop production, Crop response, Grains(Crops), Nitrogen, Nutrients, Arid lands, Fertilizers.
Identifiers: *Nutrient uptake, Dwarf barley cultivar RDB-1.

A field experiment was conducted on a dwarf cultivar of barley with irrigation at 20, 35, and 50% ASM and nitrogen levels at 30, 60, 90, and 120 kg/ha alone and with 40 kg/ha each of P and K. The grain, straw, and dry matter yield all decreased with decreasing irrigation levels. Uptake of N, P205, and K20 increased with higher irrigation levels. Irrigation at 50% ASM produced significantly higher grain yield. Significant differences in straw yield, but not grain yield, were noted between 35 and 20% ASM treatments. Significant differences in grain and straw yields were found for increasing levels of nitrogen to 90 kg/ha, but a reduction in grain yield occurred between 90 and 120 kgN/ha. With increasing levels of nitrogen, applications of PK increased straw and grain yields. Nutrient uptake followed a trend similar to that of production, increasing up to 90 kg/ha level of nitrogen, increasing with the application of PK, and decreasing uptake with the highest dose of 120 kgN/ha with or without PK. Maximum yield and nutrient uptake were recorded with the treatment combination of 50% ASM with 90 kgN/ha supplemented with PK. (Ullery-Arizona)
W77-12002

NOTE ON DIVERGENCE IN SOME VARIETIES OF WHEAT GROWN UNDER RAIN-FED CONDITION,
Indian Agricultural Research Inst., New Delhi. Div. of Genetics.
S. P. Yadav, J. R. Sharma, N. N. Roy, and O. P. Jain.
Indian Journal of Agricultural Sciences, Vol 44, No 11, p 778-780, November 1974. 1 tab, 4 ref.

Descriptors: *Plant morphology, *Crop response, *Wheat, *Plant growth, *Soil-water-plant relationships, *Variability, Height, Planting management, Moisture stress, Plant breeding, Flowering, Plant physiology, Crop production, Genetics.
Identifiers: *Divergence, Clusters.

A study was conducted to evaluate the relative degree of divergence under changes from irrigated to rain-fed conditions in 32 new strains of wheat in 3 height categories (tall and D and D2 semi-dwarfs), using Mahalanobis's D3 statistic. The D3 values representing divergence among any 2 varieties taken for all morphological character combined ranged from 5.45 between 'Chhoti Lerma' and 'HD 1493' to 1257.40 between 'HD 1669' and 'HD 1570', indicating substantial diversity in the material. The 32 strains were grouped into 13 clusters, with the pedigree relationship of genotypes having little influence on clustering pattern. Intra-cluster divergence is described; inter-cluster divergence ranged from 6.9 to 33.9. The alleles for flowering duration and height had considerable influence on the clustering pattern. No genotypes with different flowering periods or plant heights were under the same group, but those with the same flowering duration often formed more than one cluster. Results indicate considerable variability between and within groups for flowering time (early, medium and late) and plant height; thus, breeding procedure is more responsible for divergence than is pedigree relationship. Crosses between certain varieties might improve yield components and seedling characteristics desirable for conditons of moisture stress. (Jahns-Arizona)
W77-12004

CHANGES IN TOTAL N, ORGANIC MATTER, AVAILABLE P, AND BULK DENSITIES OF A CULTIVATED SOIL 8 YEARS AFTER TAME PASTURES WERE ESTABLISHED,
South Dakota State Univ., Brookings. Dept. of Plant Sciences.
E. M. White, C. R. Krueger, and R. A. Moore.
Agronomy Journal, Vol. 68, No. 4, p 581-583, July-August 1976. 2 tab, 9 ref.

Descriptors: *Nitrogen, *Organic matter, *Phosphorus, *Bulk density, *Soil investigations, *South Dakota, Pastures, Alfalfa.

Cultivated Williams loam soils in north-central South Dakota were sampled after pastures were established and 8 years later so that the effect of the pastures on soils could be studied from analysis in the laboratory. Pastures were seeded to Russian wildrye, crested wheatgrass, or a mixture of smooth bromegrass, intermediate wheatgrass, and a pasture alfalfa. Soil N and bulk densities increased as available P decreased in the 8 years. The soil organic matter increased under all pastures, but it was small. The increases in organic matter, decreases in available P, and increases in saturated-clod bulk densities were different in the various pastures. Total N and organic matter increased about 0.001 and 0.02% per year, respectively, which is slower than the rate of decrease caused by cultivating the original grassland soils. (Skogerboe-Colorado State)
W77-12115

EVALUATION OF AN ELECTRONIC FOLIOMETER TO MEASURE LEAF AREA IN CORN AND SOYBEANS,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 7B.
W77-12118

A SYSTEM AND PROGRAM FOR MONITORING CO2 CONCENTRATION, GRADIENT, AND FLUX IN AN AGRICULTURAL REGION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W77-12120

YIELD AND NITROGEN UTILIZATION BY RICE AS AFFECTED BY METHOD AND TIME OF APPLICATION OF LABELLED NITROGEN,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
K. R. Reddy, and W. H. Patrick, Jr.
Agronomy Journal, Vol 68, No 6, p 965-969, November-December 1976. 1 fig, 6 tab, 20 ref.

Descriptors: *Nitrogen, Fertilization, Nutrients, Fertilizers, *Rice, Crop response, *Crop production.
Identifiers: Ammonium sulfate, Rice production.

Recent increases in the cost of N fertilizer make it important to examine methods of improving the utilization of fertilizer N by lowland rice. The objective of the present investigations was to compare the effects of different methods and times of N application on yield and utilization of N by lowland rice. Field experiments using labelled fertilizer N were carried out during 1974 and 1975 utilizing different times and methods of application of ammonium sulfate on small field plots. Fertilizer N was applied either by deep placement at the beginning of the season or at one or more times during the growing season as surface application. Relative contributions of native soil N and fertilizer N sources to plant uptake were followed during the growing season, and total uptake of native soil N and fertilizer N by rice was determined at harvest. (Skogerboe-Colorado State)
W77-12121

COMPARISON OF SIMULATED AND MEASURED NITROGEN ACCUMULATION IN BURLEY TOBACCO,
Texas Tech Univ., Lubbock. Dept. of Agronomy.
R. E. Zartman, R. E. Phillips, and J. E. Leggett.
Agronomy Journal, Vol 68, No 2, p 406-410, March-April 1976. 4 tab, 13 ref.

Descriptors: Fertilizers, *Fertilization, *Nitrogen, *Tobacco, Nutrients, *Simulaton analysis, Model studies, Root development.

Efficient utilization of N fertilizers by plants is important for scientific, economic, and environmental reasons. The objectives of this experiment were (1) to experimentally evaluate the simultaneous mass flow and diffusion of NO3(-)N to tobacco roots and (2) to compare the calculated accumulation of N in tobacco, the root of which was assumed to be a perfect sink for NO3(-)N (Model I), or flux of NO3(-)N into the root which was assumed to be proportional to concentration of NO3(-)N at the root surface (Model II), to measured accumulation of N in Burley tobacco grown under field conditions. Model I overestimated accumulation of N an average of 52%. Model II underestimated accumulation an average of 26%. The proportionality constant, k, assumed by Model II, was found to be 4.27 times 10 to the minus 7th power sq cm sec-1 throughout the growing season, except when moderate plant water stress was experienced by the plant. The data show that the accumulation of N by Burley tobacco was proportional to the concentration of NO3(-)N in the soil solution. (Skogerboe-Colorado State)
W77-12122

SPRINKLER APPLICATION OF P AND ZN FERTILIZERS,
Nebraska Univ., North Platte. Dept. of Agronomy.
G. W. Hergert, and J. O. Reuss.
Agronomy Journal, Vol 68, No 1, p 5-8, January-February 1976. 2 fig, 7 tab, 9 ref.

Descriptors: *Phosphorus, *Zinc, *Fertilizers, Fertilization, Nutrients, *Sprinkler irrigation, Irrigation practices, Irrigation water, *Corn(Field).

The rapid development of sprinkler irrigation in the Great Plains has stimulated interest in applying fertilizers in sprinkler irrigation water. Sprinkler application and conventional preplant application effects of P and Zn fertilizers on the dry matter yield, nutrient content, and grain yield of corn were compared in 1968 and 1969. Both years preplant P treatments produced a significantly higher dry matter yield during the first 5 weeks of the growing season. No significant difference existed between P treatments after this time. In 1969 plants which received preplant P and Zn contained slightly higher concentrations of P and Zn than the plants which received sprinkler P and Zn. Grain yields were significantly increased by Zn application in 1968 but not in 1969. In 1968 on a Nunn clay loam soil the sprinkler-applied P did not move below a 4-5 cm depth. On a Haxtun loamy sand in 1969 sprinkler-applied P moved to a depth of approximately 18 cm. Sprinkler-applied Zn moved to a maximum depth of 5 cm on both soils. (Skogerboe-Colorado State)
W77-12123

CORN GROWTH AS AFFECTED BY AMMONIUM VS. NITRATE ABSORBED FROM SOIL,
Potash Inst., Columbia, Mo. Dept. of Agronomy.
D. W. Dibb, and L. F. Welch.
Agronomy Journal, Vol 68, No 1, p 89-93, January-February 1976. 1 fig, 8 tab, 14 ref.

Descriptors: *Ammonium, *Nitrates, *Corn(Field), Crop response, Leaching, Denitrification, Greenhouse experiments, *Absorption.

The effect of NH4 on corn growth in a soil medium is of interest because of the possibility of significantly decreasing leaching and denitrification losses of applied N by preserving N in the NH4 form. The objective of this investigation was to determine growth and nutrient content of corn plants when the principal form of N was either NH4 or NO3. Corn, grown in the greenhouse in a soil medium, was allowed to absorb N as either NH4 or NO3. A chemical nitrification inhibitor and different souces of added N were used to manipulate the form of N available for absorption. The maximum amount of N absorbed as NO3 was estimated as the difference between the NO3 content of fallow and cropped pots at harvest. Plants estimated to have absorbed at least 95% of their N as NH4. (Skogerboe-Colorado State)
W77-12124

SUGARBEET YIELD AND QUALITY AS AFFECTED BY NITROGEN LEVEL,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
J. N. Carter, D. T. Westermann, and M. E. Jensen.
Agronomy Journal, Vol 68, No 1, p 49-55, January-February 1976. 5 fig, 4 tab, 15 ref.

Descriptors: *Sugar beets, *Nitrogen, Nutrients, *Fertilizers, Fertilization, Crop response, Idaho, Crop production.

This study was conducted, under several climatic and soil conditions, to determine the effect of N level on sugarbeet yield and quality and to further develop and refine both soil and tissue test methods for predicting N fertilizer needs for efficient refined sucrose production. Previous studies indicate that N fertilizer needs for maximum sucrose production may be predicted by considering yield potential and all N sources. Sugarbeets were grown under field conditions at N fertilizer levels varying from 0 to 448 kg n/ha on six sites throughout southern Idaho to determine root yield, sucrose percentages, sucrose yield, impurity index, and plant N uptake in relation to the residual NO3(-)N, mineralizable N, fertilizer N, and petiole NO3(-)N. These experiments demonstrated that the N fertilizer needs of sugarbeets can be determined by relating the root yield potential to the masured residual NO3(-)N plus a measured or estimated mineralizable N level for an area. Optimum N level from all available soil and fertilizer sources has been found to vary between 5 to 6 kg/metric ton of beet roots produced. (Skogerboe-Colorado State)
W77-12125

IRRIGATION SCHEDULES FOR SUGARBEETS ON MEDIUM AND COARSE TEXTURED SOILS IN THE NORTHERN GREAT PLAINS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
D. K. Cassel, and A. Bauer.
Agronomy Journal, Vol 68, No 1, p 45-48, January-February 1976. 1 fig, 3 tab, 5 ref.

Descriptors: *Sugar beets, Soils, Soil investigations, Soil water, Soil moisture, Irrigation, Irrigation water, Tensiometers, *North Dakota, Great Plains.
Identifiers: *Irrigation scheduling.

An increase in the access to irrigation water in the Northern Great Plains is effecting large increases in the acreages of soils being irrigated. Much of this water is being applied to medium to coarse-textured soils which hold a maximum of 7 to 12 cm of available water in a 152 cm deep profile. An investigation was conducted in the field to devise a system, using tensiometers, to schedule the application of irrigation water to sugarbeets growing on these soils. Tensiometers were installed at various soil depths, and irrigation water was applied with a small plot irrigator when soil moisture tension reached a predetermined level. One tensiometer located at the 45 cm depth was equally effective in scheduling as two tensiometers, one positioned at a depth of 30 and one at 61 cm. Maximum crude sugar yields of 8.4 to 8.8 metric tons/ha were obtained in 1971 and 1973, respectively. Total water use efficiency was 0.15 to 0.16 metric tons of crude sugar/ha per cm. The maximum irrigation water use efficiencies were 0.32 and 0.36 for 1971 and 1973, respectively. It is concluded that 56 to 62 cm of water, well distributed throughout the growing season, is sufficient for sugarbeet production in southeastern North Dakota in a year of normal growing season temperatures. (Skogerboe-Colorado State)
W77-12126

NITROGEN RELEASE FROM ISOBUTYLIDENE DIUREA: SOIL PH AND FERTILIZER PARTICLE SIZE EFFECTS,
Illinois Univ. at Urbana-Champaign. Dept. of Horticulture.
T. D. Hughes.
Agronomy Journal, Vol 68, No 1, p 103-106, January-February 1976. 6 fig, 6 ref.

Descriptors: Nitrogen, Nutrients, Fertilizers, Fertilization, Soil moisture, Soil properties, Soil investigations, *Ureas, Nitrification.
Identifiers: *Nitrogen release(Soil).

Soil-isobutylidene diurea (IBDU) mixtures were incubated to determine the effects of soil pH and IBDU particle size on N release patterns. Such information is needed for predicting rates and frequencies of application. All incubations were conducted at a temperature of 21 plus or minus 0.5C and 28 plus or minus 2% soil moisture. Evidence was obtained for excluding urea-N concentrations from calculations of N recovery, but all recoveries were based on concentrations of

(NH(+)4 + NO(-)3)(-)N. Nitrogen release patterns from 0.7 to 0.8 mm IBDU particles in soil at initial pH's of 5.7, 6.8, and 7.7 were determined. After four weeks of incubation, the amount of N released was equivalent to one-third of the IBDU-N for soil at pH 5.7, however, lesser amounts were released in soil at pH's 6.8 and 7.7. Differences in N release were due to differences in NH(+)4(-)N concentrations, whereas concentrations of NO(-)3(-)N were not related to soil pH throughout the 10-week incubation period. (Skogerboe-Colorado State)
W77-12127

NUTRIENT UPTAKE BY RUSSET BURBANK POTATOES AS INFLUENCED BY FERTILIZATION,
Oregon State Univ., Corvallis. Dept. of Soil Science.
T. L. Jackson, and G. E. Carter.
Agronomy Journal, Vol 68, No 1, p 9-12, January-February 1976. 5 tab, 11 ref.

Descriptors: Nutrients, Fertilizers, *Fertilization, *Potatoes, *Zinc, *Manganese, Oregon.

Zinc and Mn deficiencies have been observed frequently in potatoes grown on eastern Oregon soils developed under arid conditions. The study was designed to evaluate effects of band and broadcast applications of ammonium sulfate (AS) and monocalcium phosphate (MCP) on yield and uptake of P, Zn, and Mn by Russet Burbank potatoes grown on calcareous mineral soil deficient in N, P, Zn, and Mn. Potatoes were grown under field conditions, harvested and evaluated. Fertilizer treatments were broadcast before planting and rototilled or banded at planting. Petiole samples to identify nutrient concentrations were taken when tubers were 2 cm in diameter. Whole plants were harvested 3 weeks later to measure nutrient uptake. Petiole concentrations and plant uptake of both Zn and Mn were greater when AS was banded than when broadcast, with or without band applications of Zn and Mn. (Skogerboe-Colorado State)
W77-12128

RESPONSES OF THREE PEANUT CULTIVARS TO GYPSUM,
Georgia Coastal Experiment Station, Tifton. Dept. of Agronomy.
M. E. Walker, T. C. Keisling, and J. S. Dresler.
Agronomy Journal, Vol 68, No 3, p 527-528, May-June 1976. 2 tab, 12 ref.

Descriptors: *Peanuts, Calcium, *Gypsum, Crop response, Soil investigations, Nitrogen.

The differential response of peanut cultivars to soil applications of Ca has been established for many years. Recent research reports, however, have indicated that peanut cultivars respond similarly to Ca application. This may result in part from new peanut cultivars differing in their response to Ca. Experiments were therefore conducted on a low Ca soil to measure responses of three commonly grown peanut cultivars to soil-applied Ca. Results from this experiment show that gypsum had no effect on yield or sound mature kernels of Florunner peanuts. Florunner peanuts produced higher yields and grades than Florigiant or NC-Fla 14, regardless of treatments. Gypsum application to Florigiant and NC-Fla 14 peanuts increased yields, sound mature kernels, and extra large kernels. In general, gypsum increased the % oil in all cultivars. Florigiant contained less oil than the other cultivars. Nitrogen content of the seed of all cultivars was reduced by gypsum application. These data indicate that on low Ca soils Florunner peanuts can produce higher yields and quality with or without gypsum, while Florigiant and NC-Fla 14 need gypsum fertilization to increase yield and improve quality. (Skogerboe-Colorado State)
W77-12129

NITROGEN AVAILABILITY TO WHEAT AS AFFECTED BY DEPTH OF NITROGEN PLACEMENT,
Nebraska Univ. Panhandle Station at Scottsbluff.
L. A. Daigger, and D. H. Sander.
Agronomy Journal, Vol 68, No 3, p 524-526, May-June 1976. 4 fig, 10 ref.

Descriptors: *Nitrogen, *Wheat, Fertilization, Fertilizers, Crop production, Nebraska, Soil moisture.

The availability of residual N in the root zone greatly influences the amount of N fertilizer required to optimize winter wheat yields. In order to determine the availability of N at different depths in the root zone, an N placement study was conducted in the field on two soils in western Nebraska, a deep alluvial fine sandy loam and a loess-derived silt loam. Ammonium nitrate was placed on the soil surface and at depths of 30, 60, 90, 120, and 150 cm. Wheat plants were harvested six times during the spring growing season to determine N uptake. Soil moisture was at field capacity in the spring when experiments were established. While N uptake tended to decrease as the depth of N application increased, total dry matter production was not affected by depth of N placement. Wheat plants easily obtained N placed at depths up to 150 cm. The results indicate winter wheat roots are mostly established during the fall growing season and are in a position to provide N early in the spring for rapid above ground growth. (Skogerboe-Colorado State)
W77-12130

DEFOLIATION AND FERTILIZER NITROGEN EFFECTS ON NITRATE-NITROGEN PROFILES IN MAIZE,
Minnesota Univ., St. Paul. Dept. of Agronomy and Plant Genetics.
D. R. Hicks, and R. H. Peterson.
Agronomy Journal, Vol 68, No 3, p 476-478, May-June 1976. 3 fig, 10 ref.

Descriptors: *Corn(Field), Hail, *Nitrates, *Nitrogen, Fertilization.

Corn vegetative tissue remaining after hail damage is often utilized for forage. Environmental stresses may cause levels of nitrate-nitrogen in plant tissue that are toxic to ruminants. This study was conducted to determine the effect of leaf blade removal (simulated hail damage) and N fertilization of the soil on the NO-3-N profile of corn fodder. Leaf blade removal of 0, 50, 100% was imposed at tasseling on the corn hybrid 'Dekalb XL45A' grown in soil fertilized with either 115 or 230 kg N/ha. Plants were sampled approximately weekly for 6 weeks after defoliation. (Skogerboe-Colorado State)
W77-12131

EVALUATION OF SULFUR-COATED UREA (SCU) APPLIED TO IRRIGATED POTATOES AND CORN,
Wisconsin Univ., Madison. Dept. of Soil Science.
E. A. Liegel, and L. M. Walsh.
Agronomy Journal, Vol 68, No 3, p 457-463, May-June 1976. 4 fig, 5 tab, 9 ref.

Descriptors: *Potatoes, *Corn(Field), Nitrogen, Fertilizers, Fertilization, Wisconsin, Leaching, Irrigation, Irrigation effects, *Ureas.

Excessive rates of soluble N fertilizers are sometimes used on irrigated sands in Central Wisconsin to compensate for loss of some of the applied N by leaching. Use of a slow-release form of N or several small applications of a soluble N fertilizer may eliminate some leaching and subsequent loss of NO3-N. This study was designed to evaluate these methods of reducing N losses by measuring yield and recovery of applied N by potato tubers and corn grain. Supplemental N treatments applied each year for 3 years were as follows: (1) urea in a single or split application, (2) SCU impregnated with a wax coating, and (3) SCU with only a sulfur coating. (Skogerboe-Colorado State)
W77-12132

SALT TOLERANCE OF PROSTRATE SUMMER CYPRESS (KOCHIA PROSTRATA),
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.
W77-12133

SEED COATING, PRECISION PLANTING, AND SPRINKLER IRRIGATION FOR OPTIMUM STAND ESTABLISHMENT,
California Univ., Davis. Dept. of Water Science and Engineering.
F. E. Robinson, and K. S. Mayberry.
Agronomy Journal, Vol 68, No 4, p 694-695, July-August 1976. 2 tab, 7 ref.

Descriptors: Lettuce, Sugar beets, *Sprinkler irrigation, Germination, Carrots, Onions, Seeds, Irrigation effects, Irrigation practices, *Crop production.
Identifiers: *Seedling.

The legal prohibition of the short handled hoe in California has forced a change in the conventional practice of surplus-seedling and subsequent thinning to achieve optimum stands with lettuce and sugar beet crops. Precision placement of coated seed was evaluated as an alternate method of stand establishment with five crops grown on Meloland sandy clay loam with sprinkler irrigation. Germination was compared to emergence of coated seed. Emergence was: carrot 86%, onion 85%, and sugar beet 71%. Single lettuce seeds 38 cm apart had 89% stand, paired seeds 2.5 cm apart on 38 cm intervals and thinned had 97%. (Skogerboe-Colorado State)
W77-12134

SOIL WATER DEPLETION--YIELD RELATIONSHIPS OF IRRIGATED SORGHUM, WHEAT, AND SOYBEANS,
Southwestern Great Plains Research Center, Bushland, Tex.
J. T. Musick, L. L. New, and D. A. Dusek.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 489-493, Spcial Edition 1976. 4 fig, 11 ref.

Descriptors: *Soil water, *Soil moisture, Irrigation, Irrigation effects, *Grain sorghum, *Wheat, *Soybeans, Irrigation practices.
Identifiers: Irrigation scheduling, *Soil water depletion.

Approximately 4 billion cu m of groundwater is pumped annually to irrigate sorghum, wheat and soybeans grown in the fine-textured soils of the Southern High Plains. Declining groundwater storage and the high costs of pumping necessitate that water be applied only when it is needed to prevent appreciable yield reductions. Relationships between soil water depltion and grain yields provide a rational basis for scheduling irrigations based on soil water in the major root zone. (Skogerboe-Colorado State)
W77-12137

SCHEDULING CENTER PIVOT SPRINKLER IRRIGATION SYSTEMS FOR CORN PRODUCTION IN EASTERN COLORADO,
Agricultural Research Service, Fort Collins, Colo.
D. F. Heermann, H. R. Haise, and R. H. Mickelson.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 284-287, Special Edition 1976. 6 fig, 1 tab, 2 ref.

Descriptors: Scheduling, Irrigation systems, *Sprinkler irrigation, Irrigation, *Corn(Field), Colorado, Soil moisture, *Crop production.

Identifiers: *Center pivot irrigation, *Irrigation scheduling.

The United States Department of Agriculture irrigation Scheduling Program was modified to provide multiple irrigation forecast dates for use with center pivot sprinkler irrigation systems. Four Eastern Colorado cooperators used the program and developed confidence in the computer output mailed to them weekly. Each cooperator used the information slightly differently. Some cooperators started the irrigation system at the earliest recommended date, whereas others started their systems between the 'start' and 'no later than' date. The two dates provided (a) the 'start' date when the soil water depletion was equal to the irrigation depth, and (b) the 'no later than' date when the system must be started so as not to deplete 50 percent of the available soil water at any location in the field. The cooperator who participated for 3 years reported that his yields had definitely increased due to the scheduling program. Thus, the scheduling program certainly can be beneficial to center pivot irrigation by increasing yields and conserving energy, water and fertilizer (in the deep percolation). (Skogerboe-Colorado State)
W77-12138

USE OF K-4 POLYMER IN INCREASING ANTIEROSIVE SOIL STABILITY IN IRRIGATION FURROWS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Melioration.
M. S. Kuznetsov, V. Ya. Grigor'ev, K. P. Paganyas, and R. Saatov.
Biol Nauki (Mosc) 19(1), p 131-134, 1976.

Descriptors: *Polymers, *Irrigation, *Cotton, *Water consumption, *Soil erosion.
Identifiers: *K-4 polymer.

Spraying of gray-soil irrigation furrows in cotton fields with K-4 polymer in aqueous solution in doses of 20 and 40 kg/ha increased the permissible water consumption by 5-9 and 6-12 times, respectively, according to erosion conditions. The effectiveness of the preparation increased with a decrease in the slope in the 0.04-0.01 range. The permissible water consumption was 1.1-1.6 times higher for 40 kg/ha than for 20 kg/ha; however, the effectiveness per preparation unit was significantly lower for the higher dose. The 20 kg/ha dose was recommended for industrial use.—Copyright 1977, Biological Abstracts, Inc.
W77-12153

A NEW APPROACH FOR ESTIMATING IRRIGATION CONVEYANCE LOSSES AND THEIR ECONOMIC EVALUATION,
Escuela Nacional de Agricultura, Chapingo (Mexico). Colegio de Postgraduados.
E. V. Palacios, and J. C. Day.
Water Resources Bulletin, Vol. 13, No. 4, p 709-719, August 1977. 1 tab, 2 fig, 5 ref.

Descriptors: *Irrigation systems, *Canals, *Economic feasibility, Methodology, Irrigation districts, Mexico, Statistical methods, Water management(Applied), Networks, Flow, Costs, Benefits, Estimating, Evaluation, Water supply, Water delivery, Regression analysis, Equations, Mathematical models, Systems analysis.
Identifiers: *Conveyance efficiency, *Operating rules, Linear model, Conveyance losses, Operational losses, Shadow prices, Lining canals, Water releases, Operational efficiency.

A new methodology for estimating conveyance efficiency within irrigation systems is presented. Based on statistical analysis of daily water releases from the source of supply and deliveries to the farmers in an irrigation district in Mexico, a linear model is obtained for estimating conveyance efficiency and two component factors. One of these factors points out the relative importance of the operational losses (i.e., losses due to water management), and the other shows the importance of the fixed losses which can be attributed to the average flow through the canal network without variations. Next, an analysis of the expected benefits and costs accruing from system improvement permits derivation of a decision rule which may be used in analyzing the economic feasibility of lining in-place canals. Results show that conveyance efficiency may be significantly increased by improving the operating rules in an irrigation system, this being the cheapest way of attaining the improvement. However, since many variable factors may affect the economic feasibility of lining canals, careful studies should be made regarding infiltration rate measurements, cost of lining, days of effective operation per year of each canal, etc., before making decisions regarding the lining of the canal in question. (Bell-Cornell)
W77-12164

CHLORIDE ACCUMULATION NEAR CORN ROOTS UNDER DIFFERENT TRANSPIRATION, SOIL MOISTURE, AND SOIL SALINITY REGIMES,
Punjab Agricultural Univ., Ludhiana (India). Coll. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-12171

NITROGEN ACCUMULATION AND TRANSLOCATION IN CORN GENOTYPES FOLLOWING SILKING.
Guelph Univ. (Ontario). Dept. of Soil Science.
E. G. Beauchamp, L. W. Kannenberg, and R. B. Hunter.
Agronomy Journal, Vol. 68, No. 2, p 418-422, March-April 1976. 3 fig, 5 tab, 6 ref.

Descriptors: *Nitrogen, Fertilizers, *Fertilization, Nutrients, Corn(Field), Crop response, Crop production.
Identifiers: *Nitrogen translocation(Corn).

The potential for improvement of N utilization in corn can depend on the existence of genotypic differences. Accordingly studies were conducted to determine if N translocation from the leaves and stalk to the car during the period immediately following silking depended on the genotype. In 1970, the N concentration of individual leaf blades, stalk, and developing ears of four inbreds was determined at the silking stage and 14 and 28 days after silking. In a similar experiment in 1971, using bulked leaf blade samples, three of the inbreds plus their Fl hybrids were analyzed for N at silking and 24 days after silking. In 1970, the apparent translocation of N from individual leaf blades differed considerably depending on the inbred. Significant differences in N concentration in either the stalks or developing ears occurred among genotypes in 1970 and 1971. Appreciable differences were found in the apparent propensity of the inbreds to translocate N to the developing ear. In 1970, apparent N translocation during the 14 to 28 day period was greater than during the first 14 days following silking. The inbreds differed between years with respect to apparent N translocation suggesting a genotype times environment interaction. (Skogerboe-Colorado State)
W77-12174

FIELD STUDIES OF THE CONDUCTANCE OF WHEAT LEAVES AND TRANSPIRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
O. T. Denmead, and B. D. Millar.
Agronomy Journal, Vol. 68, No. 2, p 307-311, March-April 1976. 4 fig, 9 ref.

Descriptors: *Wheat, *Transpiration, Stomata, *Leaves.
Identifiers: Water potentials, Leaf conductance, Canopy transpiration.

Light and water stress appear to be the main factors determining the short-term variation of stomatal aperture in the field but their joint influences have seldom been studied in the natural environment. We have examined the effects of the irradiances and water potentials of leaves of field-grown wheat plants on their conductances for water vapor and on canopy transpiration. Water potentials were measured by thermocouple psychrometry or estimated from water flow rates and plant resistances. Conductances were measured with a diffusion porometer or calculated from meteorological measurements inside the canopy. The latter data also permitted calculation of leaf irradiances and transpiration rates. (Skogerboe-Colorado State)
W77-12175

NITRATE-N AND TOTAL N CONCENTRATION RELATIONSHIPS IN SEVERAL PLANT SPECIES,
National Fertilizer Development Center, Muscle Shoals, Ala.
G. L. Terman, J. C. Noggle, and C. M. Hunt.
Agronomy Journal, Vol. 68, No. 4, p 556-560, July-August 1976. 5 fig, 2 tab, 9 ref.

Descriptors: *Nitrates, *Nitrogen, Nutrients, Greenhouse experiments, Corn(Field), Phosphorus, Potassium, Crop response.
Identifiers: *Nitrate-nitrogen.

Accumulation of NO3-N in plants is important in regard to plant N nutritional status, in the formation of NO2-N toxic to animals and people consuming the plants, and as a producer of lethal gas in silos. This paper describes relationships between NO3-N and total N concentrations in plants grown in several greenhouse pot experiments, as affected largely by response to applied N and by continuing growth. Corn was grown in soil with 200 to 800 mg of N/pot and in nutrient solutions with 2 to 16 ppm of N. Both crops were harvested at 4-day intervals. Spinach and mustard were grown in soil with several rates of N, P, and K, and tall fescue with 1.0 and 2.0 g of N/pot. (Skogerboe-Colorado State)
W77-12176

DIFFUSION AND MASS FLOW OF NITRATE-NITROGEN INTO CORN ROOTS GROWN UNDER FIELD CONDITIONS,
Ministry of Agriculture, Bangkok (Thailand). Dept. of Agronomy.
T. NaNagara, R. E. Phillips, and J. E. Leggett.
Agronomy Journal, Vol. 68, No. 1, p 67-72, January-February 1976. 4 fig, 3 tab, 10 ref.

Descriptors: *Nitrogen, *Nitrates, *Corn(Field), Crop response, Nutrients, Fertilizers, Fertilization, *Mass flow, Model studies, *Diffusion, *Root zone.

Nitrate-nitrogen, the most important source of N of non-leguminous plants, is soluble in soil water and is transported to plant roots by both mass flow and diffusion. It is, therefore, important to evaluate the relative importance of each of these two mechanisms of transport of NO3(-)N to plant roots and the environmental conditions under which each is the dominant mechanism of transport. The objective of this paper was to present measurements of plant and soil parameters necessary for estimating accumulation of N grown under field conditions with the use of a theoretical model and to compare estimates of accumulation of N in the corn plant with measured accumulation in the plant. (Skogerboe-Colorado State)
W77-12177

SUBSOIL CHISELING AND SLIP PLOWING EFFECTS ON SOIL PROPERTIES AND WHEAT GROWN ON A STRATIFIED FINE SANDY SOIL,
Agricultural Research Service, Brawley, Calif. Dept. of Soil Science.

For primary bibliographic entry see Field 2G.
W77-12178

SOIL PHYSICAL CONDITIONS AFFECTING RICE ROOT GROWTH: BULK DENSITY AND SUBMERGED SOIL TEMPERATURE REGIME EFFECTS,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W77-12179

COMPATIBLE SEDIMENT CONTROL PRACTICES AND TILLAGE SYSTEMS,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W77-12181

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

ROOF DRAINAGE OF LARGE BUILDINGS IN SOUTH AFRICA,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 3B.
W77-11555

ANALYSIS OF THE TEMPORAL BEHAVIOUR OF THE LEVEL OF LAKE MALAWI,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Geography and Environmental Science.
For primary bibliographic entry see Field 2H.
W77-11565

ADEQUACY OF DREDGING METHODS AND EQUIPMENT IN THE UNITED STATES FOR MAINTENANCE OF NAVIGABLE WATERS,
American Society of Civil Engineers, New York. Committee on Waterways of the Waterway, Port, Coastal and Ocean Div.
For primary bibliographic entry see Field 8G.
W77-11595

A METHOD OF ESTIMATING THE PROBABILITY OF OCCURRENCE OF SNOW WATER EQUIVALENTS IN THE UNITED KINGDOM,
British Meteorological Office, Bracknell (England).
M. C. Jackson.
Hydrological Sciences Bulletin, Vol. 22, No. 1, p 127-142, March 1977. 9 fig, 4 tab, 19 ref, 1 append.

Descriptors: *Probability, *Estimating, *Snow, Snowmelt, Snow cover, Water measurement, Meteorology, Hydrology, Water, Mathematical studies, Water management(Applied), Foreign countries, Foreign research.
Identifiers: *Snow water equivalents, *United Kingdom, Guides.

A simple guide (shown in an appendix) was produced, which enables a water manager or engineer to make an estimate of statistics of water equivalent snow cover for return periods between 5 and 100 years for most places in the United Kingdom. The paper described how the guide was produced. The methods described should be of help to both meteorologists and hydrologists in temperate countries with similar snow questions. (Roberts-ISWS)
W77-11601

MODEL OF THE DISTURBANCES IN HYDROLOGICAL SEQUENCES BASED ON THE METHOD OF DEMODULATION,
Karlova Universita, Prague (Czechoslovakia).
For primary bibliographic entry see Field 2E.
W77-11602

A STOCHASTIC MODEL FOR THE SIMULATION OF DAILY FLOWS,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 2E.
W77-11603

THE MONTE CARLO APPROACH TO OPTIMIZATION OF THE OPERATION RULES FOR A SYSTEM OF STORAGE RESERVOIRS,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
J. Kindler.
Hydrological Sciences Bulletin, Vol. 22, No. 1, p 203-214, March 1977. 6 fig, 9 ref.

Descriptors: *Monte Carlo method, *Reservoir storage, *Resource allocation, *Reservoir operation, Systems analysis, Model studies, Mathematical models, Water resources, Hydrology, Simulation analysis.
Identifiers: Optimal policy.

Development of a method which enables formulation of reservoir operation rules in a multi-reservoir water resources system was described. The method consists of three major steps: (1) development of a mathematical model of a multivariate (time and space) river flow process and generation of a synthetic input to the system, (2) development of a mathematical model of a water resources system and the simulation of its operation over the whole period of synthetic inflows (simulation coupled with one of the mathematical programming techniques), and (3) statistical analysis of the results of the simulation-optimization computations. Consecutive implementation of all steps leads to the formulation of the operation rules for all the reservoirs in the system. (Lee-ISWS)
W77-11604

STUDIES ON DRAINAGE WATER OF BEHIRA GOVERNORATE: THE SUITABILITY OF EL-KHYRI GROUP DRAINS,
Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
For primary bibliographic entry see Field 3C.
W77-11634

REMOTE SENSING OF WATER DEMAND INFORMATION,
California Univ., Santa Barbara. Dept. of Geography.
For primary bibliographic entry see Field 6D.
W77-11635

THE APPLICATION OF TECHNOLOGY IN DEVELOPING COUNTRIES.
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6B.
W77-11637

DUAL TECHNOLOGICAL SYSTEMS IN WATER AND GRAIN STORAGE,
Wunderman Foundation, New York.
For primary bibliographic entry see Field 6B.
W77-11638

REMOTE SENSING AND DEVELOPING COUNTRIES: POTENTIAL AND PROBLEMS IN THE TRANSFER OF TECHNOLOGY,
Clark Univ., Worcester, Mass. Graduate School of Geography.
For primary bibliographic entry see Field 6B.
W77-11639

PLANNING FOR URBAN STORMWATER CONTROL,
Fell, Brusso, Bruton, and Knowles, Inc., Tulsa, Okla.
For primary bibliographic entry see Field 5G.
W77-11669

ENGINEERING ANALYSIS OF WATER-DISTRIBUTION SYSTEMS,
Technion-Israel Inst of Tech. Haifa. Dept. of Civil Engineering.
U. Shamir, and C. D. D. Howard.
Journal of the American Water Works Association, Vol. 69, No. 9, p 510-514, September 1977, 1 fig, 4 ref.

Descriptors: *Water distribution(Applied), *Networks, Analytical techniques, Design, Calibrations, Optimization, Operations, Control, Simulation analysis, Reservoirs, Behavior, Technology, Computers, Computer programs, Mathematical models, Systems analysis.
Identifiers: Newton-Raphson method, Jacobian matrix, Sensitivity analysis.

To bridge the gap between technological advancement and application, a nonmathematical explanation of modeling for analysis of water-distribution systems is given. Considered specifically is a 1966 investigation of the Boston, Massachussets water distribution system; a previous paper describes the precise mathematical formulations and gives the results of application to the Boston engineering study. Herein, a review of the previous work is given, where the Newton-Raphson technique was used to solve a set of nonlinear equations for a hydraulic network. The basic engineering problems encountered in the analysis of water distribution systems are discussed: calibration, operation and control, design, and optimization. Next, the paper considers design criteria, surrogate models and skeletonized networks, modeling of special elements, simulation and reservoirs, and the behavior of water-distribution systems. It is concluded that the described method of solving water distribution networks is practical for engineering analysis. The capability to solve for a mixture of unknowns influences the way in which engineers approach distribution analysis problems and acquire field data. For evaluations of network or data modifications, sensitivity analysis is more effective than the solution itself because water distribution networks behave linearly over a practical range of operation. (Bell-Cornell)
W77-11764

A FACTOR ANALYSIS OF SOCIOECONOMIC CHANGE IN THE TENNESSEE RIVER WATERSHED,
Tobacco Tax Council, Richmond, Va.
For primary bibliographic entry see Field 6B.
W77-11767

PROCEDURES FOR THE EVALUATION OF ENGINEERING ALTERNATIVES,
Engineering-Science, Inc., Arcadia, Calif.
For primary bibliographic entry see Field 6B.
W77-11771

A MULTICRITERIA ANALYSIS FOR WATER RESOURCE AND LAND USE DEVELOPMENT,
Vrije Universiteit, Amsterdam (Netherlands). Dept. of Economics.
For primary bibliographic entry see Field 6A.
W77-11773

DISASTER-CAUSED INCREASES IN UNIT REPAIR COST,
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 6F.
W77-11777

LOW FLOW CRITERIA FOR DIVERSIONS AND IMPOUNDMENTS,
Geological Survey, Menlo Park, Calif. Environmental and Safety Section.
S. L. Chiang, and F. W. Johnson.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 227-238, November 1976. 2 fig, 6 ref.

Descriptors: *Water management(Applied), *Diversion, *Impoundments, *Low flow, Regulation, Planning, Water resources.
Identifiers: *Flow patterns.

Low flow criteria for impoundments and diversions were formulated through a multidisplinary task force are being used by the State of Pennsylvania. Watershed size, low flow yield of the stream, reservoir capacity, and water quality were considered in the formulation of the criteria. The criteria were implemented using a simple chart which provides a transition from an impoundment to a diversion. The techniques used to arrive at the chart and formula are applicable to reservoirs and diversions elsewhere. (Bell-Cronell)
W77-11778

PRESSURE EFFECTS ON GREAT LAKES VERTICAL CONTROL,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W77-11782

SPECIAL FLOOD HAZARD INFORMATION: ALAMEDA AND LAS CRUCES ARROYOS, LAS CRUCES, NEW MEXICO.
Army Engineer District, Albuquerque, N. Mex.
Prepared for City of Las Cruces, NM. June 1971, 14 p, 23 plates, 2 tab.

Descriptors: *New Mexico, *Arroyos, *Floods, *Flood data, *Peak discharge, *Nonstructural alternatives, Flooding, Flood flow, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Flood plain zoning, Warning systems, Building codes, Land use, Zoning, Standard Project Flood.
Identifiers: Las Cruces(NM), *Alameda Arroyo(NM), *Las Cruces Arroyo(NM), Campus Arroyo(NM), Tortugas Arroyo(NM), Flood plain management.

The study area includes the city of Las Cruces in south central New Mexico in the Rio Grande's Mesilla Valley. The four major arroyos of Alameda, Las Cruces, Campus, and Tortugas enter the city from the east and terminate in the low valley area of the city. All of the channel courses have been completely occupied by urban and rural development. Except for a period from May 1958 to September 1966, significant discharge records are not available for the arroyos under study. Flood data were obtained from historical documents, U.S. Geological Survey (USGS) and Soil Conservation Service (SCS) publications, and field studies. Flood profiles and flooded area maps were developed from these data. Major flooding occurs in late summer and early fall. The worst known flood occurred on September 21, 1941, discharging an estimated 2,630 cubic feet per second (cfs). Another large flood, on August 22, 1965, discharged 2,170 cfs. The Intermediate Regional Flood is expected to discharge 6,300 cfs in the Alameda Arroyo and 5,400 cfs in the Las Cruces Arroyo, while the Standard Project Flood would discharge 9,010 cfs in the Alameda Arroyo and 8,960 cfs in the Las Cruces Arroyo. The report's contents are intended to aid in planning the best use of flood prone lands, and nonstructural alternatives are described as a planning aid. (Nessa-NC)
W77-11834

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH JUNIATA RIVER,
Army Engineer District, Baltimore, Md.
Prepared for Blair County Planning Commission, Pennsylvania, July 1976. 18 p, 7 tab, 7 fig, 8 plates.

Descriptors: *Floods, *Flood profiles, *Flood data, *Flood peak, *Historic floods, *Pennsylvania, Maximum probable flood, Flood control, Flood plain, Peak discharge.
Identifiers: *Frankstown Branch Juniata River(PA), Frankstown Township(PA), 500-year flood, 100-year flood.

The study area involves approximately 6 miles of the Frankstown Branch of the Juniata River, which is a major tributary of the Juniata and Susquehanna Rivers. It is located in the Township of Frankstown, Pennsylvania. The upper half of the study area is mostly agricultural, while the lower half has commercial, residential and industrial developments. The only source of streamflow records is a U.S. Geological Survey (USGS) gage located 8.5 miles downstream from the study area. The gage has been maintained since 1917. Additional data sources were USGS topographic sheets, 1975 field survey information on stream cross-sections and bridges, and an hydraulic analysis. Floods occur at all times of year, but the largest floods were caused by snowmelt in conjunction with rainfall, or hurricane activity. The worst flood of record occurred on March 18, 1936, discharging 47,600 cubic feet per second (cfs) and cresting at 850.4 feet, mean sea level datum (MSL) at the USGS gage. The most serious recent flood occurred on June 23, 1972, discharging 16,400 cfs and cresting at 850.2 MSL. The 500-year flood is expected to discharge 39,500 cfs, while the 100-year flood would discharge 23,500 cfs. Data from this report will be used to develop flood plain management records. (Nessa-NC)
W77-11835

FLOOD PLAIN INFORMATION: BUFFALO CREEK, N.Y. IN THE TOWNS OF ELMA AND WEST SENECA.
Army Engineer District, Buffalo, N.Y.
Prepared for Erie County, N.Y., April 1966. 48 p, 18 fig, 7 plates, 2 tab.

Descriptors: *New York, *Flood data, *Peak discharge, *Land use, *Planning, Floods, Flood flow, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Ice jams, Flood plain zoning, Building codes, Zoning, Flooding, Standard Project Flood.
Identifiers: *Buffalo Creek(NY), Elma(NY), West Seneca(NY), Intermediate Regional Flood.

The study area includes the portions of the cities of Elma and West Seneca that are subject to flooding from Buffalo Creek. Some residential and commercial developments are on the flood plain. Flood data were obtained from stream gages, newspaper accounts, and historical documents. The main flood season is late winter and early spring and results from rainfall, snowmelt, or both. The worst flood of record occurred in June, 1937 and discharged an estimated 16,000 cubic feet per second (cfs) and crested 10.2 feet above flood stage at the site of the USGS gage at Gardenville. Recent large floods occurred in March, 1955 and March, 1956. Both floods discharged 13,000 cfs and crested 9.4 feet above flood stage. The January 1959 flood discharged 10,000 cfs, but ice jams at some locations crested flood levels higher than those of 1955 or 1956. At the Gardenville age, the Intermediate Regional Flood would discharge 16,000 cfs and the Standard Project Flood would discharge 76,000 cfs. In 1966, the Corps of Engineers determined that no flood control projects were justified in the watershed. The report describes non-structural flood control measures, including zoning, subdivision controls, and flood plain regulations. (Nessa-NC)
W77-11836

FLOOD PLAIN INFORMATION: CAZENOVIA CREEK, NEW YORK, CITY OF BUFFALO AND TOWN OF WEST SENECA.
Army Engineer District, Buffalo, N.Y.
Prepared for Erie County, N.Y. Main Report and Technical Appendix. October 1966. 45 p, 19 fig, 4 plates, 2 tab, append.

Descriptors: *New York, *Flood data, *Peak discharge, *Land use, *Planning, Floods, Flooding, Flood flow, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Ice jams, Flood plain zoning, Building codes.
Identifiers: *Cazenovia Creek(NY), *Buffalo(NY), West Seneca(NY), Erie County(NY).

The study area includes the portions of the cities of Buffalo and West Seneca that subject to flooding by Cazenovia Creek–0.7 miles in Buffalo and 5.4 miles in West Seneca. Some residential development exists on the flood plain, with a park and golf course. Pressure for development is increasing. Flood data were obtained from stream gage records and newspaper files. The main flood season occurs in late winter and early spring and is caused by snowmelt, rainfall, or both. Ice jams complicate these floods, creating higher flood stages. The worst flood of record occurred in June, 1937. Stream gage records are not available for that time. More recent floods have occurred in 1955, 1959 and 1962. The 1955 flood had a peak discharge of 13,500 cubic feet per second (cfs) at the Ebenezer gage. The Intermediate Regional Flood is expected to discharge 18,000 cfs. Flood profiles for the Standard Project Flood are not presented. Although intended for informational purposes, this report describes non-structural control measures, including zoning, subdivision controls, and flood plain regulations. Also included is a discussion of structural controls to help alleviate flooding damages for existing structures and development. (Nessa-NC)
W77-11837

FLOOD PLAIN INFORMATION: RIVER ROUGE, MICHIGAN, MAIN, EVANS DITCH, AND FRANKLIN BRANCHES IN WAYNE AND OAKLAND COUNTIES.
Army Engineer District, Detroit, Mich.
Prepared for Detroit, MI., December 1966. 20 p, 3 fig, 10 plates, 1 tab, append.

Descriptors: *Michigan, *Flood data, *Peak discharge, *Land use, Floods, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Flood plain zoning, Building codes, Zoning.
Identifiers: *River Rouge(MI), Main Branch, Franklin Branch(MI), Evans Ditch(MI), Detroit(MI).

The study area includes the portions of the Detroit metropolitan area which are subject to flooding by the River Rouge Main Branch, Evans Ditch, and Franklin Branch. Some residential and commercial developments are on or adjacent to the flood plains. Flood data were obtained from U.S. Geological Survey (USGS) stream gages and topographic maps, precipitation records, newspaper accounts and historical documents. The worst flood of record, equivalent to the 70 year flood, occurred on April 5, 1947, and discharged 10,700 cubic feet per second (cfs) in the River Rouge Main Branch, 1,300 cfs in Evans Ditch, and 1,450 cfs in the Franklin Branch. The respective Standard Project Floods for these streams would be 41,500 cfs, 5,000 cfs, and 5,600 cfs, respectively. Although intended for informational purposes, this report describes non-structural control measures, including zoning, subdivision regulations, building codes, and mortgage restrictions. (Nessa-NC)
W77-11838

FLOOD PLAIN INFORMATION: UPPER RIVER ROUGE, FARMINGTON, MICHIGAN.
Army Engineer District, Detroit, Mich.
Prepared for City of Farmington, MI., February 1963. 26 p, 6 fig, 2 plates, 2 tab, append.

Descriptors: *Michigan, *Floods, *Flood data, *Peak discharge, *Non-structural alternatives, Planning, Flood flow, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Flood protection, Flood plain zoning, Building codes, Zoning, Standard Project Flood.
Identifiers: *Upper River Rouge(MI), Farmington(MI), Novi(MI), Quakerton(MI), Detroit(MI).

The study area involves the Upper River Rouge watershed, including the cities of Farmington, Novi, and Quakerton, which are suburbs of Detroit. Some high value residential developments exist on the floodplain. Flood data were obtained from U.S. Geological Survey (USGS) stream gages and topographic maps, rainfall records, newspaper files, and historic documents. The major flood season is late winter and early spring and results from rainfall, snowmelt, or both. The greatest recorded flooding occurred on April 6, 1947. Stream gaging records are not available for this flood. A flood having a 70 year recurrence interval is expected to discharge 1,500 cubic feet/second (cfs), which is equivalent to the 1947 flood. The Standard Project Flood would discharge 5,500 cfs. Although intended for informational purposes, this report describes nonstructural control measures, including zoning, subdivision regulations, building codes, and mortgage restrictions. (Nessa-NC)
W77-11839

FLOOD PLAIN INFORMATION: ATLANTA, TEXAS: BLACK BAYOU AND TRIBUTARIES.
Army Engineer District, New Orleans, LA.
Prepared for Atlanta, Texas, January, 1974, 33 p, 18 fig, 22 plates, 5 tab.

Descriptors: *Texas, *Flood data, *Peak discharge, *Land use, Flood flow, Flood forecasting, Cloudbursts, Flood frequency flood peak, Flood plains, Planning, Flood profiles, Historic floods, Flood stages, Standard Project Flood.
Identifiers: Atlanta(TX), *Black Bayou(TX), Haw Creek(TX), Intermediate Regional Flood.

The study area includes the portions of the City of Atlanta, Texas that are subject to flooding from Black Bayou, Haw Creek, and two unnamed tributaries. Some residential and commercial developments exist in the flood plains. Several new developments are in the planning or construction phases. Stage and discharge records are not available for the study area, except for some highwater marks. Other flood data were obtained from precipitation records, U.S. Geological Survey maps, newspaper files and historical documents. The main flood season is spring and results from general heavy rains, although flooding may occur at any time of year. The worst flood of record occurred on April 26, 1958. The peak Intermediate Regional Flood flows woudl be 11,700 cubic feet/second on Black Bayou, 3,820 cubic feet/second at the mouth of Haw Creek, 850 dfs at the mout of the Haw Creek tributary, and 990 cfs at the mouth of the Black Bayou Tributary. Peak Standard Project Flood flows would be 20,600 dfs on Black Bayou, 5,060 dfs at the mout of Haw Creek, 1,020 dfs at the mouth of the Haw Creek tributary, and 1,310 cfs at the mouth of the Black Bayou tributary. The data contained in this report were requested for use in the development of suitable land use controls. (Nessa-NC)
W77-11840

FLOOD PLAIN INFORMATION: CHADAKOIN RIVER, JAMESTOWN-FALCONER, NEW YORK.
Army Engineer District, Pittsburgh, Pa.
Prepared for Jamestown, Falconer, Allegheny River Basin Regional Water Resources Board, and Others, October, 1970. 55 p, 14 fig, 13 plates, 14 tab.

Descriptors: *New York, *Historic floods, *Flood data, *Peak discharge, Floods, Flood flow, Flood forecasting, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Planning.
Identifiers: *Chadakoin River(NY), Jamestown(NY), Falconer(NY), Ellicot(NY).

The study area includes the portions of the cities of Jamestown, Falconer, and Ellicot that are subject to flooding by the Chadakoin River, involving 9.6 miles of the River. Industrial, commercial, and residential properties occupy the flood plain. Flood data were obtained from stream gage records, newspaper accounts and historical documents. The main flood season in January through April and is caused by rainfall, snowmelt, or both. The only current flood prevention measures consist of the Warner Dam on the Chadakoin River, operated by the City of Jamestown. Eight bridges or buildings create obstructions to flood flow. The greatest floods of record occurred in Jamestown in April 1912 and in Falconer in April 1947. Stream gage records are not available for the 1912 flood. The 1947 flood discharged 2,120 cubic feet per second (cfs) at the Falconer gage. Another more recent flood, occurring in April 1961, discharged 1,720 cfs. The Intermediate Regional Flood would discharge 3,000 cfs and the Standard Project Flood would discharge 4,500 cfs. Three bridges would be overtopped by the Intermediate Regional Flood. The report does not present solutions to flood plain problems, but rather is presented as a basis for future planning for flood plain management. (Nessa-NC)
W77-11841

FLOOD PLAIN INFORMATION: ANTELOPE CREEK, SECRET RAVINE AND TRIBUTARIES, ROCKLIN, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for the City of Rocklin, Calif., April 1976. 29 p, 14 fig, 24 plates, 8 tab.

Descriptors: *California, *Flood data, *Peak discharge, *Planning, Floodwater, Flood flow, Streamflow forecasting, Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Land use.
Identifiers: Rocklin(CA), Placer County(CA), *Antelope Creek(CA), *Secret Ravine(CA), Intermediate Regional Flood.

The study area includes the portions of Rocklin and adjoining areas in Placer County, California, that are subject to flooding by Antelope Creek, Secret Ravine, and their tributaries. Properties on the flood plain are primarily residential, and anticipated development pressures will consume the remaining open space. There are no streamflow gages in the streams under study. Records from two stream gaging stations on Dry Creek downstream from the study area were used in deriving basic hydrologic data for this study. Precipitation records and U.S. Geological Survey (USGS) topographic maps were used; 145 cross sections were developed from several data sources. The main flood season occurs from October through May and results from heavy general rainfall in the tributary area. Sixteen flood events are known to have occurred on Dry Creek since the mid 1930's. It is reasonable to assume that numerous flood events have occurred on streams in the study area since they are the principal source of Dry Creek. It is predicted that the Intermediate Regional Flood would discharge 3,450 cubic feet per second (cfs) and the Standard Project Flood would discharge 6,400 cfs near the study area's lower limit. (Nessa-NC)
W77-11842

BLACKSMITH FORK AND SPRING CREEK FLOOD PLAIN INFORMATION, MILLVILLE, UTAH.
Army Engineer District, Sacramento, Calif.
Prepared for Cache County, Utah, May 1976, 27 p, 6 tab, 12 fig, 16 plates.

Descriptors: *Floods, *Flood data, *Utah, Maximum probable flood, Flood peak, Historic floods, Flood plains, Flood flow, Peak discharge.
Identifiers: *Blacksmith Fork(Utah), *Spring Creek(Utah), Millville Canyon Creek(Utah), Providence(Utah), Nibley(Utah), Millville(Utah), Cache County(Utah), 100-year flood, 500-year flood.

The study area involves 7 miles of Blacksmith Fork, 3 miles of Spring Creek and 1 mile of Millville Canyon Creek. Spring Creek and Millville Canyon Creek are both tributary to Blacksmith Fork. The towns of Millville, Nibley, and Providence, and adjoining areas in Cache County, Utah are subject to flooding. Development on the Blacksmith Fork floodplain is primarily agricultural, with only a few scattered dwellings, but many roads. Providence is situated directly across the Spring Creek flood plain. The Millville Canyon Creek flood plain is agricultural. Development pressure exists in all of the areas and could affect the flood plains. Flood data were obtained from a stream gage maintained on Blacksmith Fork since 1913, USGS 7.5 minute quadrangle sheet entitled 'Logan' (1961), newspaper files, and precipitation records. Floods result from general rains, melting snow, or severe cloudbursts, and they occur from mid-April through September. All would be overtopped by 500-year flood, many inundated by the 100-year flood. A cloudburst flood on Spring and Millville Canyon Creeks in August 1959 resulted in a peak flow on Spring Creek of 175 cubic feet per second (cfs). A snowmelt flood on Blacksmith Fork in May 1971 had a peak flow of 825 cfs. The 500-year flood is expected to discharge 4,700 cfs on Blacksmith Fork at the State Highway 242 bridge gage, and 2,200 cfs on Spring Creek. The 100-year flood would discharge 2,300 cfs at the gage, and 600 cfs on Spring Creek. There are no flood control facilities for the study area which have been authorized, and none are under investigation. (Nessa-NC)
W77-11843

FLOOD PLAIN INFORMATION: ANDROSCOGGIN AND DEAD RIVERS, LEEDS, MAINE.
Army Engineer District, Waltham, Mass. New England Div.
Prepared for Leeds, Maine, December 1975. 28 p, 22 fig, 14 plates, 5 tab.

Descriptors: *Maine, *Flood data, *Peak discharge, *Land use, Planning, Flood flow, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood frequency, Flood stages, Flood peak, Flood plains, Standard Project Flood.
Identifiers: *Androscoggin River(ME), *Dead River(ME), Leeds(ME), Androscoggin Lake(ME), Intermediate Regional Flood.

The study area includes the portions of Leeds, Maine that are subject to flooding by the Androscoggin and Dead Rivers, and Androscoggin Lake. Some residential and commercial developments exist on the flood plains. There are no stream gaging stations in the study area but there are gages both upstream and downstream from the study area. These gage records were used to estimate flood flows in Leeds. Other flood data were obtained from newspaper files and historical documents. The main flood season occurs in the spring and results from a combination of snowmelt and heavy rains. The worst flood of record occurred on March 20, 1936 and discharged 118,550 cubic feet/second (cfs) at the Leeds downstream town line. At the same location, the Intermediate Regional Flood (IRF) would discharge 107,000 cfs, and the Standard Project Flood (SPF) would

discharge 154,000 cfs. Four bridges in the study area would be overtopped by the IRF. The data contained in this report are intended for use in the development of suitable land use controls and an overall flood plain management program. (Nessa-NC)
W77-11844

FLOOD PLAIN INFORMATION: MERRIMACK, SHAWSHEEN, AND SPICKET RIVERS, LAWRENCE, METHUEN, ANDOVER AND NORTH ANDOVER, MA.
Army Engineer District, Waltham, Mass. New England Div.
Prepared for Lawrence, Methuen, Andover, and North Andover, MA., March 1972. 109 p, 25 fig, 17 plates, 12 tab.

Descriptors: *Massachusetts, *Flood data, *Peak discharge, *Land use, Flood flow, Flood forecasting, Flood profiles, Historic floods, Flood frequency, Flood peak, Flood plains, Non-structural alternatives, Flood plain zoning, Building codes, Standard Project Flood.
Identifiers: *Merrimack River(MA), *Shawsheen River(MA), *Spicket River(MA), Lawrence(MA), Methuen(MA), Andover(MA), North Andover(MA), Intermediate Regional Flood.

The study area includes the portions of the cities of Andover, Lawrence, Methuen, and North Andover that are subject to flooding by the Merrimack, Shawsheen, and Spicket Rivers. Most development in the four cities has taken place outside of the flood plain. Flood data were obtained from stream gage records, newspaper files, and historical documents. The main flood season is spring and is caused by rain, snowmelt, or both. The greatest flood of record on all 3 rivers occurred in March, 1936. Stream gage records are not available for this date. Compared with the 1936 flood, the Intermediate Regional Flood would be about 10 feet lower on the Merrimack River, 4 feet higher on the Shawsheen River, and identical on the Spicket River, while the Standard Project Flood would be 3 feet lower on the Merrimack, 1-3 feet lower on the Shawsheen, and 2 feet higher on the Spicket. Although intended for informational purposes, this report describes non-structural control measures, including zoning, subdivision control, and flood plain regulations. (Nessa-NC)
W77-11845

FLOOD PLAIN INFORMATION: PENOBSCOT AND STILLWATER RIVERS, OLD TOWN AND MILFORD, MAINE.
Army Engineer District, Waltham, Mass. New England Div.
Prepared for Old Town, Maine, and Maine Soil and Water Conservation Commission, December 1975. 36 p, 29 fig, 18 plates, 5 tab.

Descriptors: *Maine, *Flood data, *Peak discharge, *Planning, Floods, Flood flow, Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Land use.
Identifiers: *Penobscot River(ME), *Stillwater River(ME), Old Town(ME), Milford(ME), Bradley(ME).

The study area includes the portions of the City of Old Town and the Towns of Bradley and Milford that are subject to flooding by the Penobscot and Stillwater Rivers. Extensive development exists on both flood plains, and further development is imminent. Flood data were obtained from stream gages, newspaper files, historical records, and U.S. Geological Survey (USGS) topographic maps. The main flood season occurs in the spring when snowmelt in conjunction with heavy rains raises water levels. Less severe floods are caused by tropical storms and hurricanes in the fall. The greatest recorded flood flows occurred on both rivers on May 1, 1923, discharging 150,000 cubic feet per second (cfs) on the Penobscot downstream from Sunkhaze Stream, and 47,000 cfs on the Stillwater at Gilman Falls. A more recent flood, on April 30, 1973, discharged 93,100 cfs and 28,900 cfs on the Penobscot and Stillwater Rivers, respectively. At the same locations, the Intermediate Regional Flood flow on the Penobscot will be 164,000 cfs, and 50,000 cfs on the Stillwater. The Standard Project Flood will be 180,000 cfs on the Penobscot, and 55,000 on the Stillwater. The data contained in this report are intended for use in the development of suitable land use controls and an overall flood plain management program. (Nessa-NC)
W77-11846

FLOOD PLAIN INFORMATION: SACO RIVER, FRYEBURG, MAINE.
Army Engineer District, Waltham, Mass. New England Div.
Prepared for Town of Fryeburg, ME, August 1971. 48 p, 12 fig, 13 plates, 6 tab.

Descriptors: *Maine, *Flood data, *Peak discharge, *Land use, Flooding, Flood flow, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood frequency, Flood stages, Flood peak, Flood plains, Standard Project Flood, Planning.
Identifiers: Fryeburg(ME), *Saco River(ME), Intermediate Regional Flood.

The study area includes the portions of the town of Fryeburg, ME. that are subject to flooding from the Saco River. Some residential and commercial developments exist on the flood plain. There are no stream gaging stations in the study area, but there is a U.S. Geological Survey (USGS) gage above the study area in Conway, New Hampshire, and below the study area in Cornish, Maine. Other flood data were obtained from newspaper files and historical documents. The main flood season is the spring and results from heavy general rains and snowmelt. Hurricanes and tropical storms may cause floods in the fall. The worst flood of record occurred in March, 1936, discharging 29,300 cubic feet/second (cfs) at the Cornish gage. Most of the resulting damage in Fryeburg was concentrated at Lovewell Pond whose waters rose 24 feet above normal. Another large flood occurred in March, 1953, discharging 28,300 cfs. The Intermediate Regional flood should crest at the same height as the March 1936 flood. The Standard Project Flood should crest about 2 feet higher than the March 1936 flood. Eight of the bridges crossing the river would be overtopped by the Intermediate Regional Flood. The data contained in this report are intended for use in the development of suitable land use controls and an overall flood plain management program. (Nessa-NC)
W77-11847

A PERSPECTIVE ON FLOOD PROTECTION OF AGRICULTURAL LANDS.
Development and Resources Corp., Sacramento, Calif.
For primary bibliographic entry see Field 6F.
W77-11850

SOCIO-ECONOMIC STUDIES OF THE UPPER ST. JOHNS RIVER BASIN, CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W77-11859

EVALUATION OF AND RECOMMENDATIONS FOR LEGAL, INSTITUTIONAL AND FINANCIAL METHODS FOR IMPLEMENTING PURPOSES AND PLANS FOR FLOOD PLAIN MANAGEMENT IN CONNECTICUT RIVER BASIN: LIF REPORT, PHASE II,
Institute for Public Administration, New York.
For primary bibliographic entry see Field 6F.
W77-11860

GUIDELINES FOR FLOOD DAMAGE REDUCTION.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 6F.
W77-11862

REGIONAL WATER MANAGEMENT WITH FULL CONSUMPTIVE USE,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
For primary bibliographic entry see Field 6B.
W77-11866

THE HYDROLOGIC HISTORY OF THE SAN CARLOS RESERVOIR, ARIZONA, 1929-71, WITH PARTICULAR REFERENCE TO EVAPOTRANSPIRATION AND SEDIMENTATION,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 2D.
W77-11870

FLOOD-PRONE AREAS AND LAND-USE PLANNING--SELECTED EXAMPLES FROM THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.; Geological Survey, Menlo Park, Calif. Conservation Div.; and William Spangle and Associates, Portola Valley, Calif.
A. O. Waananen, J. T. Limerinos, W. J. Kockelman, W. E. Spangle, and M. L. Blair.
For sale by Supt. of Documents, GPO, Washington, DC 20402, price $2.20. Professional Paper 942, 1977. 75 p, 28 fig, 10 tab, 98 ref.

Descriptors: *Flood plains, *Flood protection, *Land use, *Planning, *Management, *California, Costs, Flood control, Hydrologic data, Reviews, Streamflow, Flood profiles, Flood peak, Maps, Flood frequency, Flood plain insurance, Regulation, Evaluation.
Identifiers: *San Francisco Bay area(Calif).

The common goal of flood-plain regulation and use is protecting life, minimizing public expenditures, and reducing flood loss. A comprehensive program combining structural and nonstructural measures can yield substantial benefits and may present a practical approach for managing a flood plain. A review of flood-plain planning, management, and regulation in the San Francisco Bay region, Calif., as shown by a study of Napa County, demonstrates complex multijurisdictional involvements. (Woodard-USGS)
W77-11871

AUTOMATIC CATEGORIZATION OF LAND-WATER COVER TYPES OF THE GREEN SWAMP, FLORIDA, USING SKYLAB MULTISPECTRAL SCANNER (S-192) DATA,
Geological Survey, Tampa, Fla.; Geological Survey, Miami, Fla. Water Resources Div.; and Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 7B.
W77-11875

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 2. SOUTHERN FLORIDA.
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11876

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 1. NORTHERN FLORIDA.
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11877

HYDROLOGIC UNIT MAP--1974, STATE OF LOUISIANA.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11880

HYDROLOGIC UNIT MAP--1974, STATE OF ARKANSAS.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11881

HYDROLOGIC UNIT MAP--1974, STATE OF KENTUCKY.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11882

HYDROLOGIC UNIT MAP--1974, STATE OF MISSISSIPPI.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11883

HYDROLOGIC UNIT MAP--1974, STATE OF TENNESSEE.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11884

HYDROLOGIC UNIT MAP--1974, STATE OF MISSOURI.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11885

FUTURE PROBLEMS AND WATER RESOURCES RESEARCH NEEDS OF THE ILLINOIS RIVER SYSTEM.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 6B.
W77-11937

SELECTING AND PLANNING HIGH COUNTRY RESERVOIRS FOR RECREATION WITHIN A MULTIPURPOSE MANAGEMENT FRAMEWORK,
Colorado State Univ. Fort Collins. Dept. of Recreation Resources.
For primary bibliographic entry see Field 6B.
W77-11938

MORPHOLOGY AND MORPHOMETRY OF A CHANNELIZED STREAM: THE CASE HISTORY OF BIG PINE CREEK DITCH, BENTON, COUNTY, INDIANA, STUDIES IN FLUVIAL GEOMORPHOLOGY NO. 4,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
For primary bibliographic entry see Field 2E.
W77-11939

RAINFALL PARAMETERS TO PREDICT SURFACE RUNOFF YIELDS AND SOIL LOSSES FROM SELECTED FIELD-PLOT STUDIES,
Rhodesia Dept. of Conservation and Extension, Salisbury.
For primary bibliographic entry see Field 2B.
W77-11964

ESTIMATION OF PARAMETERS OF A UNIFORMLY NONLINEAR SURFACE RUNOFF MODEL,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W77-11985

THE CENTRAL ARIZONA PROJECT: 1918-1968,
Central Arizona Project Association, Phoenix.
For primary bibliographic entry see Field 6B.
W77-11999

DIGITAL SIMULATION OF A DRAINAGE BASIN,
Madras Univ., Guindy (India). Dept. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 2A.
W77-12082

LINEAR AND NONLINEAR MODELS FOR PEAK FLOW FORECASTING,
Slovenska Akademie Vied, Bratislava (Czechoslovakia).
A. Svoboda.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 455-460, 1974. 3 fig, 1 tab.

Descriptors: *Peak discharge, *Reservoirs, *Flow system, *Model studies, Mathematical models, Flow, Inflow, Discharge(Water), Reservoir storage, Surface waters, Hydrology.
Identifiers: Linear models, Nonlinear models.

The paper dealt with the influence of the nonlinearity of a hydrologic system on the ouput peak. A system consisting of a series of equal reservoirs was used. The calculations were performed for uniform input of various magnitude (P sub k), various duration (T), and for systems with various degrees of nonlinearity (b). The results for the system consisting of a single reservoir (N = 1) were presented. For each duration T, it was possible to find an input magnitude which results in the same output (qk) peak for any degree of nonlinearity b. The value of so called critical input (P sub kr) depends on its duration. Results were presented for a number of reservoirs in series N = 1,2,3 and 5. The results of analytical solution for limiting cases (b approaching 0 and b approaching infinity) for a single reservoir were also presented. (See also W77-06708) (Sims-ISWS)
W77-12083

A SWAMPLAND MODEL,
Ministerio do Interior, Rio de Janeiro (Brazil). Departmento Nacional de Obras de Saneamento.
For primary bibliographic entry see Field 2E.
W77-12085

A DETERMINATE MODEL FOR RUNOFF AS A NONLINEAR SYSTEM,
Gatehouse Farm, Essex (England).
For primary bibliographic entry see Field 2E.
W77-12099

MATHEMATICAL MODEL OF SPRING RUNOFF FORMATION,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2A.
W77-12101

MATHEMATICAL MODELLING OF THE FORMATION OF RIVER RUNOFF IN MOUNTAIN DRAINAGE BASINS,
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 2A.
W77-12103

SIMULATING OVERLAND FLOW ON HILLSLOPES WITH A KINEMATIC CASCADE,
Agricultural Research Service, Beltsville, Md. Hydrography Lab.
For primary bibliographic entry see Field 2A.
W77-12108

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1977.
Geological Survey, Austin, Tex. Water Resources Div.
Texas District report, February 1977. 25 p, 1 plate.

Descriptors: *Water resources, *Data collections, *Texas, *Projects, *Bibliographies, Surface waters, Water quality, Groundwater, Streamflow, Flow characteristics, Gaging stations, Lakes, Reservoirs, Water quality, Sediment transport, Water resources development.

This report describes the water-resources projects and activities of the U.S. Geological Survey in Texas for the 1977 fiscal year (October 1, 1976 to September 30, 1977). A continuing series of measurements and analyses are made of streamflow, reservoir contents, and estuarine flow. In addition, data collected on the chemical quality of water, sediment in streams and reservoirs, water levels in wells, and land-surface subsidence. As of September 30, 1976, the following data-collection stations were in operation: 553 continuous streamgaging, reservoir-content, and stage-only stations. Partial-record streamflow sites included 84 low-flow, 13 crest-stage, 68 flood-hydrograph, 12 flood-profile, and 57 tide-level stations, and 18 reconnaissance stations. Water-quality sites included 30 continuous stations, 121 daily stations, 4 suspended-sediment stations, 154 periodic stations, and 70 stations on reservoirs. Included is a list of 70 reports in preparation, released, or published during the year. (Woodard-USGS)
W77-12151

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7A.
W77-12154

MAXIMUM FLOODFLOWS IN THE CONTERMINOUS UNITED STATES,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-12156

HYDROLOGIC EVALUATION OF THE UPPER DUCHESNE RIVER VALLEY, NORTHERN UINTA BASIN AREA, UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-12158

A TEST OF ALTERNATIVES FOR MEETING PUBLIC POTABLE WATER REQUIREMENTS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Urban Studies.
For primary bibliographic entry see Field 5G.

W77-12159

CHICAGO METROPOLITAN FLOODWATER MANAGEMENT PLAN,
Metropolitan Sanitary District of Greater Chicago, Ill.
F. L. Kudrna.
Water Resources Bulletin, Vol. 13, No. 4, p 825-833, August 1977. 3 fig.

Descriptors: *Flood control, *Project planning, *Programs, *Watersheds(Basins), *River basins, *Water management(Applied), Flood plains, Flood damage, Water resources, Legislation, Streams, Drainage, Erosion, Land use, Regional development, Sewers, Illinois.
Identifiers: *Public participation, Chicago(Ill), Urban planning, Urban development, Little Calumet River(Ill).

The Chicago Metropolitan Floodwater Management Plan is a cooperative planning program under Public Law 566 of the 83rd Congress (The Watershed Protection and Flood Prevention Act). The planning effort was jointly sponsored by the U.S. Department of Agriculture, Soil Conservation Service, and the Metropolitan Sanitary District of Greater Chicago. The project is unique in that it studies a 1260 square mile (3266 sq. kilometer) watershed, which is approximately 35 percent urbanized and contains approximately 7.5 million people. At present, approximately 4.4 percent or 330,600 people live in a floodplain. It is presently estimated that 80,000 acres (32,000 ha.) of the study area are subject to flooding with a current average annual damage estimated at approximately $10 million. The Plan which has been developed to reduce or eliminate these damages is divided into six separate watershed plans, and has been developed through extensive use of local citizen watershed steering committees. The paper discusses the planning process, public participation and implementation both at an overall river basin level and watershed case study level; considered are the Chicago Metropolitan Area River Basin study area and the Littel Calumet Watershed Floodwater Management Plan. (Bell-Cornell)
W77-12162

A NEW APPROACH FOR ESTIMATING IRRIGATION CONVEYANCE LOSSES AND THEIR ECONOMIC EVALUATION,
Escuela Nacional de Agricultura, Chapingo (Mexico). Colegio de Postgraduados.
For primary bibliographic entry see Field 3F.
W77-12164

SIMULTANEOUS INVESTMENT AND ALLOCATION DECISIONS APPLIED TO WATER PLANNING,
Texas Univ. at Austin.
For primary bibliographic entry see Field 6A.
W77-12168

A PHYSICALLY-BASED MODEL TO PREDICT RUNOFF UNDER VARIABLE RAIN INTENSITY,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
A. Y. Hachum, and J. F. Alfaro.
Presented at the 1976 Winter Meeting of the American Society of Agricultural Engineers, December 14-17, 1976, Chicago, Illinois. 16 p, 1 fig, 2 tab, 15 ref.

Descriptors: Infiltration, Rainfall, Model studies, *Simulation analysis, Rain, *Rainfall intensity, *Rainfall simulators, Rainfall-runoff relationships, *Runoff, *Forecasting.

A review of literature revealed that there are many empirical and physically-based models that have been proposed to analyze infiltration under different rainfall conditions. However, the validity of these models is still unknown due to the lack of experimental data to support them. A simple and universal physical model capable of predicting the ponding time and the rain infiltration in soils is presented. Basically, the model is an extension of the Green and Ampt approach to analyze infiltration under variable rainfall patterns. Model applications for a storm presented elsewhere (Smith 1972) is included as well as for a hypothetical storm with a smooth-variable intensity rainfall pattern. The prediction of the system behavior, for the first case, closely agrees with that of Smith (1972). (Skogerboe-Colorado State)
W77-12182

4B. Groundwater Management

AXIAL-FLOW PUMPS FOR DEEP WATERS.
Mono Pumps Africa Pty Ltd. (South Africa).
For primary bibliographic entry see Field 8C.
W77-11550

HYDROGEOLOGY OF THE IOSEGUN LAKE AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W77-11587

HYDROGEOLOGY OF THE MOUNT ROBSON-WAPITI AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W77-11588

HYDROGEOLOGY OF THE WHITECOURT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W77-11589

A METHOD OF CALCULATING THE HYDRAULIC PROPERTIES OF LEAKY AQUIFER SYSTEMS,
VIAK A. B., Falun (Sweden).
For primary bibliographic entry see Field 2F.
W77-11605

FLUCTUATIONS IN THE WATERLEVEL IN WELLS DUE TO VARIATIONS IN ATMOSPHERIC PRESSURE,
TERRAQUA ApS, Kalundborg (Denmark).
T. Sorensen, and H. Kaergaard.
Nordic Hydrology, Vol. 8, No. 2, p 83-92, 1977. 5 fig, 10 ref.

Descriptors: *Europe, *Wells, *Atmospheric pressure, Well data, Barometric efficiency, Artesian aquifers, Groundwater, Groundwater basins, Hydrology, Equations, Mathematical studies, Aquifer testing.
Identifiers: *Aquifer skeleton, *Denmark.

Deviations from the classical theory of the barometric efficiency were shown in some examples. A model with a semipermeable bed overlying the aquifer was proposed, and equations were presented for the flow in the model. Solutions were given for specified variations in the total load, and some data from nature were compared with one of the solutions. The data presented were from the archives of the Geological Survey of Denmark, Hydrogeological Department. (Lees-ISWS)
W77-11606

ESTIMATION OF TRANSMISSIVITY AND PERMEABILITY IN SWEDISH BEDROCK,
Chalmers Univ. of Technology, Goteborg (Sweden).
For primary bibliographic entry see Field 2F.
W77-11607

CYANIDE MOBILITY IN SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W77-11619

RESTRICTED DRAINAGE AND ITS EFFECT ON RISING GROUND WATER TABLE AND SOIL SALINITY,
Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
R. M. Abdel-Aal, A. A. Abdel-Wahed, and M. S. Abdel-Gawad.
Agricultural Research Review (Cairo), Vol 54, No 4, p 163-176, April, 1976. 7 fig, 6 tab, 7 ref.

Descriptors: *Drainage, *Drainage effects, *Surface-groundwater relationships, *Salinity, *Saline water, Groundwater, Saline soils, Water table, Soil profiles, Irrigation, Salts, Cations, Sodium, Calcium, Magnesium, Chlorides, Anions, Saline water intrusion, Water level fluctuations, Water quality, Alluvium.
Identifiers: Egypt.

It has previously been established that the rise of the groundwater table is the main factor responsible for deterioration through salinization of the Egyptian alluvial soils. The salt contents of the groundwater are increasing with time, especially where impeded drainage dominates. A saline area along the Ismailia Canal near Cairo was selected to study the effect of high saline groundwater on soil profile. The study includes ten profiles to the depth of the fluctuating groundwater table. Six samples from each profile were collected. The results are presented and show that the area suffers from high water table and high salinity. It was found that there is a correlation between the salt content of the groundwater and that in the soil crust. In addition, it was shown that the salt content of the groundwater and that in the surface crust was greatly higher than the salt content of the top layer up to 45 centimeters from the surface. (Jamail-Arizona)
W77-11627

THE APPLICATION OF TECHNOLOGY IN DEVELOPING COUNTRIES.
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6B.
W77-11637

RENOVATION OF MUNICIPAL WASTEWATER FOR GROUNDWATER RECHARGE BY THE LIVING FILTER METHOD,
Pennsylvania State Univ., University Park. Institute for Research on Land and Water Resources.
For primary bibliographic entry see Field 5G.
W77-11692

AN INVESTIGATION INTO ENVIRONMENTAL EFFECTS OF SEWAGE EFFLUENT REUSE AT THE KANE'OHE MARINE CORPS AIR STATION KLIPPER GOLF COURSE,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W77-11792

HOT GROUNDWATER SYSTEMS IN ICELAND TRACED BY DEUTERIUM,
Iceland Univ., Reykjavik. Science Inst.
For primary bibliographic entry see Field 2F.
W77-11812

COMPREHENSIVE GEOHYDROLOGICAL STUDY OF CONSOLIDATED SEDIMENTARY ROCKS IN BORNHOLM,
TERRAQUA ApS, Kalundborg (Denmark).
For primary bibliographic entry see Field 2F.
W77-11813

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS,
For primary bibliographic entry see Field 5G.
W77-11863

RELATIONSHIP OF TECTONIC STRUCTURE TO AQUIFER MECHANICS IN THE WESTERN GRAND CANYON DISTRICT, ARIZONA,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W77-11867

MOVEMENT OF MOISTURE IN THE UNSATURATED ZONE IN A LOESS-MANTLED AREA, SOUTHWESTERN KANSAS,
Geological Survey, Mineola, N.Y. Water Resources Div.
R. C. Prill.
For sale by Supt. of Documents, GPO, Washington, DC 20402, price $1.70. Professional Paper 1021, 1977. 21 p, 20 fig, 4 tab, 11 ref.

Descriptors: *Artificial recharge, *Groundwater recharge, *Ponding, *Water spreading, *Loess, Soil moisture, Soil water movement, Flow rates, Deep percolation, Induced infiltration, Evaluation, *Kansas.
Identifiers: Southwestern Kansas, High Plains.

A study of moisture movement associated with ponding near Garden City, Kansas, indicates that loess-manted areas have excellent potential for artificial recharge by water spreading. Infiltration stabilized at rates ranging from 0.7 to 2.2 feet (0.2 to 0.7 meter) per day reflecting changes in hydraulic conductivity of soil horizons. Results of the study indicate that the underlying loess has the capacity to temporarily store about 1 cubic foot (0.03 cubic meter) of water for each 6 cubic feet (0.17 cubic meter) of material. Owing to relatively high hydraulic conductivities of the loess and alluvium, however, moisture continues to move through the unsaturated zone. After application of 21 feet (6 meters) of water, mounding at the water table had a maximum thickness of 2 feet (0.6 meter) at the edge of the pond. Although the boundary of mounding spread rapidly, the applied water moved slowly by lateral displacement. (Woodard-USGS)
W77-11872

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--GREAT BASIN REGION,
Geological Survey, Carson City, Nev. Water Resources Div.; and Salt Lake City, Utah. Water Resources Div.
T. E. Eakin, D. Price, and J. R. Harrill.
For sale by Supt. of Documents, GPO, Washington, DC 20402. Professional Paper 813-G, 1976. 37 p, 8 fig, 1 plate, 8 tab, 17 ref.

Descriptors: *Groundwater resources, *Appraisals, *Great Basin, *Nevada, *Utah, Wyoming, Idaho, Groundwater basins, Water supply, Water yield, Groundwater availability, Water quality, Groundwater potential, Water resources development, Withdrawal, Pumping.

Ground-water withdrawals by wells in the Great Basin Region were about 1.1 million acre-feet in 1970. An appraisal of the regional ground-water resource indicates the region could sustain an annual net pumpage of about 2.6 million acre-feet. Larger withdrawals could be sustained if only part of the pumped water was used consumptively, if conflicts with existing surface-water rights are resolved, and if extensive treatment, artificial recharge, and reuse of water prove feasible. Ground water stored in the upper 100 feet of saturated deposits of the valley ground-water reservoirs is estimated to be on the order of 300 million acre-feet. Total ground-water storage probably exceeds several billion acre-feet. Only a few areas of the Great Basin Region have been studied in detail sufficient to enable adequate design of an area-wide ground-water developement. These areas already have been developed. As of 1973 data for broadly outlining the ground-water resources of the region had been obtained. However, if large-scale planned development is to become a reality, a program for obtaining adequate hydrologic and related data would be a prerequisite. Ideally, the data sould be obtained in time to be available for the successively more intensive levels of planning required to implement developments. (Woodard-USGS)
W77-11873

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 2. SOUTHERN FLORIDA.
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11876

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 1. NORTHERN FLORIDA.
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11877

POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT, NORTH FLORIDA, MAY 1976,
Suwannee River Water Management District, Fla.; and Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11878

DIGITAL MODEL ANALYSIS OF THE PRINCIPAL ARTESIAN AQUIFER, SAVANNAH, GEORGIA AREA,
Geological Survey, Doraville, Ga. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11879

GROUND WATER RECHARGE IN WESTERN UTTAR PRADESH,
Indian Inst. of Tech., Kanpur. Dept. of Chemistry.
P. S. Datta, P. S. Goel, and S. P. Sangal.
Proc Indian Acad Sci Sect A. 78(1), p 1-12, 1973.

Descriptors: *Groundwater recharge, *Groundwater movement, *Soil water movement, *Irrigation, Precipitation(Atmospheric), Soil moisture, Tritiated water.
Identifiers: *India(Western Uttar Pradesh).

The downward movement of water in the soil due to 1971 monsoon precipitation and supplemental surface irrigation was traced at about 45 sites in Western Uttar Pradesh (India), using a thin layer of moisture tagged with tritiated water. The tritiated layer moved down to different depths at different sites. The movement, averaged over the 40 sites was 96 cm, indicating that the average recharge for the year 1971 (a year of normal monsoon) was 21.5 cm of water. Copyright 1974, Biological Abstracts, Inc.
W77-11932

INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS,
New Zealand Agricultural Engineering Inst., Lincoln.
For primary bibliographic entry see Field 5B.
W77-11974

WATER AND DEVELOPMENT IN SAUDI ARABIA,
Durham Univ. (England). Dept. of Geography.
P. Beaumont.
The Geographical Journal, Vol 143, Part 1, March 1977, p 41-60. 3 tab, 6 fig, 18 ref.

Descriptors: *Water resources development, *Groundwater, *Water resources, *Competing uses, Water allocation(Policy), Aquifers, Desalination, Desalination plants, Arid lands, Arid climates, Projects, Project planning, Dams, Water quality, Water conservation, Water demand, Water management(Applied), Water policy, Domestic water, Industrial water, Irrigation programs, Planning, Irrigation water, Sewage effluents, Sewage treatment, Water pollution, Water storage, Environmental effects, Desalination wastes, Urbanization, Agriculture, Foreign countries.
Identifiers: *Saudi Arabia(Al Hasa Project).

Rapid economic development in Saudi Arabia has increased demands upon scarce water resources. The paucity of rainfall and the absence of reliable surface water reserves has concentrated attention upon the large groundwater reserves of eleven major aquifers. Groundwater has been developed chiefly for irrigation. But because little recharge is taking place, a number of dams have been constructed to facilitate artificial recharge of aquifers. In addition to the shortage of water Saudi Arabia is also short of land suitable for development of agricultural production. A number of development projects to facilitate irrigation have been undertaken by the government. However, large-scale projects for developing water resources for agricultural needs have thus far not been as successful as was hoped, and smaller-scale projects have been encouraged. Rapid urbanization and per capita increases in water demand have further strained the country's water resources. Solutions have been sought with wells tapping deep aquifers and by desalination methods. Potentially the greatest threats to further developments include water quality deterioration from salt-water intrusion resulting from pumping, salinity build-up in irrigated soil, sea water oil pollution, and contamination from urban sewage effluents. (Ullery-Arizona)
W77-11991

CONSERVATION IN KANO,
J. Samways.
Geographical Magazine (England), Vol 49, No 8, p 504-507, May, 1977.

Descriptors: *Water resources development, *Water management(Applied), *Water supply development, *Water storage, *Water utilization, *Africa, Water requirements, Storage, Wells, Groundwater, Dams, Semiarid climates, Water demand, Boreholes, Drill holes, Drilling, Water conservation, Water supply, Water resources, Social aspects, Social impact.
Identifiers: *Nigeria, Developing countries.

Kano state, in the north of Nigeria, has a water problem arising from a decreased supply and increased demand. The problems of supplying water to this region are discussed and the technical problems of water delivery outlined. Water for the area can be drawn from underground wells and from surface storage resulting from dam construction. The problem of water storage is discussed and socio-economic problems created by the building of dams are presented. Inundation calls for resettlement which can result in much stress and the loss of individual and community rights.

The tapping of groundwater supplies through the use of boreholes is evaluated. In some areas of the state the groundwater is largely sub-artesian and diesel pumps have to be installed to lift the water to the surface. The expense and difficulty of maintaining drilling rigs and providing equipment in remote areas where communication is poor is discussed. (Jamail-Arizona)
W77-11993

EFFECT OF DEPTH AND QUALITY OF GROUND WATER ON SOIL SALINIZATION: A FIELD STUDY WITH A FLUCTUATING WATER TABLE,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2G.
W77-12000

A DISCRIMINANT FUNCTION FOR GROUND WATER EXPLORATION,
Southern Methodist Univ., Dallas, Tex. Geophysics Div.
For primary bibliographic entry see Field 2F.
W77-12003

MODELLING GROUNDWATER RESOURCES REPLENISHMENT DUE TO RIVER FLOW IN THE FLOOD PERIOD DURING THE OPERATION OF INFILTRATION WATER INTAKE,
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
For primary bibliographic entry see Field 2F.
W77-12110

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1977.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-12151

HYDROLOGIC EVALUATION OF THE UPPER DUCHESNE RIVER VALLEY, NORTHERN UINTA BASIN AREA, UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
J. W. Hood.
Utah Department of Natural Resources, Salt Lake City, Technical Publication No 57, 1977. 34 p, 5 fig, 2 plates, 3 tab, 12 ref.

Descriptors: Water resources, *Surface-groundwater relationships, *Water quality, *Water utilization, *Water yield, Streamflow, Aquifers, Hydrogeology, Pumping, Water wells, Water level fluctuations, Groundwater recharge, Evaluation, Available water.
Identifiers: *Upper Duchesne River Valley(Utah).

The upper Duchesne River valley was studied during 1971-74 as part of an investigation of the northern Uinta Basin area, Utah and Colorado. This report describes the relation of ground water to surface water in the upper Duchesne River valley, estimates the quantity of ground water that moves to the Duchesne River, and evaluates the probable effect of increased ground-water withdrawals on the stream regimen. The primary source of water is precipitation on the highlands adjacent to and north of the area and on the valley itself. Discharge is mainly by flow in the Duchesne River. Adjacent to and within the valley, ground water and surface water are intimately related, and they can interchange in several ways due to both natural and manmade conditions. The valley fill, which is composed mainly of outwash and related glacial debris constitutes the mainground-water reservoir in the valley. The ground water in the fill is unconfined. The volume of ground water stored in the fill, and theoretically available by gravity drainage, is a minimum of 40,000 acre-feet; this volume fluctuates by a maximum of 10 percent annually. The discharge from wells and springs used for domestic, stock, public, and irrigation purposes in 1974 was about 2 cubic feet per second. Most ground water, except in parts of the Uinta Formation, and all the surface water sampled in the study area, was fresh. (Woodard-USGS)
W77-12158

SENSITIVITY ANALYSIS IN AQUIFER STUDIES,
Stanford Univ., Calif. School of Earth Sciences.
E. Aguado, N. Sitar, and I. Remson.
Water Resources Research, Vol. 13, No. 4, p 733-737, August 1977. 4 fig, 1 tab, 8 ref.

Descriptors: *Aquifers, *Management, *Planning, *Linear programming, *Groundwater, Optimization, Wells, Discharge(Water), Dewatering, Pumping, Hydraulic conductivity, Equations, Constraints, Mathematical models, Systems analysis.
Identifiers: *Sensitivity analysis.

A method is presented for determining in which areas detailed knowledge of aquifer characteristics and conditions is most critical to the success of a management plan. These questions are answered by using sensitivity analysis to determine how variations in parameters and input data affect the optimal solution of a linear programming management model. The model uses either finite element or finite difference approximations of the groundwater equations as constraints. The optimal locations and discharge rates of wells have been determined for dewatering a rectangular area to a specified level while minimizing steady state total pumping rate and maintaining hydraulic heads in the dewatered area at or below the specified value. The area is in a small aquifer having constant head boundaries. Sensitivity analysis has shown that the optimal steady state solution is most sensitive to hydraulic conductivity at and near the aquifer boundaries parallel to the length of the dewatered area. Thus field exploration and testing should be concentrated on determination of hydraulic conductivity in those areas. (Bell-Cornell)
W77-12160

SUBSURFACE DRAINAGE COST AND HYDROLOGIC MODEL,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Agricultural Engineering.
A. K. Bhattacharya, N. Foroud, S-T. Chieng, and R. S. Broughton.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. IR3, p 299-308, September 1977. 4 fig, 4 tab, 7 ref.

Descriptors: *Drainage practices, *Tiles, *Water balance, *Economics, Hydrology, Water table, Weather data, Simulation analysis, Computers, Costs, Soil water, Effects, Frequency analysis, Mathematical models, Systems analysis.
Identifiers: *Economic analysis, *Hydrologic models, Net financial benefit.

A computer simulation water balance model was used to analyze the variation of daily water-table depths in the field using 27 years of weather data and soil water parameters. The high water table in the study area resulted from a cool moist climate and poor natural drainage condition. The effects of drainage rates and drain depths on the water table were studied. A frequency analysis was made to obtain the recurrence intervals of specific water-table depths for various successive numbers of days. The net financial benefit from the system was evaluated corresponding to various chances of crop failure due to inadequacy of the drainage system during its assumed amortization period. In conclusion, in the absence of definite functional relationships between the processes of a soil-water-plant system, a computer simulation approach becomes valuable in predicting water table depths and their relationships to other pertinent parameters. (Bell-Cornell)
W77-12166

4C. Effects On Water Of Man's Non-Water Activities

WATER YIELD CHANGES AFTER THE URBANIZATION OF THE CANON'S BROOK CATCHMENT, HARLOW, ENGLAND,
University Coll., London (England). Dept. of Geography.
G. E. Hollis.
Hydrological Sciences Bulletin, Vol. 22, No. 1, p 61-75, March 1977. 7 fig, 1 tab, 17 ref.

Descriptors: *Water yield, *Urbanization, *Clay minerals, Watersheds(Basins), Sewers, Surface water, Rainfall-runoff relationships, Flow rates, Rainfall, Runoff, Foreign countries, Foreign research.
Identifiers: *Water yield changes, *Clay catchment, *Canon's brook catchment(Harlow England), *England, Surface water sewers.

The 21.4 sq km clay catchment of the Canon's Brook was built over during the period 1953-1968. By 1968, 16.6% of the area was paved, and the impervious surfaces drained to the river by means of surface water sewers. Records of rainfall and runoff were taken since 1950, i.e., before development began, and quantitive description be double mass analysis revealed an increased water yield from the catchment as urbanization progressed. The median flow from 1950 to 1953 was around 0.057 m/s, and the flow had been increased by urbanization to about 0.142 cu m/s in 1968. The precise extent of increased water yield and its reflection in the flow regimen were derived from a computer simulation model. The data were calibrated on the records for 1950-1953, and then the flow from an unchanged rural catchment was simulated for the period of urban development, 1953-1968. The difference between the gaged urban water yield from a 15% paved catchment and its simulated rural equivalent averaged 59.4 mm per annum, or about 30% of the runoff from the rural catchment. (Roberts-ISWS)
W77-11600

HYDROLOGIC RESPONSE AND NUTRIENT CONCENTRATIONS FOLLOWING SPRING BURNS IN AN OAK-HICKORY FOREST,
Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab.
M. D. Knighton.
Soil Science Society of America Journal, Vol. 41, No. 3, p 627-632, May-June 1977. 3 fig, 4 tab, 28 ref.

Descriptors: *Forest fires, *Runoff, *Nutrients, *Wisconsin, Burning, Forests, Forest management, Hydrologic aspects, Forest watersheds, Watersheds(Basins), Forest soils, Rainfall, Overland flow, Hydrologic properties, On-site investigations, Vegetation, Effects, Erosion, Soil physics, Forestry.
Identifiers: *Spring burns, Oak-hickory forests.

Annual spring burns were applied for 1 to 3 years on a 25 to 50% slope in an oak-hickory forest in southwestern Wisconsin. Overland flow and sedimentation did not increase, although no severe storms occurred during tht study. Fires of light to moderate intensities consumed most of the fresh litter and sometimes all of the fermentation layer. Mean weight of litter plus fermentation layers were significantly reduced (alpha = 0.05) from 15,800 kg/ha to 10,100 kg/ha by three annual burns. Bulk density, total pore volume, organic carbon content, and water permeability of the mineral soil were unaltered. Stems less than 5 cm in diameter at breast height were killed, but shrubs sprouted vigorously and herbaceous vegetation was not altered. Mean concentrations of both

anions (PO-P and (NO3 + NO2)-N) and cations (Ca, Mg, K) in the soil leachate collected at 15-cm depth appeared to increase after burning, although the differences were small and highly variable. Significant changes (alpha = 0.05) in the concentration of both anions were measured through the growing season. Concentrations of (NO3 + NO2)-N peaked 6 weeks after the mid-April fires, which reflects increased nitrification following burning. Sodium concentrations were not affected by burning. Although it was increased by burning, nutrient loss to deep leaching appeared to be approximately equivalent to, or less than, estimated annual input from precipitation. (Sims-ISWS)
W77-11613

WATER YIELD IMPROVEMENT BY VEGETATION MANAGEMENT,
Arizona Univ., Tucson. Coll. of Agriculture.
For primary bibliographic entry see Field 3B.
W77-11770

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT - PHASE III,
Washington Univ., Seattle, Coll. of Forestry.
R. Zasoski, H. Dawson, and L. Lestelle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 410, Price codes: A06 in paper copy, A01 in microfiche. Final Report (1977). 105 p, 35 fig, 10 tab, 16 ref, 5 append. OWRT C-6304(No. 5231)(1).

Descriptors: *Soil chemistry, *Water chemistry, *Anaerobic conditions, *Hydrogen ion concentration, *Acid streams, *Oxidation-reduction potential, Soil horizons, Salmonids, Forest soils, Liquid chromotography, Compaction, Organic matter, Calcium carbonate, Washington.
Identifiers: Quinault Reservation(Wash), Camp Creek Watershed(Wash).

On the Quinault Reservation (Washington State), areas of low stream pH have been correlated with reduced salmonid production. Causes of low stream pH were investigated in the Camp Creek Watershed using undisturbed soil columns and field lysimeters to monitor oxidation-reduction conditions, dissolved iron and organic matter, and solution pH. Both static and flow-through conditions were simulated in soil columns and solution pH modification was attempted by adding lime or wood ash to the column surface. Stream waters in upper Camp Creek appear to be equilibrating with the acid soils. Stream pH's of 4.5-5.0 would be expected in Camp Creek. pH reductions were also thought to originate from the oxidation of ferrous iron to ferric ions. Aeration of column effluents showed decreases in pH of up to 0.5 pH units; however, dissolved organics seem to be stabilizing ferrous ion in solution. A slight rise in pH was found when lime and wood ash were applied. The large buffering capacity of the soil limited the effectiveness of these modifications. Similar results were found in attempts to modify stream pH by additions of lime and oyster shells. (See also W74-12355 and W75-08468)
W77-11941

A PLAN FOR A NATIONAL COASTAL WATER QUALITY MONITORING NETWORK.
Interstate Electronics Corp., Arlington, Va. Environmental Engineering Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-236 636, Price codes: A04 in paper copy, A01 in microfiche. Report No. 445ES, Executive Summary, prepared for the Environmental Protection Agency, (1974). 53 p, 10 fig. EPA-68-01-0160.

Descriptors: *Water quality control, *Monitoring, *Pollution abatement, *Planning, *Environmental effects, Resources development, Coasts.
Identifiers: *Outer Continental Shelf, Coastal zone.

A national plan for coastal water quality monitoring is a vital step for this nation in the process of protecting our environment from irreversible degradation. Fragmented efforts at monitoring and control are ineffective and costly due to a lack of cooperation, uniformity and forward planning. To safeguard the quality of our coastal environment, a national monitoring system has been designed that will encourage conscious action and intelligent decisions for effective pollution abatement. An assessment was made of what is in existance now and what elements of existing plans are useable. The logical development of a national plan for monitoring requires that an overview of the problem first be obtained. The various levels of monitoring that have already been initiated at local, state and regional areas have been reviewed, evaluated, and incorporated into a plan which will allow immediate use of existing capabilities on a national basis. (Sinha - OEIS)
W77-12147

COMPUTATION OF BACKWATER AND DISCHARGE AT WIDTH CONSTRICTIONS OF HEAVILY VEGETATED FLOOD PLAINS,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.; Geological Survey, Columbus, Ohio. Water Resources Div.; Geological Survey, Jackson, Miss. Water Resources Div.; and Geological Survey, Baton Rouge, La. Water Resources Div.
V. R. Schneider, J. W. Board, B. E. Colson, F. N. Lee, and L. Druffel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 418, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigation 76-129, February 1977. 64 p, 15 fig, 13 tab, 16 ref.

Descriptors: *Backwater, *Flow profiles, *Discharge measurement, *Numerical analysis, *Analytical techniques, Floods, Flood plains, Data collections, Mannings equation, Flow rates, Open channel flow, Bridges, Energy loss, Mississippi, Alabama, Louisiana.
Identifiers: *Indirect discharge measurement, Bridge backwater computation.

The U.S. Geological Survey, cooperated with the Federal Highway Administration and the State Highway Departments of Mississippi, Alabama, and Louisiana, to develop a proposed method for computing backwater and discharge at width constrictions of heavily vegetated flood plains. Data were collected at 20 single opening sites for 31 floods. Flood-plain width varied from 4 to 14 times the bridge opening width. The recurrence intervals of peak discharge ranged from a 2-year flood to greater than a 100-year flood, with a median interval of 6 years. Measured backwater ranged from 0.39 to 3.16 feet. Backwater computed by the present standard Geological Survey method averaged 29 percent less than the measured, and that computed by the currently used Federal Highway Administration method averaged 47 percent less than the measured. Discharge computed by the Survey method averaged 21 percent more then the measured. Analysis of data showed that the flood-plain widths and the Manning's roughness coefficient are larger than those used to develop the standard methods. A method to more accurately compute backwater and discharge was developed. The difference between the contracted and natural water-surface profiles computed using standard step-backwater procedures is defined as backwater. The energy loss terms in the step-backwater procedure are computed as the product of the geometric mean of the energy slopes and the flow distance in the reach was derived from potential flow theory. The mean error was 1 percent when using the proposed method for computing backwater and 3 percent for computing discharge. (Woodard-USGS)
W77-12152

4D. Watershed Protection

MATHEMATICAL MODELLING OF THE MINERALIZATION OF RIVER SYSTEMS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5B.
W77-11570

WATER YIELD CHANGES AFTER THE URBANIZATION OF THE CANON'S BROOK CATCHMENT, HARLOW, ENGLAND,
University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W77-11600

A STUDY ON THE MOISTURE AVAILABILITY AND OTHER CONDITIONS OF UNSTABILISED DUNES IN THE CONTEXT OF PRESENT LAND USE AND THE FUTURE PROSPECTS FOR DIVERSIFICATION,
Central Arid Zone Research Inst., Jophpur (India).
H. S. Mann, A. N. Lahiri, and O. P. Pareek.
Annals of Arid Zone, Vol 15, No 4, p 270-284, December, 1976. 5 fig, 3 tab, 12 ref.

Descriptors: *Moisture availability, *Moisture content, *Melons, *Sand dunes, Moisture stress, Arid lands, Plant growth, Transpiration, Deserts, Vegetation effects, Erosion, Soil conservation, Soil-water-plant relationships, Consumptive use, Crop production, Dry farming, Dunes, Soil moisture, Land use.
Identifiers: *Rajasthan, India.

The prospects of plant production on desert dunes is considered with special attention given to prevailing soil-plant-environment conditions. The ares under study is western Rajasthan, India, of which 58 percent is covered with sand dunes. Soil moisture was determined gravimetrically and soil temperature was measured by thermistors. Transpiration was recorded by the quick weighing technique of Parker, and microclimatic observations were recorded by standard conventional equipment. The results are given. Most desert vegetation generally uses water at a high rate. Water utilization, however, varies among species and this is discussed. Utilization of moisture in barren dunes is also discussed and experiments with vegetation establishment on these dunes are presented. At present only melons are grown on the dunes. Cultivation on dunes induces erosion, but local farmers need the land and are likely to utilize the dunes. Therefore, it is suggested that suitable cropping patterns for dune areas be developed to reduce erosion hazards. (Jamail-Arizona)
W77-11628

VEGETAL COVER TO ESTIMATE SOIL EROSION HAZARD IN RHODESIA,
Hatcliffe Engineering Centre, Barrowdale (Rhodesia). Dept. of Conservation and Extension.
H. A. Elwell, and M. A. Stocking.
Geoderma, Vol 15, p 61-70, January, 1976. 4 fig, 2 tab, 11 ref.

Descriptors: *Vegetation establishment, *Soil erosion, *Erosion control, *Rainfall, Africa Erosion, Erosion rates, Rain, Precipitation(Atmospheric), Rainfall intensity, Precipitation intensity, Rainfall-runoff-relationships, Raindrops, Soil moisture, Soil physics, Soil chemistry, Soil physical properties, Mathematical models.
Identifiers: *Cropping management, *American universal soil loss equation, *Rhodesia.

The role of vegetation establishment in helping control soil erosion in Rhodesia is examined. In addition, an alternative approach to the cropping management factor of the American Universal Soil Loss Equation which is more applicable

where financial resources are limited is presented. The use of percent vegetal cover as a spill loss estimation was measured in six treatments that produced a wide range of vegetal cover conditions. The soil was a medium grained fersiallitic sand on 4 percent slopes. Each treatment was replicated three times and soil loss and runoff were recorded for ten years. A simple linear model was developed which represented the amount of soil not protected by live or dead vegetation. Evidence is presented to show that percent vegetal cover is the major factor determining the erosion from crops and grassland in Rhodesia. (Jamail-Arizona)
W77-11630

NOAA-ARS COOPERATIVE SNOW RESEARCH PROJECT. WATERSHED HYDRO-CLIMATOLOGY AND DATA FOR WATER YEARS 1960-1974,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2C.
W77-11662

A FACTOR ANALYSIS OF SOCIOECONOMIC CHANGE IN THE TENNESSEE RIVER WATERSHED,
Tobacco Tax Council, Richmond, Va.
For primary bibliographic entry see Field 6B.
W77-11767

EROSION OF THE TARKIO DRAINAGE SYSTEM, 1845-1976,
Agricultural Research Service, Columbia, Mo.
For primary bibliographic entry see Field 2J.
W77-11796

OPTIMAL PREDICTION OF PONDING,
Agricultural Research Service, Fort Collins, Colorado.
For primary bibliographic entry see Field 2G.
W77-11798

THE INTEGRATED HYDROLOGICAL CATCHMENT MODEL EGMO,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 2A.
W77-11815

CONTROLS OF VARIATION IN SUSPENDED SEDIMENT CONCENTRATION IN THE RIVER ROTHER, WEST SUSSEX, ENGLAND,
King's Coll., London (England). Dept. of Geology.
P. A. Wood.
Sedimentology, Vol. 24, No. 3, p 437-445, June 1977. 5 fig, 12 ref.

Descriptors: *Suspended load, *Rating curves, *Watersheds(Basins), *Hysteresis, Suspended solids, Sediment discharge, Sediment distribution, Seasonal, On-site investigations, Hydrographs, Duration curves, Discharge(Water), Rivers, Frequency, Storms, Foreign countries, Foreign research.
Identifiers: *England, *River Rother(England), Suspended sediment concentration.

Suspended sediment concentrations were determined for samples collected from the River Rother, West Sussex, and rating loops constructed for several hydrographs. The rating loops often exhibit hysteresis, with a greater suspended sediment concentration for a given discharge occurring on the rising limb than on the falling limb. A comparison of the loops indicated that the hysteresis and the suspended sediment concentration (for a given discharge) become reduced progressively when storm events occur in rapid succession. Various types of rating curves can be identified, and a model of suspended sediment concentration and discharge can be constructed. Controlling factors of suspended sediment concentrations are river discharge, duration and frequency of the storm event, the length of time between successive events, and the time of year. (Humphreys-ISWS)
W77-11824

RAINFALL PARAMETERS TO PREDICT SURFACE RUNOFF YIELDS AND SOIL LOSSES FROM SELECTED FIELD-PLOT STUDIES,
Rhodesia Dept. of Conservation and Extension, Salisbury.
For primary bibliographic entry see Field 2B.
W77-11964

THE SWIRL CONCENTRATOR FOR EROSION RUNOFF TREATMENT,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W77-12080

DESIGNING CONCEPTUAL CATCHMENT MODELS FOR AUTOMATIC FITTING METHODS,
Ministry of Works, Wellington (New Zealand).
For primary bibliographic entry see Field 2A.
W77-12084

PROBLEMS OF APPLYING THE CONCEPTUAL MODEL DEVELOPED FOR THE FLAT CATCHMENTS OF HUNGARY,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W77-12087

REPRESENTATION OF A CATCHMENT BY A NETWORK OF RESERVOIRS,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-12088

PHYSICO-STATISTICAL MODEL OF RAINFALL FLOOD FORMATION AND DETERMINATION OF ITS PARAMETERS,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2A.
W77-12100

MATHEMATICAL MODEL OF THE HYDROMETEOROLOGICAL REGIME FORMATION OF A RIVER BASIN,
Gosudarstvennyi Gidrologicheskii Institut, Moscow (USSR).
For primary bibliographic entry see Field 2A.
W77-12102

DETERMINISTIC AND STOCHASTIC MODELLING OF FLOODS IN MOUNTAIN REGIONS,
Kazakhskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Alma-Ata (USSR).
For primary bibliographic entry see Field 2A.
W77-12104

THE VELOCITY ASSUMPTION BEHIND LINEAR INVARIABLE WATERSHED RESPONSE MODELS,
Ministry of Agriculture, Jerusalem (Israel). Hydrological Service.
For primary bibliographic entry see Field 2A.
W77-12105

APPLIED PRINCIPLES OF CATCHMENT SIMULATION,
Institut fuer Wasserwirtschaft, Berlin (East Germany)
For primary bibliographic entry see Field 2A.
W77-12106

ROLE OF WES IN THE DEVELOPMENT OF HYDRODYNAMIC WATERSHED MODELS,
Illinois Univ. at Urbana-Champaign. Hydrosystems Section.
For primary bibliographic entry see Field 2A
W77-12107

USE OF K-4 POLYMER IN INCREASING ANTIEROSIVE SOIL STABILITY IN IRRIGATION FURROWS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Melioration.
For primary bibliographic entry see Field 3F.
W77-12153

HYDROLOGIC DATA FOR NORTH CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-12155

COMPATIBLE SEDIMENT CONTROL PRACTICES AND TILLAGE SYSTEMS,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
F. D. Tompkins, C. H. Shelton, and J. E. Temple.
Presented at the 1976 Winter Meeting of the American Society of Agricultural Engineers, December 14-17, 1976, Chicago, Illinois. 16 p, 4 fig, 3 tab, 5 ref.

Descriptors: Sediments, *Sediment control, Flow resistance, *Soybeans, Runoff, Watersheds(Basins), Return flow, Cultivation.
Identifiers: *Tillage practices.

The results of this study indicate that pattern efficiency for a graded system was about the same as that for the conventional cropping pattern previously used. The angle at which the rows intersect the headland affects the time required for turning. Time required for turning increases as the intersection angle increasingly deviates from 90 degrees. Soybean yields obtained after land grading were somewhat higher than the station average. This suggests that, for the study area, soil disturbance due to land grading did not adversely affect yield. For specific runoff events occurring in early spring, sediment yield per cm of runoff on the original ungraded watershed was 85 percent less when the land was planted to wheat as compared to a fallow condition. After grading, the wheat-covered land yielded only 15 percent as much sediment per cm of runoff as that produced by the original watershed in wheat. The sediment yield per cm of runoff for the graded watershed in wheat was only about 2 percent of the yield from the original fallow watershed. (Skogerboe-Colorado State)
W77-12181

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

MERCURY IN BOTTOM SEDIMENTS OF RIETVLEI RESERVOIR,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-11512

THE COMMON MUSSEL MYTILUS EDULIS AS INDICATOR FOR THE LEAD CONCENTRATION IN THE WESER ESTUARY AND GERMAN BIGHT, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
M. Schulz-Baldes.
Mar Biol (Berl). 21(2), p 98-102, 1973.

Descriptors: *Mussels, *Estuaries, Spectrophotometry, *Lead, *Bioindicators, *Pollutant identification, Water pollution sources.
Identifiers: *Weser estuary(W Germany), *German Bight(W Germany).

Common mussels were collected at 13 stations of the Weser Estuary and the German Bight in 3 size categories: 14-16 mm, 21-23 mm, 35-40 mm shell length. Equal numbers of the 3 groups from each station were analyzed separately for lead concentration by flameless atomic-absorption spectrophotometry. The lead concentration of the soft parts decreases from 6.4 micrograms/g dry weight 15 km northwest of Bremerhaven to 1.9 micrograms/g at Helgoland (Germany). At the same station, the concentration in small mussels is significantly higher than in larger mussels. The lead concentration is exceptionally high in the kidney, quite high in the intestine (with the digestive glands) and in the adductor muscle, and low in the foot, gills, and mantle with gonads. Laboratory experiments reveal that mussels directly reflect the actual lead concentration of their environment. The observed gradient in lead contents of M. edulis in the Weser Estuary can be explained by the dilution of the highly lead-polluted river water by the sea water of the German Bight. With this physiological property, M. edulis is highly suitable as an indicator organism for lead, and possibly other heavy metal pollutants.—Copyright 1974, Biological Abstracts, Inc.
W77-11520

CONTENT OF PLUTONIUM, THORIUM AND PROTACTINIUM IN SEA WATER AND RECENT CORAL IN THE NORTH PACIFIC,
Kanazawa Univ. (Japan). Radiochemistry Lab.
T. Imai, and M. Sakanoue.
J Oceanogr Soc Jap. 29(2), p 76-82, 1973.

Descriptors: *Pollutant identification, *Pacific Ocean, *Radioisotopes, Plutonium, Sea water, Coral, Thorium, Water pollution sources.
Identifiers: China, Japan, *Plutonium-238, plutonium-239, *Protactinium-231, *Thorium-228, Thorium-230, Thorium-232, Yoron.

The contents of Pu isotopes (293Pu and 238Pu), Th isotopes (232Th, 230Th and 228Th) and Pa-231 in sea water collected in the North Pacific, the East China Sea and the Japan Sea were determined. These nuclides were sequentially analyzed by alpha-ray spectrometry after separating them mainly with solvent extraction technique. The contents of 239Pu in surface sea water ranged from 0.6-1.6 pCi/1000 l, 238Pu activity ratios being 0.2 equivalent to 0.7. The 228Th/232Th activity ratios for the North Pacific waters varied between 7.6 and 30, whereas the samples from the East China Sea showed the very high value, 65. The contents of 231Pa are less than 6% of that in equilibrium with its parent 235U. Analysis of Pu isotopes in recent coral from Yoron Island (Japan) confirmed that Pu isotopes have concentrated in recent coral with a concentration factor of about 1 equivalent to 2 x 1000. Copyright 1974, Biological Abstracts, Inc.
W77-11527

SERUM IRON LEVEL AND TOTAL IRON BINDING CAPACITY IN CULTURE FISH,
Tokyo Univ. of Fisheries (Japan). Radioisitope Research Lab.
Y. Ikeda, H. Ozaki, and K. Uematsu.
J Tokyo Univ Fish. 59(1), p 43-53, 1972.

Descriptors: *Iron, Fish, *Rainbow trout, *Carp, Fish diets, Growth rates, Analytical techniques.
Identifiers: Seriola-quinqueradiata, *Yellow-tail, *Serium iron level(Fish).

The serum iron levels, total Fe binding capacities and Fe saturation rates were determined by the Matsubara's and Ramsay's methods in 3 cultured fish, yellowtail (Seriola quinqueradiata), rainbow trout (Salmo irideus) and carp (Cyprinus carpio). The values for the 3 determinations are presented. In yellow-tail, the serum Fe level, unvarying during the period of June to Dec. directly correlated with the specific growth rate of body weight and dropped in fedding on the fish meal compound diets containing 0 or 27.3 mg% dry weight of Fe as iron succinate, but recovered in that added with 57.3 mg% of Fe. In rainbow trout, serum Fe level was higher in May than in March and indifferent to whether in freshwater or in seawater. In carp, the level, the lowest among the 3 species, was less than half as much as that in yellow-tail. The serum Fe levels seemed to be related to the species, activity, diet quality and water temperature. The total Fe binding capacities were almost the same in the 3 species. In yellow-tail, Fe saturation rate was the highest, but dropped with increased total Fe binding capacity when fed on the compound diet deficient in Fe. Between rainbow trout in freshwater and in seawater, slight differences were observed in total Fe binding capacity and Fe saturation rate. In carp, Fe saturation rate was the lowest. The feeding on the compound diet deficient in Fe caused a rise in total Fe binding capacity and a decline in Fe saturation rate. The above 3 determinations might be helpful in diagnosing nutritional status or some diseases. The increase in total Fe binding capacity was attributed to a rise in Tf present in the 3rd fraction of serum protein in yellow-tail fed on the diet deficient in Fe.—Copyright 1974, Biological Abstracts, Inc.
W77-11543

HEAVY METAL ENRICHMENT IN MINE DRAINAGE 2. THE WITWATERSRAND GOLDFIELDS,
Pretoria Univ. (South Africa). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-11544

PROBLEMS ENCOUNTERED WITH EDTA AS AN ANTICOAGULANT FOR FISH BLOOD,
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Dept. of Zoology.
G. L. Smit, and H. J. Schoonbee.
South African Journal of Science, Vol 72, No 12, p 380-381, December 1976. 2 tab, 12 ref.

Descriptors: Sampling, Carp, Hydrogen ion concentration, Fish, Pollutant identification.
Identifiers: South Africa, *EDTA, *Anticoagulants.

Fish have such a rapidly activated blood clotting mechanism that syringe needles become blocked during bloodsampling. It has been found, however, that if the stress to which fish are subject during collection is minimized, clotting can be delayed for 2-3 min. Klontz attributes this phenomenon to the retention of thrombocytes in the spleen and kidney. For blood sampling it is therefore essential to use a substance with good anticoagulant properties. Heparin, citrate, oxalate and EDTA have been used successfully as anticoagulants for fish blood, and of these Hesser found EDTA to be the most effective anticoagulant in the examination of blood cell morphology. Heparin is the most widely used agent of this kind, probably because of the ease with which syringes and capillary tubing can be coated. EDTA powder, on the other hand, is unsuitable for this purpose because of its crystalline nature. Although Blaxhall stressed the importance of concentration when using EDTA as an anticoagulant, it is often observed that EDTA is added to the blood indiscriminately during routine haematological investigations. This unqualified use of EDTA prompted further investigations into the suitability and use of this agent as an anticoagulant. (So African Water Info Center)
W77-11564

ABSORPTION AND ACCUMULATION OF 32P BY OEDOGONIUM AND SOME AQUATIC MACROPHYTES,
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Navorsingsgroep Varswaterbiol.
J. F. Vermaak, J. H. Swanepoel, and H. J. Schoonbee.
Water SA, Vol. 2, No. 1, p 7-12, 1976. 5 figs, 1 tab.

Descriptors: *Phosphorus, *Aquatic weeds, Impoundments, Rivers, *Absorption, *Radioisotopes.
Identifiers: South Africa, *Oedogonium, Macrophytes, Filamentous algae.

Absorption and accumulation of 32P by Oedogonium and nine species of water weeds commonly found in rivers and man-made lakes in the Transvaal, South Africa, were investigated. It is shown that different hydrophytes vary in their ability to absorp and accumulate this isotope. The filamentous alga, Oedogonium, shows a far better ability to accumulate 32P than any of the hydrophytes investigated. The highest average concentration factor value obtained for Oedogonium clearly exceeds those obtained for Salvinia molesta and Myriophyllum brasiliense. (So African Water Info Center)
W77-11569

PROGRESS OF STUDIES ON THE TYPE A (INFECTIOUS) HEPATITIS VIRUS IN WATER,
National Inst. for Water Research, Pretoria (South Africa).
W. O. Grabow.
Water SA., Vol. 2, No. 1, p 20-23, 1976. 2 fig, 23 ref.

Descriptors: *Viruses, Laboratory studies, *Public health, *Human diseases.
Identifiers: South Africa, Lesser bushbabies, *Hepatitus.

The value of the latest findings on hepatitis viruses with regard to research on their incidence and behaviour in water is discussed. This includes the discovery that certain species of marmoset monkeys may be susceptible to the type A and B viruses. Properties of virus-like particles, which may be the aetiological agents of viral hepatitis and their isolation from blood or faeces of infected humans or experimental animals, are summarized. The paper contains data on recent findings which indicate that lesser bushbabies (Galago senegalensis moholi) may be susceptible to the type A hepatitis virus. (So African Water Info Center)
W77-11571

REMOVAL OF MICROCYSTIS TOXINS IN WATER PURIFICATION PROCESSES,
National Inst. for Water Research, Pretoria (South Africa).
J. R. Hoffmann.
Water SA., Vol. 2, No. 2, p 58-60, 1976. 1 tab, 5 ref.

Descriptors: Water purification, Algae, Flocculation, Sedimentation, Chlorination, Filtration, Activated carbon, Algae toxins, Water pollution.
Identifiers: South Africa, Microcystis aeruginosa.

Algal species such as Microcystis aeruginosa forma aeruginosa produce toxic substances which may have an ill effect when consumed. The ability of unit processes such as flocculation, sedimentation filtration and chlorination to remove dissolved algal toxins was investigated in the laboratory. These processes did not remove the toxins to below 'active levels' (as defined by the conditions

of the investigation). Treatment with activated carbon, however, was successful in removing high concentrations of the toxins to below 'active levels'. (So African Water Info Center)
W77-11576

METAL ENRICHMENT OF SEDIMENTS IN INLAND WATERS - THE JUKSKEI AND HENNOPS RIVER DRAINAGE SYSTEMS,
Pretoria Univ. (South Africa). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-11578

VANADIUM AND OTHER ELEMENTS IN GREENLAND ICE CORES,
San Diego State Univ., Calif. Dept. of Chemistry.
For primary bibliographic entry see Field 2C.
W77-11586

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 10C.
W77-11594

SUSPENDED SOLIDS MEASUREMENT GIVES IMPROVED CONTROL,
Instruments (H. F.) Ltd., Bolton (Ontario).
For primary bibliographic entry see Field 5D.
W77-11624

RADIOACTIVITY IN MISSISSIPPI RIVER WATER,
Louisiana Water Resources Research Inst. Baton Rouge.
F. A. Iddings, and R. M. Knaus.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 042, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, April 1977. 36 p, 14 fig, 15 tab, 7 ref. OWRT A-039-LA(4), 14-34-0001-6019.

Descriptors: *Radioactivity, *Bioindicators, *Mississippi River, *Louisiana, Willow trees, Measurement, *Radioisotopes, Sampling, Monitoring, *Potable water, Water supply.
Identifiers: *Black Willow.

Base line alpha, beta, and gamma radioactivity measurements for Mississippi River water are presented. The base line study encompasses 12 months. An evaluation of the change in radioactive content of the water as it passes down the river is presented. All results indicate a low radionuclide content for the river water during the period of study. A second section of the study details experience in sample handling and attempts at improvement of measurement. A simple filter system for measuring both alpha and beta particles using a GM tube is described. A novel technique for calibrating irregular geometry samples such as Marinelli beakers is also presented. A brief description of a simplified whole body counting procedure is included. Results are presented of studies to establish the possibility of using the Black Willow (Salix nigra Marsh.) as a biological indicator for radio-nuclides coming from nuclear power plants. On the basis of use of manganese and lanthanum as radiotracers and as post-experiment activated stable tracers, the willow roots appear to be an excellent bioindicator.
W77-11641

QUANTUM-MECHANICAL STUDIES OF ENVIRONMENTAL EFFECTS ON BIOMOLECULES: I. HYDRATION OF FORMAMIDE,
Consiglio Nazionale delle Ricerche, Pisa (Italy). Laboratori di Chimica Quantistica.
For primary bibliographic entry see Field 2K.
W77-11645

TWO-TEMPERATURE MEMBRANE FILTER METHOD FOR ENUMERATING FECAL COLIFORM BACTERIA FROM CHLORINATED EFFLUENTS,
Massachusetts Univ., Waltham. Dept. of Environmental Sciences.
B. L. Green, E. M. Clausen, and W. Litsky.
Applied and Environmental Microbiology, Vol 33, No 6, p 1259-1264, June, 1977. 5 fig, 4 tab, 11 ref.

Descriptors: *E. coli, *Coliforms, *Sewage bacteria, *Analytical techniques, *Incubation, Sewage treatment, Enteric bacteria, Microorganisms, Cultures, Sewage, Waste treatment, Waste water treatment.
Identifiers: Multiple tube method, Membrane filter method.

Techiques for the recovery of fecal coliform bacteria from chlorinated sewage effluents using the standard membrane filter method (MF), the multiple-tube or most-probable-number (MPN) method, and a modified MF method were compared. Fecal coliform counts were determined for plant- and laboratory-chlorinated primary and secondary effluents. Results indicated that the MF method was much less effective than the MPN method, yielding only 14% of the recovery obtained by the MPN method. Modifications to improve recovery by the MF method were investigated by comparing counts obtained after using various preincubation periods (0, 3, 4 and 5 hours) at 35C. It was found that the preincubation for 5 hours at 35C prior to the standard 44.5C incubation period yielded the lowest recovery. Results obtained by the modified method (5 hours at 35C) were comparable to those obtained by the MPN method. Statistical comparisons for the various methods were prepared using the least squares method for best fit. (Schulz-FIRL)
W77-11728

TRANSVERSE-GRID WATER QUALITY ANALYSES OVER THE SZOB-BUDAPEST DANUBE SECTION (KERESZTMETSZETHALOS VIZMINOSEG VIZSGALATOK A DUNA SZOB-BUDAPEST KOZOTTI SZAKASZAN),
Kozepdunavolgyi Vizugyi Igazgatosag, Budapest (Hungary).
M. Puskas.
Hidrologiai Kozlony, Vol. 52, No. 2, p 65-70, February, 1977. 4 fig, 1 tab, 4 ref.

Descriptors: *Water quality, *Chemical oxygen demand, Rivers, Streamflow, *Sampling, Organic loading, Waste assimilative capacity, Chemical analysis, Waste water disposal, Waste water treatment, Analytical techniques.
Identifiers: Danube River, Hungary, Transverse-grid system.

Analyses of water taken from a series of cross-sections along the Danube River have indicated that water quality is far from uniform along the stream. The transverse-grid system for collection was devised to insure optimal selection of sample points, representative samples, and reliable estimation of mass currents. Samples from the 7 cross-sections were collected at 4 occasions annually. Analytical results have been used to construct contour lines for flow velocity, depth, BOD5, COD (dichromate), ammonia, and ultraviolet absorption for several cross-sections. Pollutant levels were found to be higher for the left bank than for the right bank. It was suggested that the optimal number of sampling points is dependent on the component being investigated and the streamflow rate. Contoured diagrams for cross-sections can be used to determine the total amount of the component passing by any point in the river. (Schulz-FIRL)
W77-11731

BACTERIOLOGICAL ANALYSES OVER THE RAJKA-BUDAPEST DANUBE SECTION (BAKTERIOLOGIAI VIZSGALATOK A DUNA RAJKA-BUDAPEST KOZOTTI SZAKASZAN),
National Inst. of Public Health, Budapest (Hungary).
Z. Deak.
Hidrologiai Kozlony, Vol. 52, No. 2, p 79-83, February, 1977. 1 fig, 3 tab.

Descriptors: *Coliforms, *Pathogenic bacteria, *Salmonella, *Sampling, *Spatial distribution, Rivers, Microorganisms, Aerobic bacteria, Streptococcus, Anaerobic bacteria, Clostridia, Sulfur bacteria, Bacteriophage, Biocontrol, Potable water, Industrial wastes, Municipal wastes, Pollutant identification, Analysis, Waste water treatment.
Identifiers: Danube River, Hungary.

Bacteriological studies have been conducted for 11 stations on the Danube River between Rajka and Budapest, Hungary. Quantitative determinations included analyses for: coliform, fecal coliform, fecal streptocci, heterotrophic mesophilic bacteria, psychrophilic bacteria, and sulfite-reducing spore-forming anaerobic Clostridia. Bacteriophages and Salmonellae were also investigated. A gradual increase in bacterial levels was observed from Rajks to Budapest, with characteristic peaks on the profile curve where four major tributaries enter the Danube. Seasonal variations in bacterial levels were attributed to the seasonal variations in effluents discharged by the area's sugar refineries. Although bacterial levels decreased slightly during the three year study, existing levels of bacteria and the presence of pathogenic bacteria such as Salmonella still prohibited bathing in the Danube and necessitated more costly treatment of drinking water. (Schulz-FIRL)
W77-11732

METHODS FOR THE EVALUATION OF THE RESULTS OF THE SELF-CONTROL-MEASUREMENTS CARRIED OUT BY THE SEWAGE TREATMENT PLANT OPERATORS (VERFAHREN ZUR AUSWERTUNG DER BETRIERSERGEBNISSE VON KLAERWERKEN),
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft.
D. Groche.
Wasserwirtschaft, Vol. 67, No. 6, p 154-161, 1977. 8 fig, 5 tab, 24 ref.

Descriptors: *Statistical methods, *Mathematical studies, *Frequency analysis, *Biochemical oxygen demand, *Integrated control measures, Flow control, Sewage treatment, Sludge treatment, Model studies, Mathematical models, Forecasting, Waste water treatment.
Identifiers: Cumulative-frequency distributions.

Statistical examination is presented as a means of more efficient treatment and operations control in waste water treatment plants. Most sewage treatment plants are operated on the basis on mean values of BOD and sewage flow. A more complete evaluation of fluctuations in BOD and sewage flow is suggested, using the standard deviation, coefficient of variability, and other statistical parameters. The number of measurements required for accuracy would be determined by the degree of control desired for a particular facility. Cumulative frequency curves produced by logarithmic plotting of BOD and sewage flow on probability graph paper are used to illustrate the effect of sample size and variability on the measurement distributions. (Schulz-FIRL)
W77-11734

MEMBRANE FILTER TECHNIQUE FOR THE QUANTIFICATION OF STRESSED FECAL COLIFORMS IN THE AQUATIC ENVIRONMENT,
Montana State Univ., Bozeman. Dept. of Microbiology.
D. G. Stuart, G. A. McFeters, and J. E. Schillinger.

Applied and Environmental Microbiology, Vol. 34, No. 1, p 42-46, July, 1977. 2 fig, 3 tab, 17 ref.

Descriptors: *Coliforms, *Sewage bacteria, *Analytical techniques, *Cultures, Effluents, Microorganisms, Meus-membrane filters, Laboratory tests, Bacteria, Chlorination, Sewage treatment, Waste water treatment, Pollutant identification.
Identifiers: *Injury-mitigating membrane filtration(IM-MF) technique, Most-probable-number(MPN) technique, Agar-membrane filter(Direct M-FC) method.

A method for the determination of coliform counts for fecal coliforms which have been injured by exposure to chlorine, industrial wastes, or marine waters is described. A modification of the membrane filter (MF) technique using injury-mitigating membrane filtration (IM-MF) was used for the analyses of effluents collected from several sewage treatment plant outfalls in Montana. For the IM-MF technique glycerol, acetate, and reducing agents were added to both layers and the filter was rinsed with an enriched lactose medium for resuscitation. Results obtained with the IM-MF technique were compared with the multiple-tube or most probable number (MPN) technique and the agar-membrane filter (Direct M-FC) method. Fecal coliform counts in chlorinated sewage determined by the IM-MF technique were significantly higher than those obtained by the MPN technique. A scattergram which illustrates the relationships between values obtained for IM-MF and MPN and for the direct M-FC and MPN is included. Results obtained by the various methods were similar for analyses of laboratory chlorinated sewage and mountain stream water. It is suggested that the IM-MF technique may provide a less costly, more accurate, and more easily performed alternative to the MPN technique for the quantification of fecal coliforms in chlorinated effluents. (Schulz-FIRL)
W77-11736

POLLUTANT REMOVAL FROM COAL-ASH BASIN EFFLUENT,
Texas Univ. Health Science Center, Houston. School of Public Health.
R. K. Guthrie, and D. S. Cherry.
Water Resources Bulletin, Vol. 12, No. 5, p 889-902, October 1976. 5 fig, 4 tab, 8 ref.

Descriptors: *Pollutants, *Water pollution, *Drainage systems, *Basins, Water quality, Measurement, Abiotic environment, Metals, Toxicity, Waste treatment.
Identifiers: *Pollutant removal, *Chemical elements, *Biotic characteristics, Neutron activation analysis, Plants, Animals.

The drainage system for an ash basin serving a coal-fired power plant at the Savannah River Project, Aiken, South Carolina, was studied for 15 months to determine abiotic and biotic characteristics and mechanisms of pollutant removal. Measurements made included temperature, dissolved oxygen, pH, turbidity, alkalinity, conductance, flow rate, sulfate, nitrate, and phosphate. Also, neutron activation analysis was employed to determine concentrations of 40 chemical elements in water, benthos, bacterial, plant, invertebrate, and vertebrate samples collected at six sampling stations. Five-day toxicity tests were performed using organisms from within and from outside the system. Temperature, dissolved oxygen, turbidity, nitrate phosphate, and flow rate decreased at stations farther removed from the ash basin. Concentrations of most chemical elements measured were greatest in benthos and least in water, indicating that a major removal mechanism was sedimentation of suspended particulate matter. Light metals were more highly concentrated in crayfish and mosquito fish than in benthos. Organisms found within the drainage system were observed to be able to survive a 5-day toxicity test at any point within the system, whereas orgainsms not existing within the system were seen to vary in their resistance to the drainage system environment. (Bell-Cornell)
W77-11784

INVESTIGATIONS ON PRECIPITATION FROM VARIOUS LOCATIONS IN NORWAY 1965-71,
Direktoratet for Jakt, Viltstell og Ferskvannsfiske, Vollebekk (Norway). Fisheries Research Inst.
For primary bibliographic entry see Field 2B.
W77-11785

BUDGET OF SELECTED MINERAL NUTRIENTS FOR TWO WATERSHED ECOSYSTEMS IN THE SOUTHEASTERN PIEDMONT,
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 5B.
W77-11791

CLOUD CONDENSATION NUCLEI FROM A PAPER MILL. PART I: MEASURED EFFECTS ON CLOUDS,
Naval Weapons Center, China Lake, Calif. Research Dept.
For primary bibliographic entry see Field 2B.
W77-11805

CLOUD CONDENSATION NUCLEI FROM A PAPER MILL. PART II: CALCULATED EFFECTS ON RAINFALL,
Naval Weapons Center, China Lake, Calif. Research Dept.
For primary bibliographic entry see Field 2B.
W77-11806

SEDIMENT CONCENTRATION AND DURATION IN STREAM CHANNELS,
Denver Univ., Colo. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W77-11825

POTENTIAL TRACE ELEMENT EMISSIONS FROM THE GASIFICATION OF ILLINOIS COALS,
Argonne National Lab., Ill. Energy and Environmental Systems Div.
N. F. Sather, W. M. Swift, J. R. Jones, J. L. Beckner, and J. H. Addington.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL-75XX1, Price codes: A02 in paper copy, A01 in microfiche. Report No. ANL-75-XX-1, March 1975. 22 p, 2 fig, 3 tab, 4 ref, append. IIEQ 80.026, ERDA W-31-109-Eng-38.

Descriptors: *Air pollution, *Coals, *Trace elements, *Pollutant identification, *Chemical analyses, Pollutants, *Illinois, Coal mines, Analytical techniques, Water pollution sources, Water quality, Analysis, Chemistry, Wastes, Natural gas, Arsenic compounds, Lead, Mercury, Fuels.
Identifiers: *Coal gasification, *Synthetic gas, *Coal analysis, Arsenic, Mercury compounds, Lead compounds, Mineral constituents, Coal ashes, Lurgi Reactor.

Results of comprehensive trace element analyses of samples of Illinois No. 5 and No. 6 seam coals and the unquenched ashes obtained from gasification of these coals in a Lurgi reactor were reported and discussed. Areas where additional background information is needed for assessment of the environmental impact of trace element emissions from coal gasification were identified. (Henley-ISWS)
W77-11827

PRECIPITATION NUTRIENTS IN THE OPEN AND UNDER TWO FORESTS IN MINNESOTA,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2K.
W77-11831

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 2. SOUTHERN FLORIDA.
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11876

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 1. NORTHERN FLORIDA.
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11877

REMOTE SENSING OF OIL SLICKS WITH MICROWAVE RADIOMETER,
Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
K. Kaski, and A. Laaperi.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-31733, Price codes: A02 in paper copy, A01 in microfiche. Radio Laboratory Report No. S 83, 1976. 19 p, 8 fig, 1 tab, 2 ref.

Descriptors: *Water pollution, *Remote sensing, *Monitoring, *Oil pollution, Equipment, *Pollutant identification, Micrwaves.
Identifiers: *Outer Continental Shelf, *Oil slicks, *Baltic Sea, *Microwave radiometers.

Experiments were made with optical devices, such as multispectral photography, colour photography and low light television system, IR-scanner (thermal IR-region), near Ir photography, themal IR radiometer, microwave radiometer, air borne radar and shipborne radar. This report deals only with the microwave radiometer. At field tests several different oil types were released from boats. The experiments also included a release behind the oil barrier which was very successful because the thickness of the oil slick was great enough to be come clearly detected. The benefits of the microwave radiometer are the mapping capability at almost all kinds of weather both day and night, and the fact that it's possible to find the thickest part of the oil slick representing the biggest volume of the slick. The experiment gave an obvious demonstration of the usefulness of the microwave radiometer for thickness estimations in the case of thick oil film layers. The identification of oil types seems to be impossible with microwave radiometer. For operative use, e.g., surveillance or volume estimations, an imaging radiometer system is required. Such a system can also be used to localize the thickest part of oil slicks. (Sinha - OEIS)
W77-11891

A SHIPBOARD OIL-IN-WATER CONTENT MONITOR BASED ON OIL FLUORESCENCE,
Baird-Atomic, Inc., Bedford, Mass. Government Systems Div.
A. W. Hornig, J. T. Brownrigg, B. R. Chisholm, and L. P. Giering.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-027 262, Price codes: A10 in paper copy, A01 in microfiche. Prepared for U.S. Coast Guard, Office of Research and Development Report No. CG-D-54-76, February 1976. 207 p, 37 fig, 31 tab. DOT-CG-34169-A.

Descriptors: *Fluorescence, *Monitoring, *Oil pollution, *Water pollution, Equipment.

Identifiers: *Outer Continental Shelf, Luminescence.

A significantly improved Oil-In-Water Content Monitor has been developed and tested. A major improvement involves the use of dual polychromators to present a total luminescence image. Using a computer-designed mask, the fluorescence from various spectral regions is summed to produce approximately equal response from many oil mixtures. The monitor produces a real time output which is linear in oil concentrations and which can be calibrated directly in ppm. While the fluorescence process is essentially instaneous, instrumental response is determined by the electronic time constant selected, usually 1 second. Auxillary transmission and scatter channels permit correction of scattering from particulates. The monitor has been tested with seventeen oil mixtures from 0 to 125 ppm, showing linear response with a standard deviation of 25.9% (at 50 ppm) for all oils, and a standard deviaton of 18.1% when the heaviest oil mixture F2r, is omitted. Variations in temperature, pH and salinity have minimal effect on monitor accuracy. Fluorescent detergents may cause background problems; however future mask design can minimize background. The monitor responds linearly to oil ceoncentrations up to 1000 ppm and water-wetted particulate concentrations to 100 mg/l. Oil-wetted partulates decrease monitor output and remain a problem. Results of the laboratory test program are fully documented, potential problems are discussed, and recommendations are included. (Sinha-OEIS)
W77-11905

DEVELOPMENT OF HIGH PRESSURE LIQUID CHROMATOGRAPHIC TECHNIQUES,
New Mexico Univ., Alburque. Eric H. Wang Civil Engineering Research Facility.
E. A. Walters.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 899, Price codes: A03 in paper copy, A01 in microfiche. Air Force Weapons Laboratory Technical Report No. AFWL-TR-75-234, May 1976. 48 p, 12 fig, 1 tab, 202 ref. F29601-74-C-0030.

Descriptors: Water pollution, *Pollutant identification, *Chromatography, Waste water, Water pollution sources, *Analytical techniques, Trace elements, Organic wastes, Metals.
Identifiers: High Pressure Liquid Chromatography(HPLC), Detectors.

A continuing study of the application of High Pressure Liquid Chromatographic (HPLC) techniques to water pollution problems is reported. This effort was concerned with the procedures, column materials, and detectors needed to establish reliable and accurate identification of trace organics and metal ions present in natural waters as a consequence of industrial discharges from Air Force installations. Developmental data on three new detection systems--an ultrasonic velocity detector, a beta-induced luminescence detector, and a specific solid-state silver-ion detector--are given. Preliminary results of work on separations in natural waters and in sewage effluents using HPLC techniques and an extensive literature survey on HPLC are also included. (Sinha-OEIS)
W77-11908

SHIPBOARD OIL-IN-WATER MONITOR,
Beckman Instruments, Inc., Anaheim, Calif. Advanced Technology Operations.
J. Bordeaux.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 785, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. FR-2677-101 to Naval Sea Systems Command, Washington, D.C., July 1976. 56 p, 22 fig, 4 tab. N00024-74-C-5445.

Descriptors: *Monitoring, *Oil pollution, Oily water, *Pollutant identification, *Reflectance, Water pollution control, Water quality control, Analytical techniques, Automation, Equipment.

The design, fabrication and testing of an automated oil-in-water content monitor is reported. A design concept was selected for development which contains the analytical features of the standard laboratory technique for measuring oil content in water. This involved solvent extraction of the oil and subsequent measurement of the infrared energy absorbed by the C-H bond using attenuated total reflectance. Automation of the process was to be done by saturating a tape with solvent, impinging the oil/water sample onto the tape, allowing the oil to be extracted and migrate through the tape where, in contact with the surface of an internal reflecting element, IR absorption would occur in proportion to the amount of oil present. A safety hazards analysis revealed a potential solvent vapor problem. The practicality of separating oil from water and depositing it directly onto the tape was then determined. It was concluded that the limited engineering type tests conducted thus far were sufficient to show feasibility of the approach. While adequate sensitivity was apparent, it was found that control of several variables must be improved to achieve the specified level of accuracy. (Sinha - OEIS)
W77-11910

ELECTROCHEMICAL CHLORINE FLUX MONITOR,
National Bureau of Standards, Washington, D.C.
G. Marinenko.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-75-11197, Price codes: A02 in paper copy, A01 in microfiche. Patent Applications, Serial No 610,711, September 5, 1975. 13 p, 6 fig.

Descriptors: *Patents, *Monitoring, *Water quality, *Water quality control, Measurement, Chlorine, Calibrations, Instrumentation, Electronic equipment, *Water treatment, Pollutant identification.

The object of the invention is to provide an apparatus for measuring the concentration of chlorine in water which has a built-in, self-contained calibration means. A water sample is mixed with a solution of potassium iodide and the reaction produces a mole of iodine for every mole of chlorine present in the water. The mixture is passed through a detection and calibration assembly where the iodine is detected amperometrically by a detection cell. Calibrant (known) iodine fluxes, equivalent in effect to the unknown chlorine-produced iodine fluxes, are supplied to the detection cell during calibration runs by means of an upstream calibration cell which electrolyzes the iodine (preferably added to distilled water) to iodine at flux rates given simply by the electrolyzing currents divided by Faraday's constant. An electronics package having gain and offset controls and a concentration display is provided. (Sinha - OEIS)
W77-11915

COMPOSITE SAMPLING METHOD AND SYSTEM,
Department of the Interior, Washington, D.C.
E. J. Peterson.
Patent Serial Number 622,344, Filing Date 14, October 1975. 14 p, 3 fig.

Descriptors: *Patents, *Sampling, *Water sampling, Automation, On-site investigations, Flow, Effluents, Equipment, Pollution identification.
Identifiers: Fish hatchery effluent.

The invention provides a low cost, reliable, automatic composite sampler which periodically collects composite samples without technician intervention and which collects samples not altered or biased. The composite sampler is comprised of a high velocity electric pump for drawing fluid such as water from a high velocity hatchery discharg into a sample chamber having inlet and outl valves controlled by a negative hydraulic pressur During a sampling cycle, the negative hydrauli pressure in the sample chamber, generated by th pump, opens an inlet valve and an outlet valve the chamber to establish high velocity fluid flo from the sampling point at the discharge, throug the sample chamber and pump, and back to reservoir. The fluid is drawn into the samp chamber at a flow velocity equal to or greater tha the flow velocity of the fish hatchery discharge avoid biasing the samples. When the pump is d energized at the end of the sampling cycle, th force of gravity and back pressure close the inl and outlet valves and open a second outlet valve the sample chamber to drain the contents of th chamber to a collection container. (Sinha-OEIS)
W77-11920

EVALUATION OF POTABLE WATER AS VEHICLE OF TRANSMISSIBILITY AND VI BILITY FOR HERPESVIRUS,
North Dakota State Univ., Fargo. Dept. of Virol gy and Pharmacology.
For primary bibliographic entry see Field 5B.
W77-11935

THE DIFFERENTIATION OF INORGANIC AN ORGANOMERCURY SPECIES IN AQUEOU SAMPLES,
North Dakota Univ., Grand Forks. Dept. Chemistry.
R. Baltisberger.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-272 43 Price codes: A03 in paper copy, A01 in microfich North Dakota Water Resources Research I stitute, Fargo, Completion Report, WI-221-041-7 July 1977. 34 p, 7 tab, 2 fig, 14 ref. OWRT A-05 NDAK(1), 14-34-0001-7071, 14-34-0001-7072.

Descriptors: *Analytical techniques, Aqua microorganisms, *Cations, *Mercury, Meta *Water analysis, Water quality standard *Pollutant identification, *Spectrophotometry.
Identifiers: Mercury compounds, Methylmercur

Mercury in environmental water samples can ex in several forms such as Hg2+, Hg2+, Hgo a CH3Hg+. Methylmercury cation, CH3Hg+ formed by the methylation of Hg2+ by aqua microorgainsms. Metallic mercury (Hgo) has solubility of 3 x 10-7 moles/liter (60 ppb) at 25o a is in equilibrium with Hg2+ and Hg22+. The fo and form of mercury compounds in aqueous so tion involve complex interactions. In order adequately establish water quality standards f this element, it is desirable to have analyti techniques available capable of differentiation the exact forms of mercury in environmen water samples. An analytical technique w developed and tested for the measurement and d ferentiation of inorganic and organic mercury c tions in environmental samples and their ultim analysis by flameless atomic spectrophotomet The method is useful in the concentration ran from 10 to 100 ppb Hg22+, Hg2+ or Ch3Hg+.
W77-11936

CHANGES IN AQUATIC MACROPHYTES A COMPANYING PHOSPHORUS REDUCTION A EUTROPHIC LAKE IN NEW YORK STAT AN ASSESSMENT BASED ON REMOTEL SENSED AND OTHER DATA,
Cornell Univ., Ithaca, N.Y. Center for Envir mental Research.
B. L. Markham, W. R. Philipson, T. Liang, and I M. Green.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-272 4 Price codes: A04 in paper copy, A01 in microfic Completion Report, August 1977. 45 p, 17 fig tab, append. OWRT A-069-NY(1), 14-34-00 7067/7068.

Descriptors: *Remote sensing, *Aerial photography, *Aquatic plants, *Mapping, *Eutrophication, *Phosphorus, *Tertiary treatment, *Nutrient removal, *Pollutant identification.

Large scale, multi-year, color and color infrared aerial photographs were used to evaluate changes in aquatic vegetation that have accompanied a reduction in phosphorus inputs to a phosphorus-limited, eutrophic lake in New York State. The study showed the distribution of emergent, floating and submersed vegetation could be determined with little or no concurrent ground data; that various emergent and floating types could be separated and, with limited field checks, identified; and that different submersed types are generally not separable. Major vegetative types were characterized by spectral and non-spectral features, and a classification was developed for compiling time-sequential vegetation maps. Based on these maps, it was found that emergent and floating vegetation changed in composition but relatively little in total area, while the area of submersed vegetation increased fourfold. Although the cause(s) of the changes could be many, the photographic and limnological data suggest that the changes were not a consequence of decreasing phosphorus inputs to the lake.
W77-11940

EVALUATION OF PORCELAIN CUP SOIL WATER SAMPLERS FOR BACTERIOLOGICAL SAMPLING,
Florida Univ., Gainesville. Dept. of Microbiology; and Florida Univ., Gainesville. Dept. of Soil Science.
F. B. Dazzo, and D. F. Rothwell.
Applied Microbiology, V. 27, p 1172-1174, June, 1974. 1 fig, 7 ref.

Descriptors: *Soil water, *Sampling, *Bacteriology, Coliforms, Farm wastes, Pollutant identification.

The validity of obtaining soil water for fecal coliform analyses by porcelain cup soilwater samplers was examined. Numbers from samples of manure slurry drawn through porcelain cups were reduced 100- to 10,000,000-fold compared to numbers obtained from the external manure slurry, and 65% of the cups yielded coliform-free samples. Fecal coliforms adsorbed to cups apparently were released, thus influencing the counts of subsequent samples. Fecal coliforms persisted in soil water samplers buried in soil and thus could significantly influence the coliform counts of water samples obtained a month later. These studies indicate that porcelain cup soil water samplers do not yield valid water samples for fecal coliform analyses. (East Central)
W77-11968

NATURE AND IMPACT OF STREAM INPUTS ON A WATERSHED BASIS,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-11980

ALL-PLASTIC SUCTION LYSIMETERS FOR THE RAPID SAMPLING OF PERCOLATING SOIL WATER,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
B. F. Quin, and L. J. Forsythe.
New Zealand Journal of Science, Vol. 19, p 145-48, June, 1976, 2 fig, 11 ref.

Descriptors: *Lysimeters, *Soil water, Percolation, *Water sampling, Moisture content, Irrigation, Instrumentation, Waste water(Pollution), Sewage, Effluents, Sewage effluents, Groundwater, Sampling, Pollutant identification.
Identifiers: *All-plastic suction lysimeters.

The changes in composition of percolating soil and ground waters are of special interest in operations involving irrigation, particularly with waste waters and sewage effluents. Soil-water sampling techniques employing suction through a porous ceramic cup have come into increasing use in recent years, but have several disadvantages. These disadvantages are discussed. All-plastic suction lysimeters do not suffer from these disadvantages. Their construction and operation are described. The differences between permanent and removable lysimeters are also outlined. Conclusions are presented. The all-plastic suction lysimeters enable percolating soil water to be sampled rapidly for both chemical and microbiological analysis, without risk of contamination. (Jamail-Arizona)
W77-12005

EFFECTS OF ORAL ADMINISTRATION OF CADMIUM ON FISH - I. ANALYTICAL RESULTS OF THE BLOOD AND BONES, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
J. Koyama, and Y. Itazawa.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 5, p 523-526, 1977. 6 fig, 15 ref.

Descriptors: *Metals, *Cadmium, *Carp, Fish, *Fish physiology, Fish behavior, Biochemistry, Mode of action, Analytical techniques, Bioassay, Path of pollutants, Freshwater fish, Laboratory tests, Phosphorous compounds.
Identifiers: Bioaccumulation, Tissue analysis.

Carp were administered feed containing 0, 28, 140, 570, 1700, or 5700 ppm of Cd for 30 and 60 days. Alkaline phosphatase activity decreased, as well as Cd content in serum, vertebrae, and cranial and vertebral ash. Inorganic phosphate concentration in serum increased with increasing Cd content. Violent swimming behavior and tetany were observed in some of the fish. This activity was thought to be due to hyperexciteability of the nervous and muscle systems by low Ca and high inorganic P levels in the plasma. (Klein)
W77-12012

ORGANOCHLORINES AND HEAVY METALS IN THE HARBOUR SEAL PHOCASVITULINA FROM THE GERMAN NORTH SEA COAST,
Kiel Univ. (West Germany). Institut fuer Haustierkunde.
For primary bibliographic entry see Field 5C.
W77-12015

DETECTION OF TRACE CONTAMINANT EFFECTS IN AQUATIC ECOSYSTEMS,
Geological Survey, Menlo Park, Calif.
S. N. Luoma.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, p 436-439. 17 ref.

Descriptors: *Toxicity, *Insecticides, *Pesticides, *Metals, *Phytoplankton, Scenedesmus, Polychaetes, *Copper, *Cadmium, *Lead, *Zinc, Estuaries, Water pollution effects, Environmental effects, Resistivity, Chlorella, Pollutant identification.
Identifiers: Trace contaminant effects.

If one population of a species is more resistant to a toxicant than are other populations, it is direct evidence that the concentration of the toxicant in the environment of the resistant population is sufficient to elicit biological effects. The presence of a toxicant-resistant population of one species in an ecosystem further suggests that other species may have been affected by the resistance-eliciting substance. (Katz)
W77-12017

CRUSTACEAN ZOOPLANKTON COMMUNITIES AS INDICATORS OF LIMNOLOGICAL CONDITIONS: AN APPROACH USING PRINCIPAL COMPONENT ANALYSIS,
Toronto Univ. (Ontario). Dept. of Zoology.
W. G. Sprules.
Journal of the Fisheries Research Board of Canada, Vol 34, p 962-975, 1977. 4 fig, 6 tab, 36 ref.

Descriptors: *Zooplankton, *Statistical methods, *Sampling, *Analytical techniques, *Bioindicators, *Mathematical studies, Numerical analysis, Systematics, Limnology, Aquatic environment, Methodology, Crustacea, Pollutant identification.
Identifiers: Zooplankton communities, *Principal component analysis, *Multivariate analysis, Numerical taxonomy.

Principal component analysis was used to develop a technique for predicting the limnological characteristics of a lake from knowledge of its mid-summer limnetic crustacean zooplankton community. Patterns of variation in zooplankton community structure were summarized in the principal components extracted, via the species covariance matrix, from the matrix of transformed proportionate numerical abundances of species in a sample of lakes. The relation between these patterns and the limnological characteristics of the lakes was determined from the first-order rank correlations of the limnological variables with the components. These patterns were contrasted with those extracted from the same data using more subjective techniques. The usefulness of the technique and some modifications were discussed. (Katz)
W77-12029

EFFECT OF SHOCK EXPOSURES OF CHLORINE ON THE PLASMA ELECTROLYTE CONCENTRATIONS OF ADULT RAINBOW TROUT (SALMO GAIRDNERI),
Consumers Power Co., Jackson, Mich. Dept. of Environmental Services.
For primary bibliographic entry see Field 5C.
W77-12031

RELATIONSHIPS BETWEEN HEAVY METALS AND MAJOR CATIONS ALONG POLLUTION GRADIENTS,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W77-12033

DETERMINATION OF MERCURY IN FISH FROM RIVERS AND LAKES IN HUNGARY BY ATOMIC ABSORPTION TECHNIQUE,
Institute of Nutrition, Budapest (Hungary).
A. Gergely, K. Soos, L. Erdelyi, and V. Cieleszky.
Toxicology, Vol 7, p 349-355, 1977. 1 fig, 3 tab, 10 ref.

Descriptors: *Mercury, *Water pollution sources, *Analytical techniques, *Laboratory tests, *Chemical analysis, Metals, Public health, Water pollution, Heavy metals, Poisons, Pollutant identification, Path of pollutants, Wastes.
Identifiers: Tissue analysis, *Danube River(Hungary), *Atomic absorption technique.

In this study total mercury content in fish from rivers and lakes in Hungary was measured. The mercury content in fish muscle-tissue from 164 fish samples averaged 0.36 mg/kg. Average levels in different fish species ranged from 0.10 to 0.57 mg/kg. The amount of mercury in fish from rivers and lakes, with the exception of the Danube, was, in general, lower than the tolerance level (0.50 mg/kg) as adopted in many countries. Mercury levels in fish from Lake Belaton did not amount to more than 0.30 mg/kg. The circulating cold vapour atomic absorption method was used to determine the mercury content in the fish samples. (Katz)
W77-12037

A METHOD OF PRECALIBRATING RE-OXYGENATION RATES IN EXPERIMENTAL CONTAINERS,
Colorado Cooperative Fishery Unit, Fort Collins.
For primary bibliographic entry see Field 7B.
W77-12051

CHARACTERIZATION OF SUSPENDED PARTICLES IN SOME PULP AND PAPER MILL EFFLUENT PLUMES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W77-12058

A QUANTITATIVE STUDY OF THE INVERTEBRATE FAUNA OF THE RIVER TEES BELOW COW GREEN RESERVOIR,
Freshwater Biological Association, Cumbria (England). Cow Green Lab.
For primary bibliographic entry see Field 5C.
W77-12060

A NOTE ON TOXAPHENE IN ENVIRONMENTAL SAMPLES FROM THE CHESAPEAKE BAY REGION,
Westinghouse Ocean Research Lab., Annapolis, Md.
For primary bibliographic entry see Field 5B.
W77-12062

PERSISTENCE OF DISSOLVED ORGANIC COMPOUNDS IN KRAFT PULP AND PAPER MILL EFFLUENT PLUMES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W77-12065

ACUTE TOXIC EFFECTS OF TWO LAMPRICIDES TO TWENTY-ONE FRESHWATER INVERTEBRATES,
Bureau of Sport Fisheries and Wildlife, Millersburg, Mich. Hammond Bay Biological Station.
For primary bibliographic entry see Field 5C.
W77-12071

OCCURRENCE OF ESCHERICHIA COLI B BACTERIOPHAGES IN MUNICIPAL WASTEWATER AND THEIR REMOVAL AND INACTIVATION BY ACTIVATED SLUDGE SEWAGE TREATMENT,
Miami Univ., Fla.
E. G. Estevez.
PhD Thesis, 1976. 138 p.

Descriptors: *Coliforms, *E. coli, *Activated sludge, *Bacteriophage, *Sewage bacteria, Anaerobic digestion, Suspended solids, Sludge digestion, Chlorination, Microorganisms, Waste treatment, Waste water treatment.

A modified plaque assay was used to examine the occurrence of E. coli B bacteriophages during various stages of the activated sludge treatment process. It was observed that coliphages, associated with suspended solids, may increase during the treatment process. Settled solids were found to contain more than 10,000 plaque-forming units per milliliter. Coliform bacteria and coliphages were reduced during anaerobic digestion of sludge, and inactivated by physical rupture of the virions during adsorption to suspended solids. Survival of coliphages after heavy chlorination was reported. (Shulz-FIRL)
W77-12140

OPTIMIZATION AND EVALUATION OF A FLUORESCENCE OIL SPILL DETECTOR. VOLUME 2 - PROTOTYPE DESIGN,
Baird-Atomic, Inc., Bedford, Mass.
H. G. Eldering, and W. A. Webb.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A016 464, Price codes: A03 in paper copy, A01 in microfiche. U.S. Coast Guard Office of Research and Development Report No. CG-D-109-75, May 1975. 26 p, 5 fig, 2 tab. DOT-CG-43845-A.

Descriptors: *Oil spills, *Oil pollution, *Monitoring, *Remote sensing, *Water pollution sources, Fluorescence, Equipment.
Identifiers: *Outer Continental Shelf, Pollutant detection.

The operational and technical requirements of a low cost harbor surveillance unit is reviewed and the design of a Scanning Oil Spill Detector is described. Operational considerations such as coverage resulted in a design containing both azimuth and elevation scanning. The incremental cost of scanning is less that the cost of additional units needed to provide the additional coverage. Space has been allotted for an optional alarm reporter (FM transmitter) within the base. The unit is purged and pressurized with dry nitrogen to provide safe operation in explosive atmospheres. Field tests indicated a complex criterion is needed to achieve the desired false alarm rate of one per year. A low cost minicomputer is used to control scanning, alarm in the presence of oil, and provide an alarm if the detector malfunctions. (Sinha - OEIS)
W77-12145

WATERFOWL REFUGE EFFECT ON WATER QUALITY: II. CHEMICAL AND PHYSICAL PARAMETERS,
New Mexico Inst. of Mining and Technology, Socorro.
D. K. Brandvold, C. J. Popp, and J. A. Brierley.
Journal Water Pollution Control Federation, Vol. 48, No. 4, p. 680-687. April 1976. 9 tab, 10 ref. OWRT A-038-NMEX(5).

Descriptors: *Water quality, *Water pollution sources, *Eutrophication, *Wildlife, Water quality control, *Mercury, Fish, Chemical oxygen demand, Biochemical oxygen demand.
Identifiers: *Bosque del Apache Wildlife Refuge(NM), *Waterfowl, Socorro(NM).

The Bosque del Apache Wildlife Refuge south of Socorro (NM) was studied to determine effects of waterfowl on overall water quality. Eight sampling stations were established. Samples were taken between July 1970 and May 1973. Physical parameters were: pH, temperature, specific conductance, dissolved oxygen (DO), total dissolved solids (TDS) and sediment. Chemical parameters were: silica, dissolved phosphate, sulfate, nitrite, chloride, chemical oxygen demand (COD), mercury (organic and inorganic), total phosphate, bicarbonate, carbonate, sodium, potassium, calcium, magnesium, Kjeldahl nitrogen, ammonia, hydrolized nitrogen, urea, uric acid. Data were considered valid if the difference between the number of millequivalents of cations and millequivalents of anions was less than 10%. Water leaving the refuge was compared with water entering. Two general trends in fish analysis were observed: the larger and more carnivorous fish contained the most mercury, and since the liver and kidney absorb mercury, the muscle tissue that is eaten contains less mercury than is reported for the entire fish. Conclusions were: waterfowl decrease amounts of nitrogen compounds and available phosphorus and increase biological oxygen demand, suggesting potential eutrophication problems; wric acid collects in sediment and is absorbe d by plants since it is insoluble in the Rio Grande River; the high sediment concentration increases concentration of various chemicals through a process of absorption; salinity should be analyzed before impounded water is released; Kjeldahl nitrogen, nitrite, COD, BOD and phosphate should be monitored as indicators of eutrophication and oxygen deficit problems. (See also W77-02513) (Gentry - North Carolina)
W77-12148

HYDROLOGIC EVALUATION OF THE UPPER DUCHESNE RIVER VALLEY, NORTHERN UINTA BASIN AREA, UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-12158

CHAMBER FOR HOLDING AQUATIC MICROINVERTEBRATES DURING TOXICITY TESTS IN A FLOW-THROUGH DILUTER SYSTEM,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
G. M. DeGraeve, T. Crutzen, and R. W. Ward.
The Progressive Fish-Culturist, Vol 39, No 2, p. 100-101, 1977. 1 fig, 3 ref.

Descriptors: Research and Development, Design, *Methodology, Regulated flow, *Equipment, *Research equipment, Design criteria, Model studies, Aquatic microorganisms, Bioindicators, Invertebrates, Copepods, Toxicity, Mortality, Bioassay.
Identifiers: *Toxicity testing, *Flow-through diluter system, Microinvertebrates.

A test chamber to be used in conjunction with a flow-through diluter system and a standard egg incubation apparatus was designed to simplify bioassays with microinvertebrates. Design and construction criteria were described as well as operational procedures of the apparatus. Recovery of the microinvertebrates tested, including species of copepods, ostracods, and cladocerans, was estimated at 95%. (Katz)
W77-12185

TOXICITY BIOASSAYS WITH PERIPHYTON COMMUNITIES: DESIGN OF EXPERIMENTAL STREAMS,
Minnesota Univ.-Duluth. Dept. of Biology.
D. Z. Gerhart, S. M. Anderson, and J. Richter.
Water Research, Vol 11, p. 567-570, 1977. 6 fig, 1 tab, 4 ref.

Descriptors: *Toxicity, *Bioassay, *Periphyton, Design, *Methodology, *Diatoms, *Artificial water courses, Aquatic life, Technology, Biomass, Biological communities, Aquaria, Research and development, Aquatic microorganisms, Laboratory tests.
Identifiers: Experimental streams, Diatom community structure.

A method for conducting toxicity or enrichment bioassays using periphyton communities was described. Communities consisting of 35-55 species of diatoms are grown in plastic laboratory streams which may be operated as flow through or recirculating systems. Replication of community biomass, species composition and diversity in these streams was excellent, and the communities were easily sampled. The effects of nutrients, heavy metals or other soluble toxins may be assayed in experiments lasting 3-5 weeks. (Katz)
W77-12188

A BOTTLE HOLDER FOR IN SITU PRIMARY PRODUCTIVITY STUDIES,
Battelle Columbus Labs., Ohio. Ecology and Ecosystems Analysis Section.
R. D. Burkett, and D. R. Taylor.
The Progressive Fish Culturist, Vol 37, No 2, p. 112, 1975. 2 fig.

Descriptors: Design, Research and development, *Research equipment, Equipment, Costs, *Primary productivity, On-site investigations, *On-site data collections, On-site tests, Light intensity, Light penetration, Growth rates, Methodology.
Identifiers: Bottle holder, Incubation bottles.

A holder which supports bottles horizontally in the water column was fabricated. Such positioning was designed to increase primary productivity rates, allow in situ suspension, and maximize light incidence. Design, costs, and construction procedures were outlined. (Katz)
W77-12189

DEVELOPMENT OF ORGANIC SOLUTE AND TOTAL ORGANIC CARBON MONITORS,
Life Systems, Inc., Cleveland, Ohio.
R. J. Davenport, and R. A. Wynveen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 629, Price codes: A05 in paper copy, A01 in microfiche. Report LSI ER-285-3, June 1976. 75 p, 31 fig, 10 tab, 19 ref.

Descriptors: *Design, *Research and development, *Research equipment, *Methodology, *Monitoring, *Solutes, *Electrochemistry, Effluents, Control systems, Suspended solids, Wastes, Analytical techniques, Methodology, Oxygen demand.
Identifiers: *Electrochemical organic content analyzer, *Monitors.

The Electrochemical Organic Content (EOC) Analyzer and three New Technology Analyzers were conceptually designed and evaluated. The four analyzers were feasible approaches to monitoring organic solute concentrations in the effluent of the Water Processing Element (WPE) of the Medical Unit, Self-Contained, Transportable (MUST) Army field hospital. The New Technology Analyzers were the Electrochemical Total Organic Carbon (TOC) Analyzer, the Electrochemical Chemical Oxygen Demand (COD) Analyzer and the Electrochemical Total Oxygen Demand (TOD) Analyzer. The feasibility of a laboratory breadboard version of the EOC Analyzer was experimentally demonstrated. Results, conclusions and recommendations were presented. (Katz)
W77-12199

DOES LOW ENVIRONMENTAL PH INFLUENCE HEPATIC GROWTH IN FISH,
Oslo Univ. (Norway). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W77-12203

DISPOSABLE ELECTRODE CHAMBER FOR MEASURING OPERCULAR MOVEMENTS OF FATHEAD MINNOWS,
Environmental Research Lab.-Duluth, Minn.
R. A. Drummond.
The Progressive Fish-Culturist, Vol 39, No 2, p 94, 1977. 1 fig, 1 ref.

Descriptors: *Methodology, Research and development, *Research equipment, Design, *Design criteria, *Electrodes, Equipment, Fish, Fish behavior, Model studies, Fish physiology, *Respiration, *Minnows.
Identifiers: *Disposable electrode chamber, *Fathead minnow, Opercular movement.

A simple, disposable chamber to measure the opercular movements of fathead minnows, Pimephales promelas, was described. Design and construction criteria were presented as well as operational procedures and advantages for using this method. (Katz)
W77-12206

TEMPERATURE SAFETY DEVICE FOR AQUATIC LABORATORY SYSTEMS,
Environmental Protection Agency,-Duluth, Minn.
For primary bibliographic entry see Field 7B.
W77-12207

ELECTRONIC CONTROLLER FOR PRODUCING CYCLIC TEMPERATURES IN AQUATIC STUDIES,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
For primary bibliographic entry see Field 7B.
W77-12208

VERGLEICHENDE PRUFUNGEN DER FISCHTOXIZITATEN AN ELRITZEN FORELLEN UND GOLDORFEN (COMPARATIVE TESTS ON TOXICITY TO FISH USING MINNOWS, TROUT, AND GOLDEN ORFE), (IN GERMAN),
Farbenfabriken Bayer A.G., Leverkusen (West Germany).
B. Hamburger, H. Haberling, and H. R. Hitz.
Archiv fur Fischwissenschaft, Vol 28, No 1, p 45-55, 1977. 2 tab, 17 ref.

Descriptors: Freshwater fish, *Trout, *Minnows, *Toxicity, Mortality, Toxins, Salts, Metals, Dyes, Rainbow trout, Salmonids, Resistance, Metabolism, Path of pollutants, Bioassay, Environmental effects, Absorption, Methodology.
Identifiers: Bioaccumulation, Golden orfe, Comparative toxicity.

Statements on the effects of chemicals on fish are required more and more frequently. For this reason, the fish species used most commonly for tests at out latitudes, the minnow (Phoxinus laevis), and the rainbow trout (Salmo gairdnerii), and the golden orfe (Leuciscus idus L.), which have been used very frequently over the past few years, were subjected to a comparative test by seven companies in the chemical industry. The tests were carried out with three dyestuffs, three auxiliaries and one heavy metal salt. The golden orfe were tested using a static test in line with the German proposal for testing the effect of chemicals on fish, and the trout were tested using the US standard methods. The continuous test arrangement for trout followed the recommendations laid down by Alabaster, and the method submitted by the French Institut National Recherche Chimique Applique (IRCHA) in draft form was used for the minnows. The results of these tests indicated that minnows, trout and golden orfe normally show similar sensitivity. (Klein)
W77-12212

SEALED-JAR BIOASSAYS FOR PULPMILL EFFLUENT TOXICITY: EFFECTS OF FISH SPECIES AND TEMPERATURE,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
M. R. Gordon, and D. J. McLeay.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 1389-1396, 1977. 3 fig, 1 tab, 29 ref.

Descriptors: *Bioassay, *Pulp wastes, *Effluents, *Toxicity, *Salmonids, *Salmon, *Temperature, Research equipment, Water quality, Water pollution sources, Mortality, Industrial wastes, Methodology, Rainbow trout, Laboratory tests.
Identifiers: *Coho salmon, *Sealed-jar bioassays.

To standardize the sealed-jar bioassay for optimum sensitivity to whole bleached kraft pulpmill effluent, experiments were designed to assess the effects of test temperature, acclimation temperature, and fish species. Coho salmon (Oncorhynchus kisutch) conformed to a previously recognized test paradigm by showing progressively decreased oxygen utilization with increasing toxicant concentrations; however, rainbow trout (Salmo gairdneri) did not. In concentrations of effluent less than 1.5 LC50, rainbow trout used significantly more oxygen than control groups, while coho salmon used significantly less oxygen. The sensitivity of these responses was influenced by test temperature and acclimation temperature. Results for coho confirmed that this species was most sensitive to effluent when tested at ambient room temperature. Both species showed significantly decreased oxygen utilization in effluent concentrations greater than 1.5 LC50 irrespective of test temperature or acclimation temperature. The significance of these responses is discussed and the applicability of sealed-jar bioassays or assessing the acute toxicity of pulpmill effluents is reviewed. (Katz)
W77-12221

MERCURY LEVELS IN FRESHWATER FISH OF THE STATE OF SOUTH CAROLINA,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
A. K. Koli, W. R. Williams, E. B. McClary, E. L. Wright, and T. M. Burrell.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 1, p. 82-89, 1977. 2 fig, 2 tab, 11 ref.

Descriptors: *Metals, *Mercury, *South Carolina, *Freshwater fish, *Sampling, Fish physiology, Carp, Bass, Catfishes, Rivers, Lakes, Ponds, Seasonal, Path of pollutants, Water pollution, Bioindicators, Pikes.
Identifiers: Bioaccumulation, Tissue analysis, Redbreast, Shad, Crappie, Mudfish, Savannah River, Edisto River, Lake Keowee, Lake Secession, Lake Murray.

Samples of fish from freshwater sources of rivers, lakes, and ponds all over South Carolina were collected during the summers of 1974 and 1975. The fish collected were bass, bluegill, redbreast, catfish, shad, carp, crappie, mudfish, and pike. Species for which fish of widely differing weights were analyzed, larger fish had higher mercury levels. Mercury levels exceeding the USDA guidelines were found in specific areas. Higher levels of mercury occurred in the highly vascularized blood tissues of liver and kidney than in muscle. Carnivorous and bottom-feeding fishes were the most reliable indicators of mercury pollution. (Katz)
W77-12223

SYNCHRONOUS FLUORESCENCE SPECTROSCOPY AND ITS APPLICATION TO INDIGENOUS AND PETROLEUM-DERIVED HYDROCARBONS IN LACUSTRINE SEDIMENTS,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanography.
S. G. Wakeham.
Environmental Science and Technology, Vol. 11, No. 3, p. 272-276, 1977. 4 fig, 30 ref.

Descriptors: *Analytical techniques, Organic compounds, *Oil, *Fuels, *Fluorescence, *Chromatography, *Spectorscopy, Lakes, Chemistry, Chemical reactions, Chemical properties, Fluorometry, Oil spills, Water pollution effects, Washington.
Identifiers: *Synchronous fluorescence spectroscopy, Chemical characterization, *Lake Washington(Wash).

A comparison of conventional fluorescence emission spectra and spectra produced by synchronously scanning both excitation and emission monochromators was made on a series of standard oils to demonstrate the increased resolution achieved by the synchronous technique. Greater information on the aromatic content of the oils was obtained by separating the aromatic hydrocarbon fractions by liquid-solid column chromatorgraphy prior to fluorescence analysis. Fluorescence spectroscopy, in particular the synchronous method, was used to characterize the indigenous and petroleum-derived aromatic hydrocarbons in sediments of lake Washington, Wash. (Katz)
W77-12225

FIELD STUDIES OF SHELL REGROWTH AS A BIOINDICATOR OF EASTERN OYSTER (CRASSOSTREA VIRGINICA GMELIN) RESPONSE TO 2,4-D BEE IN MARYLAND TIDEWATERS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
C. K. Rawls.
Chesapeake Science, Vol 18, No 3, p 266-271, 1977. 2 fig, 1 tab, 3 ref.

Descriptors: *Crustaceans, *Oysters, Animal physiology, *Bioindicators, Organic compounds, *Chlorinated hydrocarbon pesticides, *Pesticides, Path of pollutants, Growth rates, Environmental effects, Bioassay, Invertebrates, Commercial shellfish, Maryland, Tidal waters.
Identifiers: *Shell regrowth, *2-4-D BEE, *Eastern oyster, *Crassostrea virginica, Tissue analysis.

New growth was filed from eastern oyster (Crassostrea virginica) shells and wire trays holding 25 oysters each were exposed to the butoxyethanol ester of 2,4-dichlorophenoxyacetic acid (2,4-D BEE) at rates of either 22.5, 33.75 or 67.5 kg ae (acid equavalent)/h (20, 30, or 60 lb ae/acre). Regenerated shell growth was measured to determine the effect of herbicide application on the oyster. Two sites were used: a double-pond area with narrow inlet and outlet, and an open bay. Plant control was noted. Under the conditions of the study oyster shell regrowth or replacement did not reflect adverse reactions to the level of herbicide applied. It appeared that 2,4-D BEE in Maryland probably can be used safely to clear oyster beds of eurasian watermilfoil (Myriophyllum specatum) prior to fall osyter harvest. (Katz)
W77-12233

A 96-HOUR SEDIMENT BIOASSAY OF DULUTH AND SUPERIOR HARBOR BASINS (MINNESOTA) USING HEXAGENIA LIMBATA, ASELLUS COMMUNIS, DAPHNIA MAGNA, AND PIMEPHALES PROMELAS AS TEST ORGANISMS,
Heidelberg Coll., Tiffin, Ohio. Dept. of Biology; and Heidelberg Coll., Tiffin, Ohio. River Studies Lab.
B. C. Prater, and M. A. Anderson.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 2, p 159-169, 1977. 2 fig, 6 tab, 5 ref.

Descriptors: *Sediments, Sampling, Water quality, *Toxicity, *Chemistry, *Bioassay, *Chemical analysis, *Physiochemical properties, Soil analysis, Mayflies, Bioindication, Mortality, Inorganic compounds, Plankton, Phytoplankton, Fish, Daphnia, Minnows, Lake Superior, Ecosystems, Minnesota, Pollutant identification.
Identifiers: Fathead minnows, Duluth(Minn), Bioaccumulation, Hexagenia, Asellus, Pimephales.

Sediment bioassays were conducted on eight sediments collected from Duluth and Superior Harbors. The stations were chosen to reflect areas that were suspected to be heavily polluted, moderately polluted, and nonpolluted. A correlation was drawn between the percent mortality of biological test organisms and bulk chemistry data. (Katz)
W77-12240

DISTRIBUTION OF N-PARRAFINS IN SELECTED MARINE BENTHIC ORGANISMS,
Texas A and M Univ., College Station. Dept. of Chemistry.
C-S. Giam, H. S. Chan, and G. S. Neff.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 1, p 37-43, 1976. 5 fig, 7 ref.

Descriptors: *Benthic fauna, *Organic compounds, *Invertebrates, Distribution, Animal physiology, Speciation, Metabolism, *Shrimp, Fish, Mollusks, Baseline studies, Gas chromatography, Analytical techniques.
Identifiers: *Squid, *Parrafins, Bioaccumulation, Tissue analysis.

Gas chromatography was used to quantitate the hydrocarbons present in organisms (squid, shrimp, and fish) collected from various sites. All of the organisms had high concentrations of the C-15 and C-17 N-parrafins of of the C-31 compound or both. Shrimp and wenchmen samples appeared to exhibit the least intraspecies and seasonal variation relative to their distribution of n-parrafins. The rise of overall distribution in addition to the odd/even ratios of hydrocarbons for baseline monitoring of hydrocarbon content was recommended. (Klein)
W77-12241

CHARACTERIZATION OF POLYCHLORINATED BIPHENYL DISTRIBUTION IN THE MARINE ENVIRONMENT,
Washington Univ., Seattle. Dept. of Oceanography.
R. N. Dexter, and S. P. Pavlou.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 4, p 477-482, 1976. 2 fig, 2 tab, 13 ref.

Descriptors: *Distribution patterns, *Analytical techniques, *Spectroscopy, *Chemical analysis, *Polychlorinated biphenyls, *Organic compounds, Laboratory tests, Research and development, Analysis, Chemistry, Technology, Aroclor, Water quality, Methodology, *Pollutant identification, Path of pollutants.

A spectral analysis technique was presented that was uniquely advantageous in describing environmental chlorobiphenyl distributions. It was based on easily determined empirical parameters, could be readily tailored to most laboratory systems, and could effectively remove ambiguities in chlorobiphenyl quantitation. (Klein)
W77-12242

ANALYSIS OF HEAVY METALS AND BACTERIA IN SEDIMENTS FROM DANISH LIGNITE PITS,
Copenhagen Univ. (Denmark). Inst. of Hygiene.
E. Fjerdingstad, E. Fjerdinstad, and F. Popea.
Archiv fur Hydrobiologie, Vol 77, No 2, p 226-253, 1976. 6 fig, 8 tab, 40 ref.

Descriptors: Metals, *Heavy metals, *Sediments, *Bacteria, *Lignite, Water pollution sources, Mining, Organic matter, Mine wastes, Mine drainage, Productivity, Analytical techniques, Physiochemical properties, Hydrogen ion concentration, Iron thiobacillus ferroxidans.
Identifiers: *Lignite pits, *Denmark.

Samples of sediment were drawn from some old, open lignite pits and investigated with a view to establishing the occurrence of trace elements. Iron constituted about 50% of the dry weight of these samples. Extensive investigations of the occurrence of acid thiobacilli were likewise made. With the only exception of T. ferro-oxidans, the species were determined on the basis of the pH-value after 28 days of incubation. There was found to be a great disparity in number as regards bacteria cultivated in sulfur medium and bacteria cultivated in thiosulfate medium. A reason for this might be that heavy metal sulfides were sparingly soluble in a sulfur medium whereas the complexes formed in the thiosulfate medium are more easily soluble. (Klein)
W77-12250

5B. Sources Of Pollution

PARTITIONING OF POLYCYCLIC AROMATIC HYDROCARBONS BETWEEN DISSOLVED AND PARTICULATE PHASES IN NATURAL WATERS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
S. E. Herbes.
Water Research, Vol. 11, (1977), p 493-496. 3 fig, 17 ref. LAG-D5-E681.

Descriptors: Environmental effects, *Water pollution effects, *Organic compounds, *Aromatic compounds, Adsorption, Food chains, Natural streams.
Identifiers: Polycyclic aromatic hydrocarbons.

Polycyclic aromatic hydrocarbons (PAH) have often been assumed to exist entirely in particulate form in natural waters. The present research was intended to quantitate adsorption characteristics of a representative PAH compound onto organic particulate material and to identify critical adsorption parameters. Anthracene was chosen as a model PAH compound. The results indicated that a significant fraction (0.15-0.65) of anthracene would be associated with detrital and living organic matter in natural waters containing moderate levels of suspended organic solids. Due to structural similarities, other PAH compounds may be expected to partition in a similar manner and substantial fractions of both dissolved and particulate PAH phases may thus be anticipated in natural waters. Rates of uptake and bioaccumulation of both forms must be examined to determine potential hazards of PAH throughout aquatic food chains and ultimately to terrestrial consumers, including man. (Chilton-ORNL)
W77-11504

THE ACCUMULATION OF MERCURY BY THE THORNBACK RAY, RAJA CLAVATA L.,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5C.
W77-11507

THE ACCUMULATION OF MERCURY FROM FOOD BY THE PLAICE, PLEURONECTES PLATESSA L.,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5C.
W77-11508

HEAVY METALS IN WATER, SEDIMENTS, AND CHIRONOMIDS,
TECHRAD, Inc., Oklahoma City, Okla.
H. Namminga, and J. Wilhm.
Journal Water Pollution Control Federation, Vol. 49, No. 7, July 1977, p 1725-1731. 3 tab, 34 ref.

Descriptors: Environmental effects, *Water pollution sources, *Heavy metals, *Sediments, *Diptera, Copper, Chromium, Lead, Zinc, *Oklahoma.
Identifiers: *Skeleton Creek(Okla).

Longitudinal variation in the concentrations of copper, chromium, lead, and zinc in water, sediments, and chronimids in Skeleton Creek, Oklahoma were measured and concentrations were compared in cool and warm seasons. Temperature ranged from 1 to 12 C on the two winter sampling days and from 25 to 29 C on the summer days. Mean concentrations for copper, chromium and zinc in water were 4.1, 1.1, and 9.1 microg/l respectively, with concentrations being generally higher in February than in August. Concentrations of copper, chromium, lead, and zinc in sediments were 1.8, 5.2, 3.5, and 9.2 microg/l, respectively with concentrations being generally higher in summer than in winter. Copper, chromium, lead and zinc concentrations in chironimids were 1.91, 2.96, 1.32, and 57.05, respectively. (Chilton-ORNL)
W77-11510

MERCURY IN BOTTOM SEDIMENTS OF RIETVLEI RESERVOIR,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Chemistry.
E. M. Veres, and R. A. Hasty.
South African Journal of Science, Vol 72, March 1976, p 86-87. 1 fig, 1 tab, 11 ref.

Descriptors: *Water pollution sources, Industrial wastes, Farm wastes, *Mercury, Sediments, Reservoirs, Africa.
Identifiers: *Rietvlei Reservoir(South Africa).

Core samples of sediments were taken from Rietvlei Reservoir at four stations. Results from these samples showed mercury concentrations ranging from 0.1 to 0.5 microg/g of dry sediment. Higher concentrations were found in the main channel flowing from the catchment area. Generally, there was little variation of concentration with depth of sediment, which indicates a constant level of mercury flowing into the impoundment over the period of build-up of the bottom sediments. This pattern is in contrast to that found in sediments from other industrial or urban areas. (Chilton-ORNL)
W77-11512

STUDIES ON APPEARANCE MECHANISM OF RICE PLANT DAMAGE BY IRRIGATION WATER POLLUTED WITH NITROGEN COMPOUNDS, (IN JAPANESE),
Tokai-Kinki National Agricultural Experiment Station, Tsu (Japan).
Y. Tokunaga, Y. Honjho, and J. Asano.
Bull Tokai-Kinki Natl Agric Exp Stn. 24, p 151-180, 1972.

Descriptors: *Nitrogen compounds, *Irrigation water, *Rice, Water reuse, Water pollution sources, *Plant growth.

There were 2 effects, the direct effect of polluted water-N (N contained in polluted water) and the indirect effect of polluted soil-N (N mineralized from soil organic N which was accumulated by irrigation with polluted water). These 2 effects had different actions on plant growth. The amount of NH4-N mineralized in polluted soil by incubation under the waterlogged condition at 30 C was greater than in non-pollutd soil and the ratio of NH4-N mineralized at 20 C to NH4-N mineralized at 30 C in polluted soil under the same condition was higher than in non-polluted soil. The amount of NH4-N in paddy soil was influenced mainly by fertilizer-N (N given as basal fertilizer) then by polluted soil-N and lastly by polluted water-N. In relation to growth stage the degree of the effects was fertilizer-N > polluted soil-N > polluted water-N at the maximum tillering stage, polluted soil-N > fertilizer-N > polluted water-N at and after the period of young panicle formation. Fertilizer-N increased plant height and number of tillers in the early growth stage, polluted soil-N increased plant height, number of tillers and culm length in the middle stage and polluted water-N increased culm length and lowered ripening qualities in the late stage. Polluted soil-N and polluted water-N increased the growth and N concentration of the plant. If the N supply was excessive the yield was reduced, the amount of polluted water-N was equivalent to 5 kg per 10a as basal fertilizer, that of polluted soil-N equivalent to 10 kg per 10a (1969), and that of polluted soil-N equivalent to above 5 kg per 10a (1970). Analysis of variance of absorbed amounts of N showed that the amount of polluted water-N was about 5 kg and that of polluted soil-N was 8 or 9 kg per 10a. N-Accumulation by non-polluted soil after a 2 yr period of irrigation with polluted water was not detected from results of incubation, fractionation of organic N of soil and growth and yield of rice plant. A small cleansing of polluted soil by a 2 yr period of irrigation with non-polluted water was indicated by the results of air drying effect and fractionation of organic N of soil. The soil kept the nature of polluted soil, high NH4-N mineralization, much total N and much nondistillable-acid soluble N.--Copyright 1974, Biological Abstracts, Inc.
W77-11515

SOIL AERATION, NITRATE REDUCTION AND FLOODING TOLERANCE IN HIGHER PLANTS,
Seville Univ. (Spain). Dept. of Ecology.
For primary bibliographic entry see Field 3C.
W77-11517

DISTRIBUTION OF CADMIUM, ZINC AND COPPER IN THE MUSSEL MYTILUS EDULIS. EXISTENCE OF CADMIUM-BINDING PROTEINS SIMILAR TO METALLOTHIONEINS,
Liege Univ. (Belgium). Laboratoire de Biologie Generale; and Liege Univ. (Belgium). Laboratoire d'Oceanologie.
For primary bibliographic entry see Field 5C.
W77-11519

THE COMMON MUSSEL MYTILUS EDULIS AS INDICATOR FOR THE LEAD CONCENTRATION IN THE WESER ESTUARY AND GERMAN BIGHT, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5A.
W77-11520

TRACE ELEMENTS IN ACARTIA CLAUSI FROM ELEFSIS BAY OF THE UPPER SARONIKOS GULF, GREECE,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
For primary bibliographic entry see Field 5C.
W77-11521

THE DEPTH OF PENETRATION WITH WATER OF THE PESTICIDE BHC IN THE PRESENCE OF SULFANOL INTO THE GROUND, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikriobiologii i Gigieny, Vilnius (USSR).
E. M. Shtarkas.
GIg Sanit. 37(2), p 106-108, 1972.

Descriptors: *Pesticides, Depth, Spatial distribution, *Adsorption, Soils, *Soil analysis, *Path of pollutants, Water pollution.
Identifiers: *BHC, Granulometric composition(Soils), *Sulfanol.

An experimental model consisting of a filtration column 2.67 cm high with a diameter of 0.4 m was constructed. Stopcocks were arranged at a vertical distance of 50 cm. The column was filled with soil with coarse (2 and 20 mg/l) and sulfanol (5 mg/l) were added to pure aqueduct water. Soil was contaminated 4 times with BHC and sulfanol (or their binary mixture). BHC was determined by thin-layer chromatography; sulfanol was determined by a modification of the Longwell and Maniece method. Water samples of BHC and (242) of sulfanol (133) were studied. Soil was impregnated with BHC at varying concentrations with or without sulfanol and contaminated to various depths in 4 steps. The depth of penetration of BHC depends on the granulometric composition of the soil; the contaminating does of BHC in the original water affects its concentration in water filtering through the experimental unit. In coarse soil, BHC with water in the presence of sulfanol penetrates deeper at higher concentration than without sulfanol. In finer soil, BHC with water in the presence of sulfanol penetrates mainly at lower concentrations than without sulfanol, which is apparently explained by a change in the adsorptive capacity of the particles as a result of foaming. BHC is not stably bound to soil particles and may occasionally be washed off with water in deep soil.--Copyright 1974, Biological Abstracts, Inc.
W77-11523

INTERFACIAL REACTIONS AND THE FATE OF HEAVY METALS IN SOIL-WATER SYSTEMS,
Delaware Univ., Newark.
C. P. Huang, H. A. Elliott, and R. M. Ashmead.
Journal Water Pollution Control Federation, Vol 49, No 5, May 1977, p 745-756. 8 fig, 1 tab, 32 ref.

Descriptors: *Water pollution sources, *Heavy metals, Interfaces, *Earth-water interfaces, Chemistry, Adsorption, Chemical precipitation, Soil chemistry, Solubility.

The processes and factors that govern the fate of heavy metals in the soil-water system are identified as dissolution-precipitation and adsorption. The congruent and incongruent solubility of oxides, hydroxides, sulfates, sulfides, and carbonates of heavy metals contributes to the chemical constituents of soil-water. The process is influenced by pH, redox potential, the amount of carbonate and sulfur present and the presence of organic substances. The formation of metal-chelates or metal complexes can render metal solids more soluble. Microorganisms, whose metabolic activities tend to modify the redox potential and contribute organic acids can influence the solubility of metal solids. Interfacial association between heavy metals and soil minerals is considered the most important process in regulating the concentration of heavy metals in the soil-water environment. Copper and zinc are more removable than lead and cadmium. When the solid surfaces are very positively charged, positive lead and cadmium ions are expelled away from the interface and result in an excess of metal ions in the bulk phase of the soil-water system. (Chilton-ORNL)
W77-11524

CONTENT OF PLUTONIUM, THORIUM AND PROTACTINIUM IN SEA WATER AND RECENT CORAL IN THE NORTH PACIFIC,
Kanazawa Univ. (Japan). Radiochemistry Lab.
For primary bibliographic entry see Field 5A.
W77-11527

DISTRIBUTION OF PLUTONIUM-237 IN A LITTORAL FRESHWATER MICROCOSM,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
J. R. Trabalka, and L. D. Eyman.
Health Physics, Vol 31, October 1976, p 390-393. 1 tab, 13 ref.

Descriptors: *Water pollution effects, Environmental effects, *Distribution, *Plutonium, Microenvironment, *Radioisotopes, *Path of pollutants.

Water in a year-old aquatic microcosm was spiked with 11 microCi of plutonium-237 nitrate. The initial water concentration (at 30 min after spike administration) was 1590 plus or minus dpm/g. A materials balance for the microcosm at 90 days provided the following estimates: 0.001% in the water, 0.04% in biota, and over 99.9% in sediments. It was concluded that the microcosm appears to be a highly useful tool in ecological studies of highly toxic material such as plutonium. (Chilton-ORNL)
W77-11530

CHARACTERISTICS OF POULTRY PROCESSING EFFLUENT,
Rockingham Poultry Market Coop., Inc., Broadway, Va.
S. P. Singh, R. Lewis Wesley, and E. A. Budd.
Poult Sci. 52(4), p 1478-1481, 1973.

Descriptors: *Industrial wastes, *Effluents, Dissolved oxygen, Suspended solids, Hydrogen ion concentration, *Biochemical oxygen demand, Poultry, *Waste water treatment.
Identifiers: Effluent, *Poultry processing wastes.

Raw effluents from 4 broiler processing plants were analyzed for BOD5 (biochemical oxygen demand), suspended solids, pH, and dissolved O2. Analytical procedures were conducted in a central independent laboratory. Variability was greatest in dissolved O2 and least in pH. A variety of factors influence the composition of raw effluents from broiler processing plants. This information should help in designing waste treatment systems for the processing industry.—Copyright 1974, Biological Abstracts, Inc.
W77-11531

DISTRIBUTION OF CADMIUM AND LEAD IN A STREAM ECOSYSTEM,
Bradley Univ., Peoria, Ill. Dept. of Biology.
M. D. Enk, and B. J. Mathis.
Hydrobiologia, Vol 52, No 2-3, 1977, p 153-158. 3 fig, 2 tab, 16 ref.

Descriptors: *Environmental effects, *Water pollution sources, Lead, Cadmium, Streams, Fish, Insects, Snails, Sediments, *Path of pollutants, Ecosystems.

Fish, insect, snail, water and sediment samples were analyzed for lead and cadmium. Cadmium was present in all components analyzed. Its concentration in water was less than 0.02 ppm. Cadmium concentration was highest in aquatic insects and was present in similar amounts in fish and sediments. Lead was also present in all components analyzed with a water concentration of less than 0.5 ppm. Concentrations of lead were higher in snails than in other components, similar in sediments and aquatic insects but higher than in fish. Concentrations of both lead and cadmium generally increased from water to fish to sediments to aquatic invertebrates. (Chilton-ORNL)
W77-11533

UPTAKE OF ZINC, LEAD, AND CADMIUM BY YOUNG WHITING IN THE SEVERN ESTUARY,
Bath Univ. (England).
For primary bibliographic entry see Field 5C.
W77-11537

ALUMINUM-26 IN DEEP-SEA SEDIMENT,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivites.
J. L. Reyss, Y. Yokoyama, and S. Tanaka.
Science, Vol 193, September 1976, p 1119-1121. 2 tab, 12 ref.

Descriptors: Environmental effects, *Sediments, *Pacific Ocean, *Radioisotopes, *Aluminum, Radioactivity, *Path of pollutants.
Identifiers: Cosmic dusts.

A126 activity in a core sample from the North Pacific was measured. The samples were A1203 extracted from a red clay core from a depth of 5439 m. The activity was found to be 0.081 plus or minus 0.046 disintegration/minute/kilogram of dry sediment. This measurement corresponds to a A126/Be10 ratio of 0.018 plus or minus 0.011 which is in good agreement with that measured in Greenland ice. It was concluded that since the observed ratios are in agreement with predicted ratio of 0.013 plus or minus 0.006 for the production by cosmic rays in the atmosphere, the postulated high influx of A126 with cosmic dust should be reconsidered. The contribution of cosmic dust bearing A126 would appear to be small in comparison with the production of this nuclide in the atmosphere. (Chilton-ORNL)
W77-11538

RADIOISOTOPE TECHNIQUES IN DELINEATION OF THE ENVIRONMENTAL BEHAVIOR OF CADMIUM,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
R. I. Van Hook, Jr., B. G. Blaylock, E. A. Bondietti, C. W. Francis, and J. W. Huckabee.
Environmental Quality and Safety, Global Aspects of Chemistry, Toxicology and Technology as Applied to the Environment, Vol 5, 1976, p 167-182. 6 fig, 7 tab, 28 ref.

Descriptors: Environmental effects, Behavior, *Cadmium, Analytical techniques, *Radioisotopes, Aquatic environment, Distribution, Sediments, Soils, Vegetation, Food chains, Absorption.

Tracer techniques using Cd109 to provide information on biogeochemical cycling and distribution of cadmium in the environment are discussed. Results of experiments indicated that in lake and river sediments the clay minerals adsorb Cd (-2) with increasing strength as pH is increased. Plant uptake studies indicated that the cadmium-soil reaction products are influenced by pH, chemical form of the element, and the presence of other ions. Plant distribution studies showed cadmium to be most available to animals whose food base was litter or detritus. Stream tagging experiments demonstrated cadmium to be accumulated by animals to a lesser extent than methylmercury. In land-water studies, the majority of the cadmium added via atmospheric input was found to be tied-up in the soil while that going into aquatic systems accumulated in sediments. (Chilton-ORNL)
W77-11541

LET'S TALK RUBBISH PART 3: LITTER,
P. B. Publico.
Municipal Engineer, Vol. 7, No. 2, p 67-71, 1976.

Descriptors: *Waste disposal, *Litter, *Municipal wastes, Concrete pipes, Education, Attitudes, Cleaning, Environmental effects, *Solid wastes.
Identifiers: South Africa.

The extent of littering and possible preventive measures are discussed by the author. Examples of anti-litter campaigns, fines, publicity and education are presented. The author concludes that most of these measures have only a short-term effect, and that the solution to the litter problem lies in the provision of comprehensive waste collection services, and the positive anti-litter conditioning and education of children and adults, by participation in publicized clean-up projects, poster competitions, film shows and public awareness projects. (See also W77-10381) (So African Water Info Center)
W77-11545

EPIDEMICS OF WEST NILE AND SINDBIS VIRUSES IN SOUTH AFRICA WITH CULEX (CULEX) UNIVITTATUS THEOBALD AS VECTOR,
Department of Health, Johannesburg (South Africa). Arbovirus Research Unit.
For primary bibliographic entry see Field 5C.
W77-11547

ORGANIC MATTER AND PARATHION DEGRADATION IN FLOODED SOIL,
Central Rice Research Inst., Cuttack (India).
N. Sethunathan.
Soil Biol Biochem. 5(5), p 641-644, 1973.

Descriptors: *Organic matter, Flooding, Soils, *Hydrolysis, *Chemical degradation, Insecticides, Pesticides, Biodegradation.
Identifiers: *Parathion degradation, Rice straw.

The effect of rice straw on parathion degradation in a flooded alluvial soil was investigated. In soils inoculated with an enrichment culture which exhibited an exceptionally high ability to hydrolyze parathion, rice straw amendments inhibited parathion hydrolysis to p-nitrophenol and diethyl thiophosphoric acid. On the other hand, in uninoculated soils, rice straw enhanced the degradation of parathion via nitro reduction. During the enhanced breakdown of parathion in uninoculated soils amended with rice straw, aminoparathion and an unidentified metabolite evidently possessing a P=S bond were detected. Thus, the influence of organic matter on the persistence of parathion in flooded soil is governed by the metabolic pathway involved in the degradation.—Copyright 1974, Biological Abstracts, Inc.
W77-11561

MATHEMATICAL MODELLING OF THE MINERALIZATION OF RIVER SYSTEMS,
National Inst. for Water Research, Pretoria (South Africa).
A. H. Gorgens.
Water SA, Vol. 2, No. 1, p 13-19, 1976.

Descriptors: *Mathematical models, River systems, Hydrology, Hydrochemistry, Future planning, Mineralogy.
Identifiers: South Africa.

During 1974, the National Institute for Water Research of South Africa's Council for Scientific and Industrial Research initiated work on the development of mathematical models of the hydrology and mineralization of two South African multi-catchment river systems. These models mathematically synthesize the hydrology of the systems as influenced by human activities, and superimpose the characteristic hydrochemistry of the various mineral source areas in the catchments on it. Use of the models in the evaluation of the beneficial or detrimental effects of possible structural and operational remedial measures on the long-term mineralization is planned, the aim being delivery of water of acceptable chemical quality to future users in the areas. (So Africa Water Info Center)
W77-11570

METAL ENRICHMENT OF SEDIMENTS IN INLAND WATERS - THE JUKSKEI AND HENNOPS RIVER DRAINAGE SYSTEMS,
Pretoria Univ. (South Africa). Dept. of Chemistry.
G. T. Wittmann, and U. Forstner.
Water SA., Vol. 2, No. 2, p 67-72, 1976. 2 fig, 4 tab, 13 ref.

Descriptors: *Heavy metals, *Sediments, Distribution, Mercury, Lead, Cadmium, Zinc, Drainage basins.
Identifiers: Hartbeespoort Dam, Rietvlei Dam, Jukskei River, Hennops River, Moddersprui.

A preliminary investigation has been conducted to establish possible sources of heavy metal discharges into the Crocodile River, resulting in an enrichment of sediments from the south-eastern zone of the Hartbeespoort Dam with mercury, lead, cadmium and zinc. Despite heavy rainfall and ensuing floods which preceded the period of sediment sampling, significant heavy metal enrichment of the pelitic sediment fraction < 2microgram from the feeder streams, has been established: The Jukskei River fed by the Modderspruit, with drainage from a chemical industrial area, chiefly contributes toward the elevated levels of lead, cadmium and zinc found in the Crocodile River estuary; by contrast, the Hennops River, draining the highly industrialized Isando-Kempton Park area, transports high concentrations of mercury. (So African Water Info Center)
W77-11578

HYDROLOGIC RESPONSE AND NUTRIENT CONCENTRATIONS FOLLOWING SPRING BURNS IN AN OAK-HICKORY FOREST,
Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab.
For primary bibliographic entry see Field 4C.
W77-11613

CYANIDE MOBILITY IN SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
B. A. Alesii.
Master of Science thesis, 1976. 34 p, 7 fig, 5 tab, 23 ref.

Descriptors: *Chemical wastes, *Water pollution, *Water pollution sources, *Groundwater movements, *Toxins, Water quality, Soil properties, Soil water movement, Infiltration, Groundwater, Soil contamination, Soils, Leaching, Chemicals, Aquifers, Clays, Recharge, Groundwater recharge.
Identifiers: *Cyanide.

The frequency of groundwater pollution by hazardous toxic elements is steadily increasing in the United States. With existing pollution regulation forcing an increased volume of toxic chemical waste to the land for ultimate disposal, many aquifers in various regions of the United States may be in danger of serious water quality degradation if soils are not effective in preventing hazardous waste from migrating downward to the groundwater table when they are recharged by rainfall infiltration. Three solutions of cyanide were each leached through five soils of varying physical and chemical properties to evaluate which soil characteristics govern the movement of the various forms in soils. The results are presented. Four recommendations for preventing cyanide contamination of groundwater systems: (1) maintenance of the cyanide plant in good condition to avoid or reduce spills or leakage; (2) establishment of a good treatment system; (3) any cyanide remaining after treatment can be effectively filtered by the soil; results from experiments show that soil should be deep, have a clay texture high in iron oxide and kaolinitic type clay with low pH., and (4) the soil should be innoculated, if possible, by cyanide degrading organisms. (Jamail-Arizona)
W77-11619

THE EFFECT OF SALINITY OF QARUN LAKE ON THE ADJACENT SOIL,
Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
For primary bibliographic entry see Field 2H.
W77-11625

DISTRIBUTION OF NITRIFYING AND HETEROTROPHIC MICROORGANISMS IN CUTOVER PEATS,
For primary bibliographic entry see Field 5C.
W77-11651

A PRELIMINARY OCEANOGRAPHIC SURVEY OF THE DAMARISCOTTA RIVER ESTUARY, LINCOLN COUNTY, MAINE,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
R. J. McAlice.
Maine Sea Grant Technical Report No. TR-13-77, 1977. Also Ira C. Darling Center contribution No. 4. 35p, 16 fig, 9 tab, 32 ref, 8 infolds. SG-04-3-158-3.

Descriptors: *Maine, Surveys, *Estuaries, *Water quality, *Sediments, *Oceanography.
Identifiers: Damariscotta River estuary(Maine).

The Damariscotta River estuary is a narrow embayment which receives a limited amount of fresh water. The estuarine portion has a MLW volume of 123.4 x 106 m3, a tidal volume of 56.2 x 106 m3, and a mean summer flushing time of 4.5 weeks. The estuary is stratified near its head but approaches a well mixed condition further seaward. Seawater moving upstream at depth is important in the circulation. Surficial sediments are for the most part poorly to extremely poorly sorted, clayey to sandy silts. Rocky bottoms and lag deposits occur in high energy areas. Sediments are apparently modern extuarine deposits of local origin and reworked glacial material. Except for some bacterial pollution, sewage from Damariscotta and Newcastle has no noticable effect on water quality. Seasonal and spatial differences in temperature, salinity, dissolved oxygen and inorganic nutrients are discussed. (NOAA)
W77-11657

NEW YORK BIGHT PROJECT. PROJECT DEVELOPMENT PLAN AND TECHNICAL DEVELOPMENT PLAN.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
NOAA, ERL, Marine Ecosystems Analysis Program Office and Science Applications, Inc., Report, April 15, 1977. 227 p, 6 fig, 7 tab, 123 ref, append. NOAA Contract to SAI 03-7-022-35105.

Descriptors: *Ecosystems, *Estuaries, *Water pollution, *Management, Project planning, Project management, Waste disposal.
Identifiers: *New York Bight, Ocean dumping, *Outer Continental Shelf, Environmental assessment.

The New York Bight was selected for an initial project because of the significance and urgency of its environmental problems. The Bight is the recipient of the nation's largest ocean dumping operation. The MESA New York Bight Project Development Plan presented has been jointly prepared by the MESA Program Office and the New York Bight Project Staff and represents the overall plan for project implementation. The plan describes a systematic approach to achieving specifically identified goals and objectives that have been delegated to the Department of Commerce for protection of the marine environment. The overall goals of the Project are to develop a comprehensive understanding of the processes and interrelationships of the ecosystem and to determine the fate and effects of pollutants and other man-related stresses on the New York Bight. The Project priorities focus on the three significant contaminant sources in the Bight Apex: Estuarine inputs and coastal outfalls, Dredge materials, and Sewage sludge. The project is guided even more specifically by the requirements of user agencies in planning for future actions such as monitoring of the Bight, oil and gas development, offshore nuclear power generation, and the development of alternatives to existing waste disposal strategies. (NOAA)
W77-11661

LIMNOLOGICAL STUDIES OF THE ONO RESERVOIR: THIRD REPORT, (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W77-11713

TRANSVERSE-GRID WATER QUALITY ANALYSES OVER THE SZOB-BUDAPEST DANUBE SECTION (KERESZTMETSZETHALOS VIZMINOSEG VIZSGALATOK A DUNA SZOB-BUDAPEST KOZOTTI SZAKASZAN),
Kozepdunavolgyi Vizugyi Igazgatosag, Budapest (Hungary).
For primary bibliographic entry see Field 5A.
W77-11731

BACTERIOLOGICAL ANALYSES OVER THE RAJKA-BUDAPEST DANUBE SECTION (BAKTERIOLOGIAI VIZSGALATOK A DUNA RAJKA-BUDAPEST KOZOTTI SZAKASZAN),
National Inst. of Public Health, Budapest (Hungary).
For primary bibliographic entry see Field 5A.
W77-11732

BEHAVIOR OF BENZIDINE AND OTHER AROMATIC AMINES IN AEROBIC WASTEWATER TREATMENT,
Los Angeles County Sanitation District, Whittier, Calif.
R. Baird, L. Carmona, and R. L. Jenkins.
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1609-1615, July, 1977. 4 fig, 4 tab, 17 ref.

Descriptors: *Organic wastes, *Toxicity, *Activated sludge, *Aerobic treatment, *Human pathology, Public health, Water pollution effects, Organic compounds, Byproducts, Water Pollution Control Federation, Waste water treatment.
Identifiers: Amines, Benzidine, Aromatic amines, Warburg respirometry.

Benzidine, 1-napthylamine, and other aromatic amines have been indicated as carcinogenic, causing bladder cancer in humans occupationally exposed to them. These compounds can be contained in industrial waste waters discharged into municipal sewers. A review of the various methods to isolate and identify carcinogens from surface and waste waters is presented. An investigation was undertaken to study the effects of benzidine on activated sludge respiration, establish relative toxicities for amines, determine the effects of activated sludge treatment on amines, examine possible criteria for biological attack, and define refractory metabolic intermediates. Methods used included Warburg respirometry, gas-liquid chromatography, mass-spectrometry, colorimetric analysis, and computer analysis. Results indicated that carcinogenic amines were not immune to biologic treatment, as suggested by previous studies, but did appear to be transformed to a degree. It was suggested that the metabolic intermediates might be responsible for the toxicity and carcinogenicity. None of the suspected carcinogenic bio-oxidation products of benzidine were observed to survive the activated sludge process. In light of the results, it was suggested that sludge be analyzed for the presence of metabolic intermediates as well as for the amines themselves. (Schulz-FIRL)
W77-11733

PROBLEMS RELATED TO WATER QUALITY OVER THE DANUBE SECTION BETWEEN RAJKA AND ESZTERGOM (A RAJKA-ESZTERGOM KOZOTTI DUNA-SZAKASZ VIZMINOSEGI PROBLEMAI),
Eszakdunantuli Vizugyi Igazgatosag, Gyor(Hungary).
M. Abraham, and N. Varday.
Hidrologiai Kozlony, Vol. 52, No. 2, p 60-64, February, 1977. 6 fig, 1 ref.

Descriptors: *Water quality, *Chemical oxygen demand, *Oxygen demand, Streamflow, *Rivers organic loading, Waste assimilative capacity, Effluents, Waste water disposal, Waste water treatment.
Identifiers: Hungary, Danube River.

The North Hungary District Water Authority has examined water quality for a section of the Danube between Rajka and Esztergom for the past 15 years. Records showed that the mineral content of the Danube water was related to the rate of streamflow alone, while the organic pollutant load was also related to temperature. A deteriorating trend in water quality as indicated by COD-streamflow measurements was attributed to increasing effluent discharges into the Danube by area industries and communities. It was found that 02 consumption was not uniform throughout the river's cross-section but was a function of depth and prevailing current. Water quality was observed to improve from Rajka downstream to Komarom, but increased effluent discharges were observed below that point. (Schulz-FIRL)
W77-11738

STANDING COMMITTEE ON THE DISPOSAL OF SEWAGE SLUDGE.
For primary bibliographic entry see Field 5E.
W77-11740

SECONDARY SEWAGE TREATMENT VERSUS OCEAN OUTFALLS: AN ASSESSMENT,
Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5E.
W77-11766

OBSERVATION ON THE HYDROLOGY OF THE RIVER KHAM,
Marathwada Univ., Aurangabad (India). Dept. of Zoology.
S. S. Bapat, and V. R. Madlapure.
Marathwada Univ J Sci Sect B Biol Sci. 11(4), p 353-355, 1972.

Descriptors: *Rivers, Asia, Chlorides, Calcium, Temperature, Hydrogen ion concentration, Hydrology, Phosphates, Dissolved oxygen, *Water pollution.
Identifiers: *River Kham(India).

The hydrology of the River Kham (India) is discussed. The hydrological conditions such as the temperature, pH, dissolved O2, inorganic phosphates, Ca and chlorides were studied in the mo. April and May, 1972.—Copyright 1974, Biological Abstracts, Inc.
W77-11769

IMPACT OF WATER RESOURCES ON VECTOR-BORNE DISEASES,
Center for Disease Control, Fort Collins, Colo.
R. O. Hayes.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 177-183, November 1976. 14 ref.

Descriptors: *Water resources development, *Diseases, *Public health, *Vectors(Biological), Mosquitoes, Effects, Human diseases.
Identifiers: *Encephalitis.

Vector-borne diseases are transmitted to wildlife, domestic animals, and human by insects and other types of arthropods. Mosquitoes are the principal vectors associated with most types of water and related land resources developments in the United States. The nature of these problems is reviewed. The need to understand the ecologic conditions involved in vector production and to incorporate vector prevention designs and techniques in project proposals and plans is stressed. (Bell-Cornell)
W77-11774

MATHEMATICAL MODELING OF TRANSPORT PROCESSES IN AQUATIC SYSTEMS,
Battelle Pacific Northwest Labs., Richland, Wash.
D. S. Trent.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-750413-1, Price codes: A20 in paper copy, A01 in microfiche. Paper for Presentation at the Topical Meeting on Computation Methods in Nuclear Engineering, American Nuclear Society, Charleston, South Carolina, April 1975. 47 p, 7 fig, 1 tab, 107 equ.

Descriptors: *Aquatic environment, *Systems analysis, *Numerical analysis, *Hydrodynamics, *Simulation analysis, *Flow, *Mathematical models, Water pollution, Pressure, Seasonal, Shear, Currents, Stagnant water, Behavior, Turbulent flow, Diffusion, Equations.
Identifiers: *Transport processes, Partial differential equations, Ports, Vorticity transport, Similarity models, Lumped parameter models, Instantaneous distribution, Continuous release, Plume behavior, Receiving water.

Our aquatic environment is likely to be burdened with industrial and municipal waste discharges as long as man inhabits the earth. But waste discharges need not always create adverse conditions; in fact, in some cases discharges can be beneficial. We must have resources available for predicting the ultimate physical fate of the discharged constituents, so that transitory and chronic environmental impacts can be assessed. Physical transport analysis in aquatic systems is one such predictive tool. This report considers numerous aspects of simulating aquatic systems. After briefly discussing the sources of aquatic pollutants and the principles of modeling in aquatic systems, the report deals in detail with partial differential equations which govern hydrodynamics and transport; considered are incompressible turbulent flow and vorticity transport. Next, models and approximations are presented. Discussed are: lumped parameter models, considering instantaneous distribution, continuous release, and shear currents; similarity models, including plume behavior, hydrodynamic regimes, and similarity analysis applied to a single round port in stagnant receiving water; and numerical simulation models. (Bell-Cornell)
W77-11786

BUDGET OF SELECTED MINERAL NUTRIENTS FOR TWO WATERSHED ECOSYSTEMS IN THE SOUTHEASTERN PIEDMONT,
Georgia Univ., Athens. Inst. of Natural Resources.
J. E. Krebs, and F. B. Golley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 286, Price codes: A07 in paper copy, A01 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC 03-77, June, 1977. 124 p, 59 tab, 13 fig, 47 ref, append. OWRT B-108-GA(1), 14-31-0001-5067.

Descriptors: Pollutant identification, Water pollution, Calcium, Cadmium, Cobalt, Copper, Chromium, Iron, Potassium, Phosphorus, Magnesium, Manganese, Sodium, Lead, Zinc, *Southeast US, *Ecosystems, *Watersheds(Basins), Nutrients, *Nutrient requirements, Aluminum, Input-output analysis, *Metals.
Identifiers: *Nutrient budget, Silicon.

Input-output budgets of aluminum, calcium, cadmium, cobalt, chromium, copper, iron, potassium, magnesium, manganese, sodium, phosphorus, lead, silicon, and zinc were calculated for two watershed ecosystems in the southeastern Piedmont--a mixed pine-hardwood forest and a pasture. Measurements were made during a 15-month period of inputs in rainwater to both ecosystems and also inputs in other feed to the pasture. Outputs measured from both ecosystems included those dissolved and suspended in streamwater and those carried in the bedload sediment. Additionally, there was an output of calves from the pasture. Analyses were made on an inductively-coupled argon plasma emission spectrograph. Both watershed ecosystems were accumulating cadmium, chromium, copper, potassium, phosphorus, lead, and zinc. Both had a net loss of aluminum, calcium, cobalt, manganese, sodium, and silicon. Magnesium showed a net loss from the forest but was accumulated by the pasture.
W77-11791

PREDICTING THE RATE OF WARMING OF RIVERS BELOW HYDROELECTRIC INSTALLATIONS,
Georgia Dept. of Natural Resources, Atlanta. Environmental Protection Div.
R. W. Troxler, and E. L. Thackston.
Journal Water Pollution Control Federation, Vol 49, No 8, p 1902-1912, August 1977. 6 fig, 4 tab, 6 ref.

Descriptors: *Path of pollutants, *Hydroelectric plants, Rivers, Reservoirs, *Water temperature, *Model studies, Mathematical models, On-site investigations, Hypolimnion, *Energy budget, Radiation, Solar radiation, Heat transfer, Temperature, Dye releases, Dye concentration, Meteorological data, Fog, Winds, Air temperature, *Thermal pollution, *Forecasting.
Identifiers: *River warming, Cold water releases.

The purpose of the reported study was to construct and to verify an energy budget model for the accurate prediction of temperature changes in flowing rivers, based solely on the approximate geometry of the river and on data normally taken at first-order weather stations. The warming of cold water released from the hypolimnion of stratified reservoirs through hydroelectric plants was studied. By collecting and analyzing various atmospheric conditions at nearby weather stations, results showed that generally good agreement between observed and predicted temperatures can be realized if appropriate adjustments to the Weather Bureau data can be made. (Sims-ISWS)
W77-11819

MODELING THE IMPACT OF STRIP MINING AND RECLAMATION PROCESSES ON QUALITY AND QUANTITY OF WATER IN MINED AREAS: A REVIEW,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 5C.
W77-11833

REMOTE SENSING OF OIL SLICKS WITH MICROWAVE RADIOMETER,
Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
For primary bibliographic entry see Field 5A.
W77-11891

LANDSAT OBSERVATIONS OF OCEAN DUMP PLUME MOVEMENT AND DISPERSION,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas, G. Davis, and R. Henry.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-29668. Price codes: A02 in paper copy, A01 in microfiche. Report on Significant Results prepared for Goddard Space Flight Center, July, 26, 1976. 4 p, NAS5-20983.

Descriptors: *Waste disposal, *Environmental effects, *Baseline studies, *Circulation, Delaware, *Path of pollutants.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Resources management, *Cape Henlopen(Del), Coastal zone, Titanium dioxide.

Eighteen LANDSAT images were analyzed to study the dispersion and movement of ocean dump plumes thirty-eight miles southeast of Cape Henlopen, Delaware, at the disposal site for waste discharged from a plant producing titanium dioxide. The discharge, which is a greenish-brown liquid containing up to 10% acidity and 4% iron chloride salts, is discharged several times per month. The following preliminary results were obtained: the frequency of the dumping made it possible for the LANDSAT satellite to image the waste plume in various stages of degradation; the predominant direction of movement of the waste plumes imaged was to the southeast; the average drift velocity for surface drogues and the waste plumes was about 0.5 knots; and the waters at the test site were highly stratified and stable in the summer and nearly homogeneous in the winter. In general, it appears that rapid movement toward shore can occur primarily during storms. However, the plume is rapidly dispersed and diluted and the probability of an identifiable plume containing heavy concentrations of acid waste reaching the shore is quite low. (Sinha - OEIS)
W77-11894

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, CHEMICAL OCEANOGRAPHY.
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Atmospheric Labs.
For sale by Superintendent of Documents, GPO, Washington, DC, 20402. NOAA Technical Report ERL 332-MESA 3, April 1975. 89 p, 57 fig, 5 tab, 32 ref. Charnell, R. L. (Ed.).

Descriptors: *Water quality, *Circulation, *Waste disposal, *Ecosystems, *Environmental effects, *Baseline studies, *Water pollution sources, New York, Sewage disposal, Sedimentation, Path of pollutants.
Identifiers: *Outer Continental Shelf, *Ocean dumping, *New York Bight, Physical oceanography, Chemical oceanography, Geological oceanography.

Analyses of the apex ecosystem of the New York Bight as understood at the end of July 1974 is summarized. The three parts of the report, physical, geological, and chemical oceanography, represent three different single-discipline views of a complex ecosystem. Conclusions though considered tentative are nevertheless immediately useful in preliminary assessment of the environmental significance of sewage sludge dumping in the New York Bight apex. The general movement of water over the continental shelf off southern New England and the Middle Atlantic States is to the west and south, parallel to the continental margin. The net current is, however, masked by high spatial and temporal variability. Structure of the spatial varibility in currents of the Bight apex has been a prime focus of the MESA project; temporal variability is the principal impediment to its rapid elucidation. Nonbiodegradable carbohydrates, possibly derived from sewage, are significant contributors to the sedimentary organic matter. The apex of the Bight seems to be enriched in carbohydrates (or sewage-derived materials) as compared with the lower Hudson Shelf Valley and New Jersey shore. The dumped sewage sludge undergoes substantial alteration before and after settling to the sediment and/or admixture with natural nonorganic sediments. It is not possible, using currently available techniques, to distinguish between sedimentary organic matter derived from barge-dumped sewage sludge or derived from other sources of treated or untreated sewage. (Sinha - OEIS)
W77-11896

SIGNIFICANCE OF LOW MOLECULAR WEIGHT HYDROCARBONS IN EASTERN GULF WATERS,
Texas A and M Univ., College Station. Dept. of Oceanography.
W. M. Sackett.
In: Summary Report of IDOE Research (1974) p 253-267, 10 fig, 5 ref. NSF-GX-30196, GX-37344.

Descriptors: *Monitoring, *Water quality, *Resources development, *Oil pollution, *Water pollution sources, *Seepage, Drilling, Baseline studies, Offshore platforms, Gulf of Mexico.
Identifiers: *Outer Continental Shelf, Petroleum hydrocarbons, Natural seepages.

It appears that both natural and man-derived sources of petroleum hydrocarbons give rise to anomalously high concentrations of the low molecular weight components over areas and volumes much larger than the visible manifestation of bubbles from natural seeps or the effluent from offshore platforms and ships. As much of the mass of the bubbles from natural gas seeps goes into solution on rising through the water column, near-bottom concentrations should be most indicative of the presence of these seeps. On the other hand, near-surface concentrations of low molecular weight hydrocarbons should be indicative of man's contributions. The impending environmental baseline program on the outer continental shelf of Florida presents an ideal opportunity to determine the hydrocarbon history of an offshore area, from a relatively virgin to a highly developed state. It is recommended that a detailed near-bottom and near-surface low molecular weight hydrocarbon survey be made concomitantly with an acoustical profiling program for seep detection as soon as possible. Following this initial study a more leisurely seasonal monitoring program for just the near-bottom and near-surface hydrocarbon concentrations during the entire outer continental shelf drilling and production operation is recommended. These periodic surveys should allow an early warning of possible damage to the Eastern Gulf Coast ecosystem. (Sinha-OEIS)
W77-11902

A SHIPBOARD OIL-IN-WATER CONTENT MONITOR BASED ON OIL FLUORESCENCE,
Baird-Atomic, Inc., Bedford, Mass. Government Systems Div.
For primary bibliographic entry see Field 5A.
W77-11905

SHIPBOARD OIL-IN-WATER MONITOR,
Beckman Instruments, Inc., Anaheim, Calif. Advanced Technology Operations.
For primary bibliographic entry see Field 5A.
W77-11910

DISPERSAL OF PHYTOPHTHORA PALMIVORA SPORANGIA BY WIND-BLOWN RAIN,
New York State Agricultural Experiment Station, Geneva. Dept. of Plant Pathology.
For primary bibliographic entry see Field 3F.
W77-11927

EVALUATION OF POTABLE WATER AS A VEHICLE OF TRANSMISSIBILITY AND VIABILITY FOR HERPESVIRUS,
North Dakota State Univ., Fargo. Dept. of Virology and Pharmacology.
I. A. Schipper.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 427, Price codes: A02 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute, Fargo, Research Report No. WI-222-012-76, August, 1976. 9 p, 6 ref. OWRT B-022-NDAK(1), 14-31-0001-3923.

Descriptors: Water pollution, Temperature, Viricides, *Viruses, *Potable water, Path of pollutants, North Dakota, Human diseases, Public health, Pollutant identification, Filters.
Identifiers: *Herpesvirus.

The primary obstacles in evaluation of water contamination with viruses are to maintain the virus survival during transportation and to concentrate the viruses sufficiently to demonstrate their presence in water under laboratory conditions. This was achieved by utilizing an AP-25 fiberglass prefilter over an HA-47 mm - 0.4 micron pore filter (Millipore Corporation). Prefilter virus retention ranged from 30 to 43 percent while concomitantly the HA filter membrane retained 33 to 46 percent. Virus was never detected in the filtrate. The addition of 2x MEM plus antibiotics followed by sonication was the most effective method of recovery of viruses from the filters. The virus survived best in water at a pH of 7 but isolates were obtained at 6 to 8.5 pH. The optimum temperature for survival was 2 degrees C (36 hours) but survival was evident at 37 degrees C for 12 hours. Contamination of water with soil, straw and bovine feces prolonged survival time. Complete destruction of virus resulted when water was exposed to direct sunlight for one hour. Viruses placed in a flowing stream survived for 24 hours and was detectable one mile from the site of deposit indicating that this would afford an ideal route of viral spread. It was also demonstrated that cotton and polyester had no virucidal effects while calcium alginate wool was extensively virucidal.
W77-11935

THE DIFFERENTIATION OF INORGANIC AND ORGANOMERCURY SPECIES IN AQUEOUS SAMPLES,
North Dakota Univ., Grand Forks. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-11936

ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS,
Ontario Dept. of Agriculture and Food, Toronto. Dept. of Land Resource Science.
M. H. Miller, J. B. Robinson, and D. W. Gallagher.
Journal of Environmental Quality, V. 5, No. 3, p 279-282, July-Sept., 1976. 6 tab, 11 ref.

Descriptors: Lagoons, Soils, Sampling, *Nutrients, Feed lots, Groundwater, Seepage, Waste storage, Nitrogen, Phosphorus, *Farm wastes, Hogs.
Identifiers: *Swine wastes.

The soils beneath 4 hog manure lagoons were sampled during the spring and summer of 1974 to determine the extent of nitrogen and phosphorus accumulation. Arrangements were made with lagoon owners to lower the manure level as far as feasible. Lagoon 1, a 2-year-old lagoon, was on a clay loam to clay calcareous till. Lagoon 2, a 2-year-old lagoon, was on a lacustrine clay deposit. Lagoon 3, a 10-year-old lagoon, was on a loam to sandy loam calcareous till. Lagoon 4, an 8-year-old lagoon, was on layered fine sandy loam, silt loam and silty clay loam. Levels of NH4-N and soluble P were very high in the top 10 cm of lagoon 1, but decreased sharply at lower depths. Soluble P at the 10-20 cm level was not above the background level (0.05-0.20 microgram/g). NH4-N at the 20-30 cm depth was slightly above the background level (1.6-7.1 microgram/g). The NO3-N level in the soil was very low. The NH4-N content below lagoon 2 was very high in the top 20 cm but was not above background (0.3-1.5 microgram/g) below that depth. Soluble P and nitrate nitrogen did not accumulate below lagoon 2. This may have been due to removal of the upper 1-2 cm of soil with the thick layer of organic material that was present in this lagoon. The NH4-N content of the soil below lagoon 3 was very high even at the 140-150 cm depth compared to the background levels (< 1 microgram/g). Soluble P accumulated in the 0-10 cm depths but not at deeper depths. NO3-N levels were very low at all depths. NH4-N levels in lagoon 4 were very high at all depths sampled—even at a depth of 400 cm. Soluble P was very high in the top 30 cm. NO3-N levels increased between sampling times, indicating the conversion of NH4-N to NO3-N took place following emptying of the lagoon. Clay content and age of lagoons 1 and 2 seemed to be the factors involved in the contrasting results between lagoons 1 and 2 and lagoons 3 and 4. The experiment indicated that the most satisfactory use of lagoons would be on fine-textured soils. (Merryman-East Central)
W77-11967

HOG MANURE WORTH $3.50 PER TON AS FERTILIZER.
Wallaces Farmer, V. 102, No. 5, p 11, March 12, 1977.

Descriptors: Liquid wastes, *Fertilizers, Odor, Agricultural runoff, Water pollution, Economics, *Farm wastes, Hogs, Costs.
Identifiers: *Swine manure, Land disposal, Cropland management, Manure pits, Agitation.

A. L. Sutton, Purdue University animal scientist, reports that liquid swine manure is worth about

$3.50 per ton as a fertilizer if it is applied uniformly as near to the planting date as possible. An even better return could be realized by developing a manure management plan. The most effective planning depends on a nutrient analysis of the waste, compared with a soil test of the land and the nutrient requirements of the crops to be grown. Applying manure to corn, sorghum and small grains can increase the dollars benefit. Maximum corn yields have resulted from applying 40 to 80 tons of swine manure per acre per year on top of the soil. When supplementing the soil with a commercial fertilizer, this rate can be decreased. Sutton offers the following recommendations to producers who plan to apply liquid manure to cropland. First, the producer must remember that gas liberated from the manure pits is deadly. Consequently, adequate ventilation should be allowed while agitating the manure. Agitation of the manure facilitates removal of settled solids and uniformly distributes the nutrients. Reasonable distances from ponds, streams, open ditches, and residential areas should be maintained when applying manure in order to minimize runoff and odor problems. Actual spreading should be done early in the day, and manure should not be applied to unlevel frozen ground or water saturated soils. Soil injection or immediate incorporation of manure into the soil maximizes its fertilizer value and minimizes its odor problems. (Keel-East Central)
W77-11969

INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS,
New Zealand Agricultural Engineering Inst., Lincoln.
D. J. Hills.
Journal Water Pollution Control Federation, V. 48, No. 4, p 695-709, April, 1976. 7 fig, 7 tab, 26 ref.

Descriptors: *Infiltration rates, Groundwater, Soils, *Sealants, Sampling, Chemical analysis, Hydraulic gradient, Bentonite, Nitrates, Ammonia, Chemical oxygen demand, Hydrogen ion concentration, Farm wastes.
Identifiers: *Anaerobic lagoons, Dairy wastes, Sodium carbonate, Sodium tripolyphosphate, Total solids, Volatile solids.

Research was done to augment present information on parameters affecting infiltration rate and quality of infiltrate from anaerobic lagoons and to investigate possible sealing techniques. Twelve pilot-scale anaerobic lagoons treating dairy shed wastes were constructed and operated for a year. Variables were soil type -- loam, silt loam, sand loam, and clay loam; pond depth -- 2, 3, and 4 m; compacted bottom soil thickness -- 15, 25, and 35 cm; and soil additives -- bentonite, sodium carbonate, and sodium tripolyphosphate. Infiltration rates were monitored. Samples of the feed, lagoon liquor, and infiltrate were chemically analyzed for nitrate, ammonia and organic nitrogen, chemical oxygen demand (COD), pH, total solids (TS), and volatile solids (VS). The following conclusions were drawn: (1) Contamination of groundwater with total nitrogen, COD, and TVS from properly constructed anaerobic lagoons is very small. (2) The amount of infiltrate and pollutants increased in the following order of the soil types used: clay loam, loam, sand loam, silt loam. (3) Additives that chemically affect soil structure to produce clogging are of little value in anaerobic lagoon construction. (4) The soil's hydraulic conductivity attained under anaerobic biological conditions seems to be a function of the inverse of the hydraulic gradient. (5) The concentration of pollutants in the infiltrate seems to be a function of the hydraulic gradient. (6) The ultimate sealing mechanism seems to be soil pore clogging that penetrates below the soil surface. Clogging is not solely a surface phenomenon. (Merryman-East Central)
W77-11974

USING LIQUID POULTRY WASTES IN WOODLANDS,
Connecticut Agricultural Experiment Station New Haven.
For primary bibliographic entry see Field 5E.
W77-11979

NATURE AND IMPACT OF STREAM INPUTS ON A WATERSHED BASIS,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
F. J. Humenik, M. R. Overcash, F. Koehler, L. Bliven, and W. S. Galler.
Paper No. 76-2564, American Society of Agricultural Engineers, 1976 Winter Meeting, Chicago, Illinois, Dec. 14-17, 1976, 14 p. 7 tab, 7 ref.

Descriptors: Agricultural runoff, Water pollution sources, Sampling, Chemical analysis, Algae, Watershed management, Pollutant identification, Farm wastes.
Identifiers: Rural runoff, Statistical survey, *Chowan River(NC).

A statistical survey of small subbasins in the Chowan River watershed was made to determine the feasibility of making areawide assessments of the magnitude and impact of rural runoff. Fifteen subbasins were randomly selected to study the potential of stratified random sampling as a monitoring strategy. The basin was stratified on the basis of soil-topographic-land use factors. The 4 strata chosen were: (1) poorly-drained Coastal Plain; (2) well-drained Coastal Plain (W); (3) agricultural Piedmont; (4) silvicultural Piedmont. Continuous monitoring and grab sampling results were compared at 5 sites. Long-term averages were found to be similar for the total basin, but individual runoff events had more impact on concentration and transport, especially at sites with human intervention. (Merryman-East Central)
W77-11980

ALL-PLASTIC SUCTION LYSIMETERS FOR THE RAPID SAMPLING OF PERCOLATING SOIL WATER,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
For primary bibliographic entry see Field 5A.
W77-12005

PHYSIOLOGICAL CHARACTERISTICS OF MERCURY UPTAKE BY TWO ESTUARINE SPECIES,
Hawaii Univ., Honolulu. Dept. of Zoology.
S. N. Luoma.
Marine Biology, Vol. 41, p 269-273, 1977. 3 fig, 3 tab, 12 ref.

Descriptors: *Metals, *Mercury, *Path of pollutants, *Mode of action, *Animal physiology, Shrimp, Invertebrates, Worms, Metabolism, Estuaries, Absorption, Chemical reactions, Bioassay, Toxicity, Chemical properties.
Identifiers: Polychaetes, Palaemon debilis, Neanthes succina, Bioaccumulation.

Due to the transformation of mercury to a slowly exchanging form within organisms, short exposures of the organisms to the metal resulted in its rapid uptake and slow loss. The extent of the difference between exposure time and depuration time depended upon the rate of transformation during uptake. For the polychaete worm Neanthea succina and the shrimp Palaemon debilis such transformations were extremely rapid. The rate of Hg exchange from the slowly exchanging form was similar among a wide variety of species. This suggested that interspecies differences in bioconcentration and toxicity were strongly influenced by differences in physiological permeability to the metal and rates of biochemical transformation. (Klein)
W77-12007

INVESTIGATIONS ON THE SIMULTANEOUS UPTAKE AND RELEASE OF MERCURY BY DUNALIELLA TERTIOLECTA,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W77-12014

ORGANOCHLORINE RESIDUES IN MATERNAL BLUBBER, MILK, AND PUP BLUBBER FROM GREY SEALS (HALICHOERUS GRYPUS) FROM SABLE ISLAND, NOVA SCOTIA,
Bedford Institute of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
R. F. Addison, and P. F. Brodie.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 937-941, 1977. 2 tab, 19 ref.

Descriptors: Aquatic animals, Mammals, *Organic compounds, *Animal physiology, *Path of pollutants, *Chlorinated hydrocarbon, *DDT, *Pesticides residues, Bioassay, Organic pesticides, Organic compounds, Analytical techniques, Polychlorinated biphenyls.
Identifiers: *Grey seals, *Halichoerus grypus, Bioaccumulation, Tissue analysis, Nova Scotia.

Residues of DDT group insecticides and of PCBs were measured in samples of maternal blubber, milk, and pup blubber from grey seals (Halichoerus grypus) from Sable Island, N.S. Mean total of DDT and PCB levels in maternal blubber lipid were 14.0 and 14.5 microgram/g, respectively. Concentrations of DDT and PCBs in milk lipid were approximately 60 and 30%, respectively, of those found in maternal blubber lipid, suggesting a partial barrier to passage of these residues through mammary tissue. Concentrations in pup blubber lipid were the same as, or slightly higher than, those in milk lipid. (Klein)
W77-12019

EFFECTS OF SALINITY ON THE NET UPTAKE OF ZINC BY THE COMMON MUSSEL MYTILUS EDULIS,
Melbourne Univ., Parkville (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-12022

HEAVY-METAL CONTAMINATION BY ATMOSPHERIC FALLOUT OF SEVERAL FLIN FLON AREA LAKES AND THE RELATION TO FISH POPULATIONS,
Toronto Univ. (Ontario). Dept. of Geology,; Toronto Univ. (Ontario). Dept. of Chemistry; and Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
J. C. VanLoon, and R. J. Beamish.
Journal of the Fisheries Research Board of Canada, Vol 34, p 899-906, 1977. 2 fig, 3 tab, 15 ref.

Descriptors: Metals, *Zinc, *Copper, *Sulfur compounds, *Heavy metals, Lakes, *Sulfates, Chemical analysis, *Fallout, Freshwater fish, Resistance, Atmosphere, Toxicity, Analytical techniques, Inorganic compounds, Water quality, *Path of pollutants, Aquatic life, Cadmium, Iron, Lead, Nickel, Industrial wastes, *Canada.
Identifiers: Accumulation, Bioaccumulation, *Flin Flon Lakes, Manitoba, Smelters, Pollution tolerance.

High concentrations of zinc and other heavy metals were found in lakes in the immediate vicinity of the Flin Flon smelters. In a study of 31 lakes, 7 had Zn levels above 100 micro-g/l, 6 had levels between 50 and 100 micro-g/l, and the remainder had concentrations less than 50 micro-g/l. The accuracy and precision of the heavy metal chemical analysis were evaluated using intercomparisons with other laboratories and a standard reference water. A linear relationship was demonstrated

between log 10 concentrations of Zn, Cu, and SC4(2-) and log 10 distance from the smelter, suggesting atmospheric fallout as the main source of these substances in the lakes. Fishes were more tolerant of these high zinc concentrations than would be expected on the basis of the responses of fish and other aquatic organisms to similar concentrations of zinc in some laboratory toxicity tests. (Klein).
W77-12027

CRUSTACEAN ZOOPLANKTON COMMUNITIES AS INDICATORS OF LIMNOLOGICAL CONDITIONS: AN APPROACH USING PRINCIPAL COMPONENT ANALYSIS,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W77-12029

DISTRIBUTION AND DEGRADATION OF DINITROANILINE HERBICIDES IN AN AQUATIC ECOSYSTEM,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
P. C. Kearney, A. R. Isensee, and A. Kontson.
Pesticide Biochemistry and physiology, Vol 7, p 242-248, 1977. 3 fig, 3 tab, 13 ref.

Descriptors: *Herbicides, *Degradation(Decomposition), *Biodegradation, *Distribution, Catfishes, Persistence, *Environmental effects, Radioisotopes, Carbon radioisotopes, Marking techniques, Laboratory tests, Path of pollutants, Aquatic algae, Aquaria.
Identifiers: Bioaccumulation, *Dinitroaniline herbicides, Trifluralin, Profluralin, Dinitramine, Chlornidine, Fluchloralin, Butralin, Daphnia, Helisoma, Oedogonium, Gambusia, Tissue analysis.

The accumulation potential of six, structurally related, dinitroaniline herbicides was investigated in an aquatic ecosystem. The herbicides investigated were trifluralin, profluralin, dinitramine, chlornidine, fluchioralin and butralin. The herbicide (0.1 mg) plus 1 micro Ci of 14C-labeled herbicide was adsorbed on 100 g of soil (1 ppm), added to individual aquariums, and flooded with 4 liters of water. Algae, snails, and daphnia were added, and 14C in water was monitored for 30 days. Fish were added on Day 30, and all components were harvested 3 days later. Bioaccumulation ratios (concentration in organism/concentration in water) for fish depended on the amount of their exposure to sunlight: Aquariums held in the dark had higher ratios for fish (235-755) than did those exposed to sunlight (32-83). Bioaccumulation ratios in the dark for fish based on 14C from bound soil residues of butralin and profluralin were 76 and 119, respectively. Direct repeated applications of profluralin (without soil) at 4-day intervals resulted in a rapid increase, then a decrease in bioaccumulation ratios for Gambusia, but a continuous increase for catfish. (Katz)
W77-12032

RELATIONSHIPS BETWEEN HEAVY METALS AND MAJOR CATIONS ALONG POLLUTION GRADIENTS,
Durham Univ. (England). Dept. of Botany.
C. R. C. Sheppard.
Marine Pollution Bulletin, Vol 8, No 7, p 163-164, 1977. 2 tab, 4 ref.

Descriptors: *Heavy metals, Lead, Copper, Nickel, Zinc, Calcium, Sodium, Potassium, Magnesium, *Spectrophotometry, *Cations, Environmental effects, Analytical techniques, Water pollution effects, Statistical methods.
Identifiers: Tissue analysis, *Urchins, *Limpets, *Atomic absorption spectrophometry, *Spearman ranked coefficient, *Electrochemical gradient.

Along some pollution gradients, animal tissue concentrations of several major, physiologically important cations vary greatly in a way that corresponds with levels of toxic metals. Changes in concentration from normal of these major cations can be as much as fourfold which may be an underlying cause of much of the stress experienced by these species in polluted environments. (Katz)
W77-12033

ABNORMAL TERNS, SICK SEA AND SHORE BIRDS, ORGANOCHLORINES AND ARBOVIRUSES IN THE INDIAN OCEAN,
Aberdeen Univ. (Scotland). Seabird Group.
For primary bibliographic entry see Field 5C.
W77-12034

CONCENTRATION PATTERN OF CHEMICAL CONSTITUENTS IN A PAPER MILL'S EFFLUENT PLUME: DYNAMICS AND MODEL,
Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch.
J. Polak, and M. D. Palmer.
Journal of the Fisheries Research Board of Canada, Vol 34, p 805-816, 1977. 7 fig, 9 tab, 11 ref.

Descriptors: *Effluents, *Model studies, *Lakes, *Winds, *Pulp wastes, *Dynamic programming, *Lake Superior, Theoretical analysis, Movements, Linear programming, Industrial wastes, Water quality, Water pollution sources, Bays, Canada.
Identifiers: *Plume, *Wind direction, Nipigon Bay.

The variation of conductivity in the effluent plume for a paper mill discharge on Lake Superior was studied to provide data for predictive models. The study included measurement of local winds and currents which were analyzed and related to the plume's location. To determine the spatial distribution of th plume, a statistical one-dimensional model relating plume conductivity and distance from the outfall and a two-dimensional phenomenological model assuming elliptically shaped isopleths were developed. It was found that chemical constituents of the plume can be expressed as linear functions of conductivity. The models thus enable the definition of the lake area affected by the effluent chemicals for different wind conditions. (Klein)
W77-12041

CHLORINE DISSIPATION AND TOXICITY PRESENCE OF NITROGENOUS COMPOUNDS,
Florida Inst. of Tech., Melbourne. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-12042

A CHARACTERIZATION OF THE SOURCES OF PETROLEUM HYDROCARBONS IN LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Chemistry.
S. G. Wakeham.
Journal Water Pollution Control Federation, Vol 49, p 1680-1687, 1977. 3 fig, 1 tab, 29 ref.

Descriptors: *Lakes, *Water pollution sources, *Organic compounds, *Oil pollution, *Oil wastes, Organic wastes, Sediments, Path of pollutants, Urban runoff, Runoff, River flow.
Identifiers: *Lake Washington(Wash), Automobile traffic, Petroleum hydrocarbons.

Sediments of Lake Washington contain high levels of petroleum hydrocarbons. High concentrations of petroleum-type hydrocarbons were found in urban stormwater runoff. The most likely source of the hydrocarbons in the stormwaters was considered to be the release by automobile traffic of the lubricating oils and greases to urban streets. In contrast, river waters flowing in to the lake contained much lower hydrocarbon levels. However, because of the much greater volume of flow for the rivers compared to the storm waters, the contribution of hydrocarbons by the rivers was nearly equal to that of the stormwaters. Rainfall and dust contributed lesser amountsj of petroleum hydrocarbons to Lake Washington. (Klein)
W77-12043

BHC RESIDUES OF DOMESTIC ORIGIN: A SIGNIFICANT FACTOR IN POLLUTION OF FRESHWATER IN NORTHERN IRELAND,
Queen's Univ., Belfast (Northern Ireland) Dept. of Agricultural and Food Chemistry.
D. B. Harper, R. V. Smith, and D. M. Gotto.
Environmental Pollution, Vol 12, p 223-233, 1977. 4 fig, 3 tab, 22 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Path of pollutants, *Water pollution sources, Effluents, *Mayflies, Aquatic insects, Invertebrates, Wastes, Larvae, Larval growth stage, Water quality, Organic compounds, Domestic wastes, Rivers, *Pesticide residues.
Identifiers: *Benzenehexachloride residues, *BHC, Baetis rhodani, Caenis moesta, Lough Neagh, Northern Ireland.

The concentration of BHC (Benzenehexachloride) residues in the rivers discharging into Lough Neagh showed a high correlation with urban population density in the catchment area of the rivers. Investigations demonstrated that this correlation arose as a result of discharged sewage effluents containing BHC. BHC in such effluent appeared to have a domestic- rather than an agriculture or industrial - origin, probably arising from the rise of wood preservatives in the home. Studies on the effect of various concentrations of BHC on species of mayfly larvee (Baetis rhodani) and Caenis moesta indicated major reductions in survival time. (Klein)
W77-12046

RETENTION OF MERCURY IN THE MUSCLE OF YELLOW PERCH (PERCA FLAVESCENS) AND ROCK BASS (AMBLOPLITES RUPESTRIS),
Institute for Fisheries Research, Ann Arbor, Mich. Fisheries Div.
P. W. Laarman, W. A. Willford, and J. R. Olson.
Transactions of the American Fisheries Society, Vol 105, No 2, p 296-300, 1976. 2 fig, 3 tab, 13 ref.

Descriptors: *Metals, *Mercury, *Perches, *Yellow perch, *Sunfishes, *Bass, *Rock bass, *Path of pollutants, *Fish physiology, Growth rates, Water pollution effects, Bioassay, Lakes.
Identifiers: Bioaccumulation, Lake St. Clair, Fish muscle.

Mercury-contaminated yellow perch (Perca flavescens) and rock bass (Ambloplites rupestris) were collected from Lake St. Clair and stocked in two earthern ponds in September 1970. Twenty-six months later, concentrations of total mercury in the fillets had declined 53% in the yellow perch and 59% in the rock bass; however, the mean weight of the fish increased 88 and 183%, respectively, during the same period. All of the reduction in mercury concentrations was attributable to dilution by growth. Slight discrepancies between the theoretical and observed reduction of mercury concentrations suggest an initial redistribution of residues from other tissues to the muscle and a continued incorporation of background amounts of mercury during growth. (Klein)
W77-12047

LONG-TERM FLUCTUATIONS OF EPIBENTHIC FISH AND INVERTEBRATE POPULATIONS IN APALACHICOLA BAY, FLORIDA,
Florida State Univ., Fla. Dept. of Biological Science.
For primary bibliographic entry see Field 5C.
W77-12053

CHARACTERIZATION OF SUSPENDED PARTICLES IN SOME PULP AND PAPER MILL EFFLUENT PLUMES,
Canada Centre for Inland Waters, Burlington (Ontario).
J. K. Leslie.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p 791-797, 1977. 7 fig., 2 tab., 18 ref.

Descriptors: *Sediments, *Suspended solids, *Effluents, *Pulp wastes, Size, Dimensions, *Particle size, Chemical analysis, Solid wastes, Aquatic drift, Sampling, On-site investigations, Pollutant identification, Industrial wastes, *Path of pollutants, *Lake Superior.

Some physical characteristics of the suspended particles from seven pulp mill effluent plumes were analyzed electronically. An effluent flow rate of 1.2 cubic meters/s contained a mean of 75.9 cubic micrometers/l particulate volume in a size range of 3.2-84.0 micrometers 'diameter.' The visible particle surface area was 334.8 square cm/1, and there were 1045 x 10 to the third power particles/ml. A slight increase in size was detected as the particles aged in the plume. The transported particulates were reduced by dispersion and sedimentation to approximately 5% by a transit of less than 1 km, but effluent was still detectable 2 km from the point source. (Katz)
W77-12058

PULP AND PAPER MILL EFFLUENT IN A FRESHWATER ENVIRONMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
J. R. M. Kelso, C. K. Minns, and R. J. P. Brouzes.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p 771-775, 1977. 2 fig., 16 ref.

Descriptors: *Effluents, *Pulp wastes, *Industrial wastes, *Chemical wastes, Toxicity, Freshwater, Ecosystems, Environmental effects, *Path of pollutants, Water pollution sources, *Lake Superior, Lakes, Discharge(Water), Distribution, Canada.
Identifiers: *Effluent plume, Nipigon Bay.

Background and scope were provided for joint Ontario Ministry of the Environment and Department of the Environment studies of the effect of a pulp and paper mill effluent in a freshwater ecosystem. Brief descriptions of pertinent features of the pulp and paper mill and Nipigon Bay were given as related to studies presented in this volume. (Katz)
W77-12059

A NOTE ON TOXAPHENE IN ENVIRONMENTAL SAMPLES FROM THE CHESAPEAKE BAY REGION,
Westinghouse Ocean Research Lab., Annapolis, Md.
T. O. Munson.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 4, p 491-494, 1976. 1 fig, 1 tab, 7 ref.

Descriptors: *Polychlorinated biphenyls, *Pesticide residues, *Pesticide kinetics, *Insecticides, *Organic pesticides, *Chlorinated hydrocarbon pesticides, Analytical techniques, *Chesapeake Bay, Water pollution sources, Chemical analysis, Chromatography.
Identifiers: *Toxaphene, Upper Chesapeake Bay survey.

Although toxaphene has been reported to be the most widely used insecticide in the United States, residues of toxaphene are seldom found in environmental samples. During a survey of the Upper Chesapeake Bay for chlorinated hydrocarbon residues several samples were found to contain toxaphene residues. It was noted that toxaphene was most visible in samples that contained low PCB levels (e.g. rainwater), since PCB tends to obscure the presence of toxaphene in some basic laboratory tests. (Katz)
W77-12062

THE UPTAKE AND INTERORGAN DISTRIBUTION OF MERCURY IN A CARNIVOROUS CRAB,
Hawaii Univ., Honolulu. Dept. of Zoology and Water Resources Research Center.
S. N. Luoma.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 6, p 719-723, 1976. 1 fig, 2 tab, 13 ref.

Descriptors: *Crabs, *Absorption, *Metals, *Distribution, *Mercury, *Path of pollutants, *Animal physiology, Metabolism, Crustaceans, Commercial shellfish, Invertebrates, Tracers, Analytical techniques, Worms, Bioassay, Laboratory tests, Radioactivity techniques.
Identifiers: *Interorgan distribution, *Carnivorous crabs, Thalamita crenata, Bioaccumulation, Tissue analysis, Neanthes succinea, Polycheates.

Carnivorous portunid crabs (Thalemita crenata) were fed 203-Hg labelled polycheates (Neanthes succinea) for 13 days. Interorgan distribution of the 203-Hg label in experimental crabs was compared to total Hg uptake and interorgan distributions observed in crabs from nature. Feeding rates compared with 203-Hg uptake indicated mercury accumulation into viscera exceeded accumulation into body muscle by 7.5 times. Uptake by viscera exceeded uptake by chela muscle by 20.9 times; uptake by body muscle was 2.7 times that of chela muscle. In contrast to laboratory studies total Hg concentrations in the body muscles of crabs from the estuary were always higher than concentrations in viscera. (Katz)
W77-12063

PERSISTENCE OF DISSOLVED ORGANIC COMPOUNDS IN KRAFT PULP AND PAPER MILL EFFLUENT PLUMES,
Canada Centre for Inland Waters, Burlington (Ontario).
M. E. Fox.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p. 798-804, 1977. 3 fig, 3 tab, 13 ref.

Descriptors: *Effluents, *Organic compounds, *Persistence, *Chemical analysis, *Dispersion, *Mode of action, Degradation(Decomposition), Analytical techniques, *Lake Superior, Pulp wastes, Sodium, *Path of pollutants, Water quality.
Identifiers: *Plumes, *Dehydroabietic acid.

The persistence of dissolved organic compounds in the effluent plumes of a pulp and paper mill on the north shore of Lake Superior was studied in 1974. Approximately 90 organic compounds were observed of which 36 (including all the major ones) were identified. The despersion of five of these compounds was examined quantitatively. Dehydroabietic acid was the only major organic compound observed to exhibit measurable persistence 2000 m from the effluent discharge. At 2000 m from the discharge, levels of 30 microg/l dehydroabietic acid were detected within the plume and 15 microg/l outside the effluent plume. The disappearance of dehydroabietic acid parrallels that of the conservative ion Na+, indicating dilution by the receiving water as the only significant short-term removal mechanism. (Katz)
W77-12065

CALORIC CHANGES ALONG PULP AND PAPER MILL EFFLUENT PLUMES,
Canada Centre for Inland Waters,
M. G. Johnson.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p. 784-790, 1977. 2 fig, 2 tab, 8 ref.

Descriptors: *Effluent, *Energy transfer, *Energy dissipation, *Respiration, Sedimentation, Suspended solids, Pulp wastes, Tracers, Rhodamine, Dyes, Solid wastes, Lake Superior, Industrial wastes, Path of pollutants, Biodegradation, Distribution.
Identifiers: *Calories.

Eight pulp and paper effluent plumes in Nipigon Bay were tracked with Rhodamine dye to determine dilution and nondilution losses of calories with distance and time. Dilution, as determined by Na+ decreases, accounted for 98.5% of the decrease in caloric concentration along centerline trajectories of plumes over 2000 m in 7.5 h: mean caloric concentration decreased from 1583 cal/l in effluent to 50 cal/l at background stations. Nondilution caloric changes were estimated by two methods, first by examination of the main processes (respiration, settling of particles, and primary production) and, secondly, by interpretation of time series of direct measurements of caloric concentrations. By the first method, measurement of resporation indicated loss of 2.1 cal/l while particle loss from plumes was 25.5 cal/l and accrual of calories by primary production was 0.5 cal/l. Integration of these results yielded an estimate of 27.1 cal/l net nondilution loss in caloric concentration along centerline trajectories over the average distance of 2000 m. By the second method, direct measurement of decrease in caloric concentration gave an estimate of nondilution loss of 45 cal/l over 2000 m. approximately 17% of effluent calories were used in biodegradation and lost in sedimentation from the plume within 2000 m of the source. Environmental degradation, in terms of dissolved oxygen conditions and deposition of particles, apparently was only locally significant. (Katz)
W77-12066

DISTRIBUTION OF DEHYDROABIETIC ACID IN SEDIMENTS ADJACENT TO A KRAFT PULP AND PAPER MILL,
Canada Centre for Inland Waters, Burlington (Ontario).
B. Brownlee, M. E. Fox, W. M. J. Strachan, and S. R. Joshi.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p. 838-843, 1977. 4 fig, 1 tab, 22 ref.

Descriptors: *Sediments, *Pulp wastes, Sampling, *Lake sediments, *Resins, *Bottom sediments, *Chemical wastes, *Effluents, *Acid soils, Sediment distribution, Industrial wastes, Water pollution effects, Water pollution sources, Distribution patterns, Soil analysis, Lake Superior, Tracers, Lead, Radioisotopes, Lead radioisotopes, Mode of action, Path of pollutants, Water chemistry, *Acids.
Identifiers: Sediment accumulation, Dehydroabietic acid, Nipigon Bay.

Sediments adjacent to a kraft pulp and paper mill on western Nipigon Bay, Lake Superior, were examined for resin acids. Dehydroabietic acid was the predominant resin acid with surficial concentrations of less than 5-100 microg/g. The aeral distribution indicated the mill to be the primary source of this compound. Depth profiles of the acid and core dating by 210Pb methods enabled the calculation of a mean sediment accumulation rate of 0.11 cm/yr and a half-life for the disappearance of dehydroabietic acid in the sediments of approximately 21 yr. A half-life of 0.12 yr was estimated for this compound in the water column. It appears therefore, that the primary removal mechanism of dehydroabietic acid is degradation in the water column. (Katz)
W77-12067

DISTRIBUTION OF SOME ORGANIC COMPOUNDS IN THE RECEIVING WATERS OF A KRAFT PULP AND PAPER MILL,
Canada Centre for Inland Waters, Burlington (Ontario),

B. Brownlee, and W. M. J. Strachan.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p. 830-837, 1977. 3 fig, 3 tab, 32 ref.

Descriptors: *Effluents, *Pulp wastes, *Sampling, *Distribution, *Organic compounds, *Path of pollutants, Water quality, Chemical analysis, Industrial wastes, Benthos, Lake Superior, Acids, Dispersion, Water pollution, Sediments, Seston.
Identifiers: Receiving water, *Dehydroabietic acid, *Palmitic acid, Dioctyl acetovanillone, Sandaracopimaric acid, 7-Oxodehydroabietic acid.

Water, seston, sediment, and macrophyte samples were collected from Nipigon Bay, Lake Superior at distances up to 6.8 km from the effluent discharge of a kraft pulp and paper mill at Red Rock, Ontario. Fifteen compounds have been identified in mill effluent and six of these were found in samples from the Bay. Mill-related compounds were found most often in water and sediment samples, less often in seston samples, and in none of the macrophyte smaples. Dehydroabietic acid, present in mill effluent in excess of 1 mg/l, was found in most water and sediment samples and a few seston samples. This compound was good indicator of the areal influence of the effluent. Palmitic acid and dioctyl phthalate were also widely distributed. Acetovanillone and sandaracopimaric acid were found in one water sample 1.0 km from the discharge. 7-oxodehydroabietic acid was found in five water samples at distances of up to 4.7 km from the discharge. This was apparently the first time that this compound has been reported in a mill effluent or in environmental samples. (Katz)
W77-12068

A KINEMATIC REFERENCE FRAME FOR ESTUARIES OF ONE DIMENSION,
University Coll., Dublin (Ireland). Dept. of Civil Engineering.
J. P. J. O'Kane.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 797-807, 1974. 6 fig, 16 ref.

Descriptors: *Estuaries, *Water quality, *Mathematical models, *Diffusion, Mathematical studies, Mathematics, Equations, Solutes, Tidal effects, Tidal waters, Model studies, Analytical techniques, Analysis, Distribution patterns.
Identifiers: Kinematic reference frame, Mass balance.

The obvious reference frame for water quality parameters in an estuary is the bank. A kinematic reference frame can be set up so that the tidal harmonics present in such parameters are largely removed. The kinematic frame oscillates so as to maintain a constant volume of water between any observer on this frame and the head of the estuary. The equations of transformation from one frame to the other may be found either analytically or in numerical form. The diffusion equation was transformed and examined. By induction from field data it may be possible to show that the harmonics in the dispersion term which remain after transformation are negligible. The 'tidal smear' approximation can be used to remove the remaining harmonics from a class of intermediate cases. The removal of tidal harmonics also should allow the use of rougher finite difference grids. The main advantage of the transformation over its moving average rival is the preservation of all information available. (See also W77-06708) (Humphreys-ISWS)
W77-12109

A MATHEMATICAL MODEL FOR SIMULATING THE TEMPERATURE STRUCTURE OF STRATIFIED RESERVOIRS AND ITS USE IN RESERVOIR OUTLET DESIGN,
Water Resources Engineers, Inc., Walnut Creek, Calif.
L. A. Roesner, W. R. Norton, and G. T. Orlob.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 848-861, 1974. 7 fig, 7 ref.

Descriptors: *Thermal stratification, *Reservoirs, *Mathematical models, *Water temperature, Water quality, Analytical techniques, Dams, Outlet works, Heat balance, Simulation analysis, Model studies, Heat transfer, Discharge(Water), Flow, Stratification, Hydraulics, Outlets, Computer models, Hydrologic aspects.
Identifiers: *Dworshak Dam(Idaho).

One of the water quality effects of reservoir construction and operation that is currently receiving much attention is the effect of the reservoir on water temperature, both within the impoundment and in the release waters. This paper briefly described a mathematical model for predicting the temperature regime of thermally stratified reservoirs and illustrated use of the model for evaluating the effectiveness of alternative reservoir outlet designs for downstream temperature control. The illustration related the application of the model to Dworshak Dam on the North Fork of the Clearwater River, Idaho. On the basis of the temperature evaluations made with the model, a 17 million dollar multigated outlet package was incorporated into the outlet design plans for the dam. (See also W77-06708) (Humphreys-ISWS)
W77-12114

FULVIC ACID AND AQUATIC MANGANESE TRANSPORT,
Massachusetts Univ., Amherst. Dept. of Chemistry.
O. T. Zajicek, and R. B. Pojasek.
Water Resources Research, Vol 12, No 2, p 305-308, April 1976. 3 tab, 2 fig, 30 ref.

Descriptors: *Manganese, *Return flow, Water quality, Rivers, Water pollution sources, Organic compounds, *Path of pollutants, Acids.
Identifiers: Manganese transport, *Fluvic acid.

The role of allochtonous organic substances in the solubilization of manganese was investigated. The organic substances used were leachates of a variety of watershed materials, fulvic acid, and a number of pure model compounds. It was found that manganese concentration and water color were directly proportional, in most cases, and that the organic materials comprising the color are effect in dissolving manganese oxides and stabilizing the dissolved manganese in solution. (Skogerboe-Colorado State)
W77-12136

SOLUBILITY AND AVAILABILITY OF CADMIUM IN CADMIUM-SLUDGE AMENDED SOIL,
Colorado State Univ., Fort Collins.
J. J. Street.
PhD Thesis, 1976, 126 p.

Descriptors: *Cadmium, *Metals, *Heavy metals, *Trace elements, *Absorption, Application methods, Phosphorus, Soil chemistry, Soil contamination, Agriculture, Waste disposal, Sludge disposal, Waste water treatment.

The distribution of Cd(+2) in soils and its availability to plants have been investigated. Cadmium carbonate and cadmium phosphate were found to inhibit cadmium activity in soils, with CdCO3 being the major controlling solid phase when high concentrations of Cd were added. Adsorption was found to be the controlling factor on Dc solubility when low concentrations of Cd were added. Uptake of Cd by corn seedlings which had been grown in soils amended with sewage sludge or with cadmium along was investigated. A positive correlation was observed between cadmium concentrations in soils and in plants. Cd uptake was found to decrease with increased soil pH and phosphorus levels. Field studies showed that heavy application of Cd-bearing sludges reduced yields and increased Cd concentrations in plants. Reduced uptake, mobility, and solubility of cadmium were observed in soils that were alkaline, rich in organic matter, and heavy-textured. (Schulz-FIRL)
W77-12144

WATERFOWL REFUGE EFFECT ON WATER QUALITY: II. CHEMICAL AND PHYSICAL PARAMETERS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 5A.
W77-12148

CALLAHAN RESERVOIR: I. SEDIMENT AND NUTRIENT TRAP EFFICIENCY,
Agricultural Research Service, Columbia, Mo. North Central Watershed Research Center.
For primary bibliographic entry see Field 5G.
W77-12149

CALLAHAN RESERVOIR: III. BOTTOM SEDIMENT-WATER-PHOSPHORUS RELATIONSHIPS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 5G.
W77-12150

LAKE MICHIGAN DIVERSION--STREAM QUALITY PLANNING,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5G.
W77-12163

CHLORIDE ACCUMULATION NEAR CORN ROOTS UNDER DIFFERENT TRANSPIRATION, SOIL MOISTURE, AND SOIL SALINITY REGIMES,
Punjab Agricultural Univ., Ludhiana (India). Coll. of Agricultural Engineering.
B. K. Sinha, and N. T. Singh.
Agronomy Journal, Vol. 68, No. 2, p 346-348, March-April 1976. 3 tab, 8 ref.

Descriptors: *Corn(Field), *Chlorides, Soil water, *Soil moisture, *Saline soils, Salinity, *Transpiration, *Root zone, Root systems, Root development.

The magnitude of 36Cl accumulation around roots of corn plants exposed to low, medium, and high transpiration rates was studied in laboratory experiments using Tulewal loamy sand salinized to ECe of 3 and 6 m mhos/cm with sodium chloride. Radioautographs and quantitative measurements of 36Cl in high transpiration treatment showed the highest concentration of the element in regions closest to the root. At high transpiration rates the chloride content of the soil close to the roots increased while the same soil showed a decrease in the chloride content when the plants were exposed to low transpiration treatment. Chloride concentrations in the 'apparent free space' and soil close to the roots was two to three times that in the bulk soil, depending upon the amount of water transpired/unit root length. At higher transpiration rates, salt accumulation increased with greater soil moisture content but was either unaffected or decreased closer to the root-soil interface, when the transpiration rate was low. The results indicate that the salinity tolerance limits of plants would be greatly influenced by the prevailing evaporative demand. (Skogerboe-Colorado State)
W77-12171

LEACHING OF PHOSPHATE AND SELECTED CATIONS FROM SANDY SOILS AS AFFECTED BY LIME,
Ministry of Agriculture, Bangkok (Thailand). Agricultural Chemistry Div.
P. Chaiwanakupt, and W. K. Robertson.
Agronomy Journal, Vol. 68, No. 3, p 507-511, May-June 1976. 12 fig, 2 tab, 7 ref.

Descriptors: Phosphorus, *Phosphates, *Leaching, *Cations, Lime, Groundwater, Soil investigations, *Sands.
Identifiers: Soil cylinders.

It is important to determine if and to what extent P moves through some acid sandy soils and, in view of the high cost of fertilizer P and the problems associated with pollution of groundwater, what can be done to prevent or reduce the movement when it occurs. Segmented columns, 25 cm in length and 5 cm in diam., were used to study P leaching in five mineral and one organic soil. A total of 25 or 50 cm H20 was passed through the columns, containing soil from various depths, after treatment in the top 2 cm with 0 to 600 ppm P tagged with 32P. Leaching of K, Ca, and Mg occurred in all soils. The amount was generally related to the CEC or the levels present in the extractable form before the leaching began. Leaching of Fe and Al was determined only on soils where P leaching was appreciable. These ions generally leached with P but there was a direct relationship between leached and 0.1 N HCl extractable ions. These data are of value in evaluating and determining P and lime requirements. (Skogerboe-Colorado State)
W77-12172

NUTRIENT TRANSPORT IN RUNOFF FROM SANDY SOILS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
K. L. Campbell.
Presented at the 1976 Winter Meeting of the American Society of Agricultural Engineers, December 14-17, 1976, Chicago, Illinois. 20 p, 4 fig, 7 tab, 5 ref.

Descriptors: Watersheds(Basins), *Water quality, Management, *Nutrients, Streamflow, Return flow, Phosphorus, Nitrogen, *Agricultural runoff, *Sands, Soils.

Two agricultural watersheds were instrumented to determine water quantity and quality measurements. The upper watershed of 437 hectares was primarily in forest cover with some pasture. The lower watershed of 208 hectares was mostly in intensive agricultural crop production with some pasture. The following results are from data collected between July, 1975 and June, 1976. 1. Nitrogen and phosphorus loads in streamflow were about proportional to the flow volume in the two watersheds. The average total nitrogen concentration was only about 10% greater in the lower watershed, while the average total phosphorus concentrations were the same in both watersheds. 2. The increased flow volume in the lower watershed occurred mostly during storm periods and was probably primarily due to land use and topography differences between the two watersheds. 3. There were only small average concentration changes between storm flow periods and low flow periods in both watersheds. 4. Partial nutrient balances indicate that nutrient losses in streamflow are a very small part of the total nitrient flow system in these two watersheds. Total nitrogen and phosphorus losses in streamflow were equivalent to about 5% of the commercial fertilizer applied in each watershed. Nutrient loads in streamflow also were less than those contributed to the watersheds in precipitation during the period. (Skogerboe-Colorado State)
W77-12184

VERTICAL GRADIENTS IN ARTIFICIAL SUBSTRATE-ASSOCIATED PROTOZOAN COMMUNITY STRUCTURE IN A STRATIFIED FRESHWATER LAKE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-12196

DETERMINATION OF ORGANOCHLORINE PESTICIDES IN THE TISSUE OF THE BLACK MULLET (MUGIL CEPHALUS) AND THE SILVER MULLET (MUGIL CUREMA),
Miami Univ., Coral Gables, Fla. Research and Teaching Center of Toxicology.
D. A. Cubit, W. B. Deichmann, and W. E. MacDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 023, Price codes: A02 in paper copy, A01 in microfiche. NOAA Report SG No 2-35147, Reprinted from American Industrial Hygiene Association Journal, p 8-15, January 1976. 2 fig, 5 tab, 12 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, Water pollution sources, *Fish reproduction, *Toxicity, *Mullets, DDT, Dieldrin, Fish physiology, Path of pollutants, Organic compounds, Water quality, Halogenated pesticides, Marine fish, Spawning, Florida, Pollutant identification.
Identifiers: Bioaccumulation, Tissue analysis, Black mullet, Silver mullet, Mugil cephalus, Mugil curema.

Because of the importance on mullet as a Florida fish food source, studies were undertaken to determine their extent of pollution by organochlorine pesticides. Consideration was given to monthly changes in tissue pesticide concentrations—such changes might occur (1) in response to seasonal agricultural pesticide use and therefore changing concentrations in runoff waters, or (2) by a physiological process inherent to spawning. (Katz)
W77-12197

ACCUMULATION AND ELIMINATION OF ALPHA-HEXACHLOROCYCLOHEXANE (ALPHA-HCH) BY THE MARINE ALGAE CHXLAMYDOMONAS AND DUNALIELLA,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Toxicology.
For primary bibliographic entry see Field 5C.
W77-12214

MODEL KUMULACJI 137CS U KARPIA (CYPRINUS CARPIO L.) A MODEL OF THE CUMULATION OF 137CS IN THE CARP CYPRINUS CARPIO L.), (IN POLISH),
Instytut Ksztaltowania Srodowiska, Katowice (Poland).
For primary bibliographic entry see Field 5C.
W77-12215

OBSERVATIONS OF AN ASH LAGOON SPILL ON THE NEW RIVER, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
C. H. Hocutt, K. L. Dickson, M. T. Masnik, and J. R. Stauffer.
Hydrobiologia, Vol 48, No 3, p 241-245, 1976. 2 fig, 2 tab, 13 ref.

Descriptors: *Alkaline water, *Dispersion, *Ecological distribution, Water pollution, Distribution patterns, Speciation, Water types, Sampling, Water pollution sources, Environmental effects, Bioassay, Aquatic life, Populations, Industrial wastes, Physicochemical properties.
Identifiers: *Ash, *New River(Virginia), Coal fly ash.

An estimated 7 million liters of slightly alkaline water (pH=7.7) and ash entered New River on 23 July 1973 near Pearisburg, Virginia. The rate of dispersion, 1.4 km/hr, allowed qualitative collections of fishes and macroinvertebrates to be made immediately before and after the biological impact of the spill. Diversity and relative abundance indicated that fishes and macroinvertebrates were little affected. Physicochemical parameters from the flyash lagoon, as projected from 1971-1972 data, were within the known tolerance ranges of aquatic biota common to New River. (Katz)
W77-12219

IMPACT OF AN URBAN METHOXYCHLOR SPRAYING PROGRAM ON THE ROUGE RIVER, MICHIGAN,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
J. F. Sullivan, and G. J. Atchison.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 1, p. 121-126, 1977. 1 fig, 20 ref.

Descriptors: *Path of pollutants, *Organic compounds, *Spraying, *Chlorinated hydrocarbon pesticides, *Plant diseases, Pathology, Toxicity, Biology, Pesticide drift, Organic pesticides, Water quality, Sampling, Analytical techniques, Water pollution, water quality, Environmental effects, Snails, Sediments, Suspended solids, Bioassay, Pesticides.
Identifiers: *Methoxychlor, Dutch Elm Disease, Bioaccumulation, *Rouge River(Mich), Detroit(Mich).

Methoxychlor was sprayed annually for a city-wide Dutch Elm Disease control program in Detroit since 1968. The path and persistence of the pesticide in urban rivers was investigated in addition to identifying storage areas and levels of concentration. Methoxychlor was not detected by gas chromatography in any of the water, suspended matter, sediment, or snail samples. No detectable levels were found in the mass spectrometric analysis of the composite samples. Explanations concerning why no methoxychlor was found in the Rouge River ecosystem were presented. (Katz)
W77-12220

FATE OF POLYCHLORINATED BIPHENYL (AROCLOR 1242) IN AN EXPERIMENTAL STUDY AND ITS SIGNIFICANCE TO THE NATURAL ENVIRONMENT,
Australian National Univ., Canberra. Dept. of Biological Sciences.
P. M. Gresshoff, H. K. Mahanty, and E. Gartner.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 6, p. 686-691, 1977. 2 fig, 14 ref.

Descriptors: *Algae, *Organic compounds, *Aroclors, *Mode of action, *Chlorinated hydrocarbon pesticides, *Growth rates, Biochemistry, Path of pollutants, Environmental effects, Population inhibition, Polychlorinated biphenyls, Laboratory tests, *Adsorption.
Identifiers: Bioaccumulation, Tissue analysis, *Aroclor 1242, Chlamydomonas reinhardi, Chlorella fusca.

The fate of PCBs under experimental conditions on freshwater algae, Chlamydomonas reinhardi and Chlorella fusca, was investigated. Results indicated that the major amount of Aroclor 1242 disappeared from the biological environment and became adsorbed to glass surfaces. C. reinhardi cells exhibited a full regeneration type of growth curve in the presence of PCBs. When the toxicant was removed, cells were released from their growth inhibition. C. fusca was highly sensitive to Aroclor 1242 with the inhibition prevailing even after the toxin was readsorbed onto fresh glass surfaces. Preferential binding of Aroclor to target sites was discussed. (Katz)
W77-12224

EFFECTS OF HIGH STABILITY IRON-COMPLEXES ON THE KINETICS OF IRON ACCUMULATION AND EXCRETION IN MYTILUS EDULIS (L.),
Institute of Marine Biochemistry, Aberdeen (Scotland).
S. G. George, and T. L. Coombs.
Journal of Experimental Marine Biology and Ecology, Vol. 28, p. 133-140, 1977. 3 fig, 2 tab, 19 ref.

Descriptors: *Absorbtion, *Metabolism, Animal physiology, *Mussels, *Metals, *Iron, Invertebrates, Mode of action, Aquatic life, Molluscs, Chemistry, Bioassay, Organic compounds, Path of pollutants, Biochemistry commercial shellfish.
Identifiers: *Iron-complexes, Bioaccumulation, Tissue analysis.

The effects of small molecular weight complexes with a high affinity for iron on the uptake, accumulation, and excretion of iron by the common mussel, Mytilus edulis (L.) were investigated. Fe(III) complexes of citrate, EDTA, and 1,10-phenanthroline increased both the rate of uptake and the total amount accumulated when compared to those for particulate ferric hydroxide in sea water, whereas ferrichrome b and the Fe(III) complexes of aceto- and benzo-hydroxamic acids gave a decrease. Increased uptake was however, compensated for by an increased rate of excretion resulting in an almost constant residence time for this metal. The iron was accumulated principally in the viscera with a smaller by significant proportion in the gills. The effects produced by prior complexation of the iron cannot be correlated with either the strength of binding of the complex to the iron or the exchangeability of the iron with other ligands but may be concerned with the endocytosis, the mechanism of uptake for iron previously shown to occur in Mytilus. (Katz)
W77-12228

RESIDUES OF CHLORINATED HYDROCARBONS IN NORTH SEA ANIMALS IN RELATION TO BIOLOGICAL PARAMETERS,
Institut fuer Meeresforschung, Bremerhaven (West Germany).
R. G. Schaeffer, W. Ernst, H. Goerke, and G. Eder.
Berichte der deutschen Wissenschaftlichen Kommission fur Meeresforschung, Vol. 24 p. 225-233, 1976. 1 fig, 5 tab, 26 ref.

Descriptors: *DDD, *DDT, *DDE, *Polychlorinated biphenyls, *Pesticides, *Chlorinated hydrocarbon pesticides, *Pesticide residues, Residues, Laboratory tests, Fish physiology, Food chains, Path of pollutants, Analytical techniques, Arochlor, Herrings.
Identifiers: Lipid based residue concentrations, Bivalves, Polychaetes, Polyphysia, Aphrodite, Acanthocardia, Clupea, Hippoglossoides, Limanda, Gadus, *North Sea, Tissue analysis, Cod, Bioaccumulation, Cod.

Fish, polychaetes and a bivalve (altogether 8 species) from the cental North Sea were analysed for residues of DDT, DDD, DDE, PCB and HCB. Residues of PCB were predominant. Concentrations of pollutants were found in the order of 0.1 ppm wet weight in muscles of fish and up to 10 ppm in livers of cod. The values were discussed relative to lipid contents, distribution over different tissues, increase with weight, food chain magnification and PCB/(summation DDT) ratios in different organisms. (Katz)
W77-12229

DISPOSITION OF DIELDRIN IN FOUR COMPONENTS OF TWO ARTIFICIAL AQUATIC SYSTEMS AND A FARM POOL,
Georgia Univ., Athens. School of Forest Resources.
W. J. Lorio, J. H. Jenkins, and M. T. Huish.
Transactions of the American Fisheries Society, Vol 105, No 6, p 695-697, 1976. 4 tab, 13 ref.

Descriptors: *Dieldrin, *Organic pesticides, *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Soils, *Farm ponds, *Water quality, Fish, Ponds, Halogenated pesticides, Distribution, Aquaria, Model studies, Path of pollutants, Sediments.
Identifiers: Bioaccumulation, Accumulation, Artificial ponds, Artificial aquatic systems.

Studies of deposition of dieldrin concentrations sublethal to fish were conducted in flowing and non-flowing aquatic systems, Residual concentrations were determined for water, soil, plants and fish in 18 flowing and 18 static artificial systems, after treatments of 24, 36, 48, and 72 h, in a farm pond. Samples from each of the four components were analyzed for dieldrin residues by gas chromatography. Two aquaria with aerated water but without biological components were tested. The distribution of dieldrin was similar in the waters of the closed, flowing, and farm-pond systems. Soils contained little dieldrin but the compound was accumulated rapidly and as high as 474 ppb (parts per billion) and 3,950 ppb by plants and fish, respectively. The concentration of the insecticide declined with time in the three systems (soils, plants, and fish). (Katz)
W77-12230

ORGANOCHLORINE POISONING OF RING-BILLED GULLS IN SOUTHERN ONTARIO,
Ontario Ministry of Natural Resources, Maple. Fish and Wildlife Research Branch.
For primary bibliographic entry see Field 5C.
W77-12234

BEHAVIOURAL, HAEMATOLOGICAL AND HISTOLOGICAL STUDIES ON ACUTE TOXICITY OF BIS (TRI-N-BUTYLTIN) OXIDE ON SALMO GAIRDNERI RICHARDSON AND TILAPIA RENDALLI BOULENGER,
Geneva Univ. (Switzerland). Department de Biologie Animale.
For primary bibliographic entry see Field 5C.
W77-12235

CHARACTERIZATION OF POLYCHLORINATED BIPHENYL DISTRIBUTION IN THE MARINE ENVIRONMENT,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-12242

POLYCHLORINATED BIPHENYL INHIBITION OF MARINE PHYTOPLANKTON PHOTOSYNTHESIS IN THE NORTHERN ADRIATIC SEA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 5C.
W77-12246

EFFECTS OF OUTBOARD MARINE ENGINE EXHAUST ON THE AQUATIC ENVIRONMENT,
Environmental Control Corp., Ann Arbor, Mich.
J. E. Schenk.
Progress in Water Technology, Vol 7, No 3/4, p 733-741, 1975. 3 tab, 17 ref.

Descriptors: *Fuels, *Oil wastes, *Water pollution sources, *Boating, *Oil pollution, *Lead, Metals, Aquatic life, Organic compounds, Path of pollutants, Toxicity, Populations, Benthos, Fish, Primary productivity, Zooplankton, Phyplankton, Sediments, Water quality.
Identifiers: *Outboard marine engine wastes, Leaded fuel, Non-leaded fuel.

With respect to the pollutional effect of outboard engines no acute effect on biological communities was observed. Species abundance, richness, and population similarity of phytoplankton populations in both the leaded and nonleaded fuel test lakes were not affected. Analysis of zooplankton and periphyton data showed no effects due to 2-cycle outboard motor emmission. No marked changes in fish behavior or populations were observed. With leaded fuel increased lead levels in the water column and sediment were indicated in addition to increased hydrocarbon levels. (Klein)
W77-12248

ANALYSIS OF HEAVY METALS AND BACTERIA IN SEDIMENTS FROM DANISH LIGNITE PITS,
Copenhagen Univ. (Denmark). Inst. of Hygiene.
For primary bibliographic entry see Field 5A.
W77-12250

5C. Effects Of Pollution

DAILY VERTICAL DISTRIBUTION OF ZOOPLANKTON IN SOME LAKES IN THE EASTERN PART OF THE BOL'SHEZEMEL'SKAYA TUNDRA (IN RUSSIAN),
Nature Conservation, Game Preserves and Hunting, Moscow (USSR). Central Lab.
For primary bibliographic entry see Field 2L.
W77-11501

COLD SHOCK TO AQUATIC ORGANISMS: GUIDANCE FOR POWER-PLANT SITING, DESIGN, AND OPERATION,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
C. C. Coutant.
Nuclear Safety, Vol. 18, No. 3, May-June 1977. p 329-342, 7 fig, 2 tab, 61 ref.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, *Aquatic life, Powerplants, Cooling water, Sites, Operations, Design.

The study deals with problems which arise at some condenser cooling-water discharges of thermal power stations when warm water releases are suddenly released. The biological basis for cold shock damages is discussed and guidance recommendations for siting, design and operation of power plants is suggested. It is suggested that siting stations away from zones of high biological activity may be the best way to prevent cold shock damages. Three principal design options which are recommended are: (1) restricting the volume of warmed water accessible to organisms, (2) reducing the frequency of complete shutdown through multiple-unit designs, and (3) reducing the temperature differences of the discharge to the ambient temperature. Operation of plants within the design bases is recommended. (Chilton-ORNL)
W77-11502

EFFECTS OF STABLE CHLORINE-CONTAINING ORGANICS ON AQUATIC ENVIRONMENTS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
C. W. Gehrs, L. D. Eyman, R. J. Jolley, and J. E. Thompson.
Nature, Vol. 249, No. 5458, June 1974, p 675-676. 10 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Organic compounds, *Chlorine, Aquatic environment, Hatching, Eggs, Carp.

Data on the toxic effects of two species of stable chlorine-containing organic compounds, 4-chlororesorcinol and 5-chlorouracil, on the hatchability of carp eggs is reported. Tests were run on water-hardened and non-water-hardened eggs at temperatures of 21 and 26 C and concentrations ranging from 0.001 to 10 mg l (minus 1) plus con-

trols. Comparison of the relative toxicity of the two chemicals on non-water-hardened eggs at the two temperatures indicated similar toxicity, with the lower concentration significantly lowering hatchability in all but the 26 C 5-chlorouracil test medium. Eggs that were water-hardened before exposure to the toxicants were more resistant to the toxicants than were non-water-hardened eggs. (Chilton-ORNL)
W77-11503

PARTITIONING OF POLYCYCLIC AROMATIC HYDROCARBONS BETWEEN DISSOLVED AND PARTICULATE PHASES IN NATURAL WATERS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W77-11504

A YEARLY CYCLE OF CHANGES IN DYNAMICS OF PRODUCTION OF THE CHEMOAUTOTROPHIC BACTERIA IN BOTTOM SEDIMENTS OF A WATER BODY,
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
E. Fischer.
Pol Arch Hydrobiol. 19(4), p 343-359, 1972.

Descriptors: *Bacteria, *Bottom sediments, Productivity, Carbon compounds, *Ponds, Seasonal, Temperature.
Identifiers: Carbon-14, *Poland, *Chemoautrophic bacteria.

The dynamics of a yearly cycle of the chemoautotrophic bacterial production in the bottom sediments of 2 small water bodies was studied. These were a natural pond situated in the area of Kampinos Forest (Poland) and an experimental reservoir situated on the premises of the Institute of Experimental Biology, Polish Academy of Sciences. The 24 h assimilation of C absorbed in the process of chemoautotrophic bacterial production was determined using labelled carbon 14C and the density of bacterial population determined by direct microscopic counting. Based on those 2 determinations, production dynamics of bacterial population in the autotrophic bacterial biomass production were estimated. This value was expressed in microgram of assimilated C/million bacterial cells. The production dynamics of the chemoautotrophic bacteria show the highest number of bacteria, the production dynamics are low, which is concurrent with a small amount of produced biomass. Factors determining the number of bacteria in small water bodies are different from those influencing production dynamics. The low number of bacteria at the high production activity in summer means the bacterial biomass turnover in the water biocenosis is high at this time contrary to the winter season where the situation is inverted. The variability of the 24 h chemoautotrophic bacterial production level is related to the variability of the production activity in such an essential manner that the seasonal variability of both those values is of a very similar character. The level of the chemoautotrophic bacterial biomass production is dependent, above all, on those factors which effect the efficiency of that production, while the effect of the abundance of bacterial cells is apparent only in sporadic cases. The computed coefficient of biomass production shows some characteristic regularities in relationship to temperature of the environment and the CO2 contents, which means that this coefficient really determines the activity of the chemoautotrophic production of bacterial population in the bottom sediments.--Copyright 1974, Biological Abstracts, Inc.
W77-11505

THE INTENSIVE PRODUCTION OF FRESH WATER ALGAE, (IN DUTCH),
Ghent Rijksuniversiteit (Belgium). Faculteit Landbouwwetenschappen.
J. De Maeseneer.
Meded Fac Landbouwwet Rijksuniv Gent. 37(4), p 1201-1209, 1972.

Descriptors: *Algae, *Productivity, *Diatoms, Climates, *Eutrophication, Food chains, Nutrients, Trophic level.
Identifiers: Milkfish, Taiwan.

The technical means for raising large quantities of algae, either in biologically purified or in unpurified water are today within reach. However, with the algae now being used a continuous production set-up is impossible in moderate climates. On the basis of limnologic observations in shallow eutrophic water, the view is expressed that diatomacea could well be the missing link for continuous production. Nothing is known about the nutritional value of diatomacea for the higher animals. It is a fact, however, that diatomacea, both in sea water and fresh water, are the basis for a high trophic pyramid. This cannot be said of the blue algae. In Taiwan the growth of diatomacea in milk-fresh ponds is encouraged by the addition of sodium silicate whenever the SiO2 content of the water drops below 0.25 ppm.--Copyright 1974, Biological Abstracts, Inc.
W77-11506

THE ACCUMULATION OF MERCURY BY THE THORNBACK RAY, RAJA CLAVATA L.,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
R. J. Pentreath.
Journal of Experimental Marine Biology and Ecology, Vol. 25, No. 2, 1976, p 131-140. 4 fig, 6 tab, 8 ref.

Descriptors: *Environmental effects, *Water pollution effects, Radiobiology, *Mercury, Absorption, Food, Sea water, Organic compounds, Inorganic compounds.
Identifiers: *Methyl mercury, Thornback ray.

Experiments showed that the ray is capable of obtaining inorganic mercury from both food and sea water. Input from sea water at 20 ng Hg/l was calculated as approximately 0.18 ng Hg/g of fish/day. Food containing approximately 35 ng/g of inorganic mercury at a feeding rate of 5% body weight/day resulted in an intake of 1.75 ng Hg/g of fish/day. 14% of this oral intake was retained. Accumulation of methylmercury from sea water was greater than that of the inorganic form and no excretion was observed. Methyl mercury distribution within the fish is similar to that of the stable mercury, and it has a relatively long biological half-life so that a total body content of approximately 1100 ng Hg could be maintained with an intake rate of 2 to 3 ng Hg/day. Concentration factor of mercury over sea water per unit time was found to be much greater for the ray than the plaice. (Chilton-ORNL)
W77-11507

THE ACCUMULATION OF MERCURY FROM FOOD BY THE PLAICE, PLEURONECTES PLATESSA L.,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
R. J. Pentreath.
Journal of Experimental Marine Biology and Ecology, Vol. 25, No. 1, November 1976, p 51-65. 7 fig, 5 tab, 31 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Mercury, Absorption, Sea water, Organic compounds, Inorganic compounds, Radiobiology.
Identifiers: *Plaice, *Methyl mercury.

Inorganic and organic mercury accumulation was studied by forcibly feeding Hg203-labelled food. Methyl mercury was found to be readily absorbed and only slowly eliminated. Five days after ingestion, approximately 30% of the organic form was associated with muscle, skin and bone tissue. It was suggested that inorganic mercury may be accumulated both by ingestion and through the gill and skin from sea water. It was concluded that the preferential absorption of the methyl form and its longer biological half-time, would result both in an increased percentage of methyl mercury at the higher trophic levels and a higher total mercury concentration. (Chilton-ORNL)
W77-11508

ACTIVITY OF HYDROLYTIC ENZYMES IN WATER AND BIOMASS OF PLANKTONIC ORGANISMS IN A RESERVOIR OF AN EUTROPHIC TYPE IN THE LAGOON OF KURSIU MARIOS, (IN RUSSIAN),
Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of Botany.
V. Yu. Gribauskene, M. M. Yamontene, and K. K. Yankyavichyus.
Liet Tsr Moksiu Akad Darbai Ser C. 2, p 3-7, 1973.

Descriptors: *Enzymes, *Biomass, Eutrophication, *Plankton, Reservoirs, Lagoons, *Proteins, Seasonal.
Identifiers: Amylases, Cellulases, Lithuania, Pectinases, Proteases, *USSR(Lagoon of Kursiu Marios).

Activity dynamics of hydrolytic enzymes (those of amylases cellulases, proteases, pectinases) and a general amount of protein substances were investigated in the water of the Lagoon and in the biomass of planktonic organisms at the 2 Lagoon stations near Juodkrante (Lithuania, USSR) from June-Sept. 1970. Considerable fluctuations of the amount of protein substances and the activity of endogenic and exogenous enzyme were determined. Two activity maxima were revealed: the 1st one from July 6-20 and the 2nd one from Aug. 17-Sept. 14. No essential difference in indices of the activity of hydrolytic enzymes and the amount of protein substances at both stations was detected.--Copyright 1974, Biological Abstracts, Inc.
W77-11509

HEAVY METALS IN WATER, SEDIMENTS, AND CHIRONOMIDS,
TECHRAD, Inc., Oklahoma City, Okla.
For primary bibliographic entry see Field 5B.
W77-11510

THE BIOMASS, ORGANIC MATTER CONTENTS AND CALORIFIC VALUES OF MACROPHYTES IN THE LAKES OF THE SZESZUPA DRAINAGE AREA,
Polish Academy of Sciences, Mikolajki (Poland). Dept. of Applied Limnology.
A. Garbowski.
Pol Arch Hydrobiol. 20(2), p 269-282, 1973.

Descriptors: *Biomass, *Organic matter, Lakes, Drainage, Aquatic plants.
Identifiers: *Caloric value, Chara-sp, Dicots, Equisetum-limosum, *Macrophytes, Monocots, *Poland(Szeszupa drainage area).

The biomass, organic matter content and caloric values were measured in macrophytes living in the littoral of the lakes of the Szeszupa drainage area (the Suwalki-Augustow Lakeland (Poland)). Fourteen lakes of different trophic types were investigated. It was found that macrophyte biomass per 1 m2 of the littoral area in the investigated lakes was from 326.5-979.0 g/m2. The highest share in the total biomass was that of emergent plants, 87.85 on the average, and the lowest one, that of floating plants, 0.7%. The highest organic matter content was that of emergent plants, 3621 cal/g, submerged plants with floating leaves, 3140 cal/g, submerged plants, 1710 cal/g, and floating plants, 1526 cal/g, dry weight. Caloric values of organic matter were calculated for the particular

macrophyte species (monocots, dicots Equisetum limosum Chara sp.) as well as for the ecological plant groups. The caloric value per area unit of the littoral was also estimated–Copyright 1974, Biological Abstracts, Inc.
W77-11511

RETENTION OF A SINGLE ORAL DOSE OF CADMIUM IN TISSUES OF THE SOFTSHELL TURTLE, TRIONYX SPINIFER,
Middle Tennessee State Univ., Murfreesboro, Tenn. Dept. of Biology.
K. M. Robinson, and M. R. Wells.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 6, December 1975, p 750-752. 1 tab, 6 ref.

Descriptors: Environmental effects, *Water pollution effects, Sewage effluents, *Turtles, *Cadmium, *Absorption.
Identifiers: Single dose.

Softshell turtles were collected from Stones River, Cannon County, Tennessee. The turtles were fed 2 mg of cadmium as cadmium acetate and then dissected at 48 and 96 hours after dosing. Analysis of liver, kidney, stomach, small intestine, and large intestine showed these tissues to be free of cadmium. In turtles collected from the same river at a site downstream from a sewage effluent, cadmium was detected with levels ranging from 9.87 ppm in the kidney to 0.19 ppm in the small intestine. It was concluded that the softshell turtle is able to tolerate relatively large concentrations of cadmium initially and over long periods of time with little effect on the health of the turtles. (Chilton-ORNL)
W77-11513

EFFECTS OF DISSOLVED OXYGEN ON SURVIVAL AND BEHAVIOR OF SELECTED FISHES OF WESTERN LAKE ERIE,
Tennessee Game and Fish Commission, Nashville.
D. Petit.
Bull Ohio Biol Surv. 4(4), p 1-76, 1973.

Descriptors: *Dissolved oxygen, *Fish behavior, *Mortality, *Lake Erie, Great Lakes, *Anaerobic conditions, Bass perch, Bluegill, Walleye, Lethal limit, Fish diets.
Identifiers: Esox-lucius, Lepomis-macrochirus, Micropterus-salmoides, Perca-flavescens, Stizostedion-vitreum-vitreum.

This study was initiated following upon the discovery that the bottom waters of Lake Erie (USA and Canada) were becoming increasingly anaerobic due to pollution. The following species of fish were studied: norther pike (Esox lucius), largemouth bass (Micropterus salmoides), bluegill (Lepomis macrochirus), walleye (Stizostedion vitreum vitreum), and yellow perch (Perca flavescens). The dissolved O2 content of lake water was reduced mechanically and delivered in continuous flow through aquaria. In the test aquaria a layer of liquid paraffin on the water surface eliminated measureable exchange of oxygen between the water and the air. All of the fish used in the tests were young-of-the-year. Test series were started at 5 ppm dissolved O2 and the concentation lowered in 1 ppm steps until lethal levels were reached. Control aquaria were maintained at 6 ppm. All fish responded to all tested O2 concentrations below 6 ppm with increased rates and amplitudes of opercular movements. Activity rates were variable but generally decreased as the lethal concentration was approached. Both single and small groups (4-6) of fish were tested and grouped fish, as a rule, showed lower rates of opercular movement than single fish. Stress phenomena, such as bleaching, cessation of feeding and loss of equilibrium, were noted in all species tested. Most of the fish were tested at bout 22C but 1 series of tests were run on the yellow perch at 15C. Lethal concentrations for northern pike, largemouth bass, bluegill and yellow perch (at 22C) was 1 ppm. Walleyes died at 2 ppm but apparently from internal injuries and not from asphyxia. The lethal concentration for yellow perch at 15C was not determined. Bluegills took longer to succumb to 1 ppm dissolved O2 than the other species tested. All concentrations of dissolved O2 below 6 ppm are probably ecologically unfavorable.–Copyright 1974, Biological Abstracts, Inc.
W77-11514

METHYLMERCURY IN THE ENVIRONMENT: A REVIEW OF CURRENT UNDERSTANDING,
Duke Univ. Medical Center, Durham, N.C. Dept. of Community Health Sciences.
W. Stopford, and L. J. Goldwater.
Environmental Health Perspectives, Vol 12, 1975. p 115-118. 39 ref.

Descriptors: *Environmental effects, *Water pollution effects, Public health, Mercury, Toxicity, Food chains, Aquatic environment, Sediments, Reviews.
Identifiers: *Methylmercury.

Some of the more important findings in the area of methylmercury poisoning are summarized. The danger of methylmercury poisoning is reported to be slight when the environment is not directly contaminated with methylmercury. Mercury is bound by sediments and its availability to aquatic organisms is decreased. Sediments have also shown a greater propensity to demethylate than to methylate mercury. Methylmercury and inorganic mercury concentrations in noncontaminated aquatic ecosystems were found to be lower than those that have been found to cause toxicity even in the most sensitive organisms. Protein bound methylmercury appears to be less toxic than methylmercury salts. Selenium present in this protein appears to be a detoxifying agent for methylmercury. (Chilton-ORNL)
W77-11516

POLYAMINE SYNTHESIS IN LIVER AND KIDNEY OF FLOUNDER IN RESPONSE TO METHYLMERCURY,
Arizona Univ. Medical Center, Tucson. Dept. of Pharmacology.
C. A. Manen, B. Schmidt-Nielsen, and D. H. Russell.
American Journal of Physiology, Vol 231, No 2, August 1976, p 560-564. 4 fig, 2 tab, 28 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Mercury, Toxicity, Fish.
Identifiers: *Flounder, Polyamine, Synthesis, Liver, Kidney, *Methylmercury.

Winter flounder, Pseudopleuronectes americanus, were administered methylmercury at the rate of 2 mg/kg in 0.85% saline. Within 2 h of treatment, the concentration of mercury in the kidney had risen from less than 1 ppm to greater than 30 ppm. This level was maintained for 16 h, after which it declined until a level of 3 ppm was reached at 72 h. Five and sevenfold elevations of ornithine decarboxylase activity occurred in the kidney and liver within 45 and 15 h, respectively, from single injections of methylmercury. 1.5 fold elevations of putrescine- and spermidine-stimulated S-adenosylmethionine decarboxylase activities were observed in both tissues. Concentrations of all three polyamines increased in the liver for 48 h and then declined. Putrescine concentration in the kidney increased to 200% of control at 72 h and then declined. Spermidine concetration decreased throughout the time studied to 17% of control at 1 wk. Spermine concentration did not change significantly throughout the time studied. (Chilton-ORNL)
W77-11518

DISTRIBUTION OF CADMIUM, ZINC AND COPPER IN THE MUSSEL MYTILUS EDULIS. EXISTENCE OF CADMIUM-BINDING PROTEINS SIMILAR TO METALLOTHIONEINS,
Liege Univ. (Belgium). Laboratoire de Biologie Generale; and Liege Univ. (Belgium). Laboratoire d'Oceanologie.
F. Noel-Lambot.
Experientia, Vol 32, No 3, p 324-326. 2 fig, 15 ref, 1976.

Descriptors: Environmental effects, *Water pollution sources, Heavy metals, *Cadmium, *Zinc, *Copper, *Mussels, Mollusks, Absorption.
Identifiers: Cadmium-binding proteins, Metallothioneins.

The soft tissues of mussels were analyzed for Cd, Zn, and Cu. The results showed that Zn and Cu are generally associated with high molecular weight proteins. Cadmium accumulated by mussels during chronic intoxications induces the synthesis of low molecular weight Cd-binding proteins (Cd-BP) in tissues. This Cd-BP possesses a high percentage of cysteine and an ultraviolet absorption spectrum typical of metallothioneins. THe existence of such proteins in molluscs would allow them to accumulate large amounts of Cd and to resist it, thus becoming a potential danger to man as food. (Chilton-ORNL)
W77-11519

TRACE ELEMENTS IN ACARTIA CLAUSI FROM ELEFSIS BAY OF THE UPPER SARONIKOS GULF, GREECE,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
D. Zafiropoulos, and A. P. Grimanis.
Marine Pollution Bulletin, Vol 8, No 4, April 1977, p 79-81. 1 fig, 3 tab, 12 ref.

Descriptors: *Environmental effects, *Water pollution effects, Industrial wastes, Sewage effluents, *Trace elements, Zooplankton, Antimony, Arsenic, Cadmium, Chromium, Cobalt, Copper, Iron, Manganese, Mercury, Scandium, Selenium, Zinc.
Identifiers: Elefsis Bay, *Saronikos Gulf(Greece), *Acartia clausi.

Neutron activation analysis was used to determine antimony, arsenic, cadmium, chromium, cobalt, copper, iron, manganese, mercury, scandium, selenium and zinc in zooplankton samples. The bay from which samples were collected receives effluents from at least 25 large industries as well as domestic sewage. Samples taken in January 1974 showed elevated concentrations for As, Co, Cu, Fe, Mn, Sb, Sc, Se, and Zn compared to concentrations found in samples taken a month later. For Hg no significant differences were found between two cruises whereas for Cd and Cr samples taken during a second cruise show higher concentrations. Lower values of Co, similar values of Fe and slightly increased values of Cr were found in Elefsis Bay Acartia clausi than those reported for Acartia clausi in the Bay of Roquebrune. It is suggested that species composition and environmental factors may account for the differences between trace element concentration found in this study and those reported in the literature. (Chilton-ORNL)
W77-11521

EFFECT OF TETRAMETHYL LEAD ON FRESHWATER GREEN ALGAE,
Canada Centre for Inland Waters, Burlington (Ontario).
B. A. Silverberg, P. T. S. Wong, and Y. K. Chau.
Archives of Environmental Contamination and Toxicology, Vol 5, 1977, p 305-313. 4 fig, 1 tab, 13 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Lead, Algae, Photosynthesis, Growth rates, *Chlorophyta.
Identifiers: *Tetramethyl lead.

The effect of tetramethyl lead on growth and photosynthesis of three species of algae (Chlorell pyrenoidosa, Scenedesmus quadricauda, and Ankistrodesmus falcatus) was studied by passing tetramethyl lead into a culture medium containing the test algae. Even though less than 0.5 mg of Pb were passed through the culture medium, it was found that primary productivity and cell growth decreased by 85 and 32% respectively. It was concluded that tetramethyl lead exposure results in Pb ions penetrating the cell and being deposited within concretion bodies which are similar to polyphosphate inclusions commonly found in the algae. Polyphosphate may be suspected as one of the substances contributing to binding of lead ions. Tetramethyl lead toxicity manifests itself by loss of the algal's physiological and structural integrity. (Chilton-ORNL)
W77-11522

EFFECTS OF DREDGING OPERATIONS ON ESTUARINE BENTHIC MACROFAUNA,
Swedish Water and Air Pollution Research Lab., Goteborg.
Marine Pollution Bulletin, Vol 8, No 5, May 1977, p 102-104. 4 fig, 8 ref.

Descriptors: *Environmental effects, *Dredging, *Benthic fauna, Estuaries, Populations, Water pollution effects, *Estuarine environment.
Identifiers: Sweden.

The number and diversity of benthic species were found to be reduced by dredging operations. Larval recruitment in the vicinity of the dredged area was also affected. Benthic fauna showed an increase in mercury, cadmium, zinc, copper, lead and nickel concentrations. Community structure appeared to be nearly restored and heavy metal concentration decreased one and a half years after termination of dredging. It was concluded that the primary effects of the dredging operations were due to the increased amount of suspended particles. Higher concentrations of trace elements found in deposit feeders as compared to filter feeders were thought to be a result of the components being associated with detritus particles and ingested by deposit feeders. (Chilton-ORNL)
W77-11525

CADMIUM AND ZINC TOXICITY TO FLAGFISH, JORDANELLA FLORIDAE,
Environmental Research Lab.-Duluth, Minn.
R. L. Spehar.
Journal of the Fisheries Research Board of Canada, Vol 33, No 9, September 1976, p 1939-1945. 1 fig, 3 tab, 22 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Cadmium, *Zinc, Fish, Absorption, Mortality, Reproduction, Growth rates, Fry, Larvae, Embryonic growth stage, Mature growth stage.
Identifiers: *Flagfish.

Response of flagfish to cadmium and zinc was measured on the basis of 96-h median lethal concentrations and significant decreases in survival, growth and reproduction. Spawning and embryo production were the most sensitive measures of effect. For zinc tests, survival of larvae and adult growth were adversely affected at lower concentrations than those affecting reproduction. Larvae previously exposed to cadmium and zinc as embryos were more tolerant than those not previously exposed. This effect was more pronounced in zinc tests. 96-h LC50 values for both cadmium and zinc to juvenile fish were 2500 and 1500 microg/liter, respectively. Fish exposed to concentrations as low as 1.7 microg/l of cadmium were seen to accumulate significant amounts of the metal. Significant amounts of zinc were accumulated by fish exposed to concentrations of 47 microg/l. (Chilton-ORNL)
W77-11526

TOXIC INTERACTION OF MIXTURES OF TWO COAL CONVERSION EFFLUENT COMPONENTS (RESORCINOL AND 6-METHYLQUINOLINE) TO DAPHNIA MAGNA,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
S. E. Herbes, and J. J. Beuachamp.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 1, 1977, p 25-32. 1 fig, 4 tab, 18 ref.

Descriptors: Environmental effects, *Water pollution effects, *Toxicity, Organic compounds, Daphnia, Plankton, Effluents.
Identifiers: *Resorcinol, *Methylquioline, Coal conversion.

Daphnia were incubated in test solutions of resorcinol and 6-methylquinoline, both individually and in mixtures. Mixtures of resorcinol and 6-methylquinoline were found to be less toxic than either pure compound tested alone. These results contrast with most earlier studies of toxic mixtures, which have generally demonstrated additive interaction between aqueous pollutants. Most earlier studies examined effects of inorganic compound mixtures or highly-similar organic compounds while the present study has dealt with two dissimilar organic contaminants. It was concluded that the present work indicates that addition of fractional toxicities may produce substantial errors in prediction of toxicity of mixtures of non-homologous organic components. (Chilton-ORNL)
W77-11528

THE TOXIC EFFECTS OF SELECTED HEAVY METALS ON UNADAPTED POPULATIONS OF VOTICELLA CONVALLARIA VAR SIMILIS,
Surrey Univ., Guildford (England). Dept. of Microbiology.
E. P. Sartory, and B. J. Lloyd.
Water Research, Vol 10, 1976, p 1123-1127. 1 fig, 2 tab, 10 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Heavy metals, Lead, Mercury, Zinc, *Protozoa, Invertebrates, Aquatic life, Adaptation, Mortality, *Toxicity.
Identifiers: *Vorticella convallaria var similis.

Unadapted populations of the protozoan Vorticella convallaria var similis which is normally found in healthy rivers, activated sludge, percolating filters and slow sand filters were exposed to a range of concentrations of lead, mercury and zinc. It was found that the unadapted protozoan is sensitive to concentrations of lead and mercury as low as 0.0005 mg/l of the free metal ion/l, but will grow in the presence of 0.0002 mg/l or less of either of these metals. It is sensitive to concentrations of zinc as low as 0.075 mg of the free metal ion/l but will grow in the presence of 0.05 mg/l or less. Survival in the presence of high concentrations of heavy metals was concluded to depend upon the degree of adaptation. (Chilton-ORNL)
W77-11529

DISTRIBUTION OF PLUTONIUM-237 IN A LITTORAL FRESHWATER MICROCOSM,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W77-11530

OCCURRENCE OF SMALL METAZOA IN DECOMPOSITION PROCESSES FROM A COMPARATIVE VIEWPOINT (SEWAGE FILTERS, PATTERN EXPERIMENTS), (IN GERMAN),
G. Weninger.
Sitzungsber Oesterr Akad Wiss Math-Naturwiss Kl. 179(7), p 129-158, 1971.

Descriptors: *Nematodes, *Rotifers, Invertebrates, *Sewage, *Filters, *Protozoa, Copepods, Nitrates, Phosphates, Ammonium salts, *Biodegradation, Oligochaetes.
Identifiers: *Bdelloidea, *Flagellates, *Metazoa, *Pattern experiments.

In both sewage filter and pattern experiments, Nematoda and Rotifera occurred; Bdelloidea were especially abundant. Many oligochaetes appeared in the filter, most of which were probably connected with the decomposition cycle. Copepoda were also evident in filters and oxidation trenches with a light flow volume. Nitrate, ammonium salt and phosphate were added to sewer waters; Nematoda flourished in the nitrogenous milieu and Rotifera thrived on phosphate. Nematoda usually appeared immediately after the initial flagellate-ciliate (protozoa) colonies, whereas Rotifera accompanied later decomposition. Nematoda reached maximum development after 20 days in a concentration of 84 mg KMnO4/l and Rotifera reached a maximum after 43 days at 58 mg KMnO4/l. Average KMnO4 consumption was 70 mg/l on the surface (80-100 mg/l in the winter), 64 mg/l at a depth of 1.5 m and 44 mg/l at a greater (unspecified) depth. Copyright 1974, Biological Abstracts, Inc.
W77-11532

LAKES SORELL AND CRESCENT - A TASMANIAN PARADOX,
New South Wales Inst. of Tech., Broadway (Australia). School of Life Sciences.
D. M. H. Cheng, and P. A. Tyler.
Int Rev Gesamten Hydrobiol. 58(3), p 307-343, 1973.

Descriptors: *Eutrophication, Lakes, *Australia, Biomass, Climates, Phytoplankton, Salinity, Seasonal, Soils, Vegetation, *Mesothrophy.
Identifiers: *Lake Sorell(Tasmania), *Lake Crescent(Tasmania).

Lakes Sorell and Crescent are closely adjacent shallow lakes on the Tasmanian Central Plateau, Australia. They have similar morphometry and similar climate, geology, soils and vegetation in their catchments. They are polymictic, oxygen-saturated and colorless but turbid. They have soft water with major ions Na, Ca, Mg, Cl, HCO3 present in almost equi-ionic quantities and a slightly alkaline reaction. Chemically they are alike, the major difference being a 20% higher salinity in Crescent from 1967-69. During 1969-71 heavy rains reduced this difference. Water frequently flows from Sorell to Crescent in any year. Despite these similarities their phytoplankton populations differ markedly in every respect-species composition, population structure, population stability and total biomass. Lake Crescent has a standing crop 10 X that of Sorell. The former is eutrophic, the latter mesotrophic. Well marked seasonal cycles do not occur but sporadic fluctuations of biomass are brought about by hydrologic or other events. The pronounced differences in every aspect of plankton populations in 2 similar and connected lakes cannot yet be explained. They remain a limnological paradox. Copyright 1974, Biological Abstracts, Inc.
W77-11534

VITAMIN B12 CONTENTS IN SEA WATER ALONG THE COAST OF FUKUYAMA IN 1970 AND 1971,
Hiroshima Univ. (Japan). Dept. of Fisheries.
A. Inoue, H. Koyama, and S. Asakawa.
J Fac Fish Anim Husb Hiroshima Univ. 12(1), p 13-20, 1973.

Descriptors: Vitamins, *Vitamin B, Bioassay, Sea water, *Eutrophication, Coasts, *Phytoplankton, Red tide, Seasonal, Temperature.
Identifiers: Eutreptiella sp, Fukuyama, Gymnodinium sp, Heterosigma sp, Japan, Lactobacillus leichmanni, Vitamin B-12, *Seto Island Sea(Japan).

In the nearshore region of the Seto Inland Sea off Fukuyama (Japan), where red water blooms of phytoplankton frequently occur, the vitamin B12 content of the sea water was determined at nearly monthly intervals except in winter during 1970 and 1971. Water samples were taken from a depth of 2m. The vitamin B12 content of the sample water filtered through a membrane filter was determined by the microbiological assay depending on Lactobacillus leichmanii. Vitamin B12 was detected in all the samples. Its concentration varied between 0.42 and 6.43 micrograms/l. The vitamin B12 content was not conspicuously low in the sea water samples taken within red water blooms (of Heterosigma sp., Gymnodinium sp. Eutreptiella sp.). Though its seasonal variation was not conspicuous, it was generally high in the months of high water temperatures (about 18C or above); the maximum occurred in June or July when the chlorinity of sea water dropped due to the rainy season; a secondary maximum occurred in Sept. or Oct. At the station most distant from the river mouth (viz., 6 km) the sea water showed somewhat lower contents of vitamin B12 than at other stations. Besides the river drainage, the bottom mud was also considered as source of vitamin B12 supply. In the present waters the fluctuation and succession of phytoplankton blooms took place during warm months. It does not seem probable, however, that these phenomena were controlled by any paucity of vitamin B12, because the latter was present in these months usually in concentrations of 2 micrograms/l or above, which is sufficient to grow some of the vitamin B12 requiring plankters to a population density of about 105 cells/ml. Copyright 1974, Biological Abstracts, Inc.
W77-11535

METHYLMERCURY: TERATOGENIC AND LETHAL EFFECTS IN FROG EMBRYOS,
Indiana State Univ., Terre Haute. Dept. of Life Sciences.
N. A. Dial.
Teratology, Vol 13, No 3, June 1976, p 327-334. 5 fig, 1 tab, 15 ref.

Descriptors: Environmental effects, *Toxicity, *Mercury, *Embryonic growth stage, *Frogs, Mortality, *Lethal limit.
Identifiers: *Methylmercury chloride, *Teratogenesis.

The experiments reported indicated that trace amounts of methylmercuric chloride (MMC) can cause death or serious defects in early frog development. Death and severe defects occurred over a rather narrow range of concentration and increased with exposure time and increasing concentration levels. Treatment at the blastula, gastrula, and neural-plate stages with 5 ppb showed only minor effects; 10, 15, and 20 ppb produced such defects as exogastrulae, poor tail development, and poor general development as well as increased death rates related to exposure time and concentration; at 30 ppb embryos showed a high frequency of defects after 24 hours and all died by the end of the third day. Individual tolerances to methylmercury were observed in all stages treated. (Chilton-ORNL)
W77-11536

UPTAKE OF ZINC, LEAD, AND CADMIUM BY YOUNG WHITING IN THE SEVERN ESTUARY,
Bath Univ. (England).
K. S. Badsha, and M. Sainsbury.
Marine Pollution Bulletin, Vol 8, No 7, July 1977, p 164-166. 1 fig, 1 tab, 8 ref.

Descriptors: Environmental effects, *Water pollution effects, *Zinc, *Lead, *Cadmium, Estuaries, Fish, *Absorption.
Identifiers: *Severn Estuary, *Whiting.

Whiting were collected from the cooling water intakes of Oldbury on Severn nuclear power station during 1975-1976. Highest levels of zinc were found in November (102 ppm) but these fell in December (79 ppm) and concentrations remained relatively constant. Lead and cadmium levels rose gradually from December to March after an initial fall in both elements from November to December. It was concluded that once zinc accumulation has reached an upper threshold limit, fish tissues maintain this level by rejecting excess zinc. Cadmium and lead, once ingested, may not be rejected so easily and slowly increase. (Chilton-ORNL)
W77-11537

THE POTENTIAL TOXICITY AND BIOACCUMULATION IN AQUATIC SYSTEMS OF TRACE ELEMENTS PRESENT IN AQUEOUS COAL CONVERSION EFFLUENTS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
S. G. Hildebrand, R. M. Cushman, and J. A. Carter.
Reprinted from Trace Substances in Environmental Health-X. 1976. A symposium held at the University of Missouri, Columbia, D. D. Hemphill, Ed. p 305-313, 3 tab, 20 ref.

Descriptors: Environmental effects, *Water pollution effects, *Trace elements, Effluents, *Toxicity, *Adsorption.
Identifiers: Coal conversion, *Bioaccumulation.

Results of analyses for 55 elements in aqueous effluents of a single experimental run of a coal conversion pilot plant are presented. Measurable quantities of 23 of these elements were detected in the dryer stage liquor and 30 elements in the product separator liquor. For the majority of elements detected, higher concentrations were observed in the product separator liquor. A literature review on the toxicity and bioaccumulation factors for aquatic biota of these 55 elements is summarized. It is emphasized that any actual assessment of the impact of trace element releases will have to be site-specific, as the chemical and biological characteristics of receiving waters will affect the toxicity and bioaccumulation of many elements. (Chilton-ORNL)
W77-11540

RADIOISOTOPE TECHNIQUES IN DELINEATION OF THE ENVIRONMENTAL BEHAVIOR OF CADMIUM,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W77-11541

EFFECTS OF SIMULATED RAIN ACIDIFIED WITH SULFURIC ACID ON HOST-PARASITE INTERACTIONS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
D. S. Shriner.
Water, Air, and Soil Pollution, Vol 8, 1977. p 9-14. 3 tab, 7 ref.

Descriptors: *Environmental effects, *Simulated rainfall, *Acidic water, Hosts, Diseases, Parasitism, Sulfuric acid, Vegetation.
Identifiers: *Host-parasite interactions.

Five host-parasite systems were investigated. Significant inhibition of some parameter of disease development occurred in three of these cases. Production of telia of the fusiform rust organism (Cronartium fusiforme) on the host willow oak (Quercus phellos) was inhibited by 86%; reproduction of a root-knot nematode (Meloidogyne hapla) on field-gron kidney beans was inhibited by 66%; there was a delay in the development of a bean rust (Uromyces phaseoli) epidemic on field-grown kidney beans which was evident after seven weeks but not after nine weeks. A difference was noted in nodulation of the kidney bean plants by the symbiotic nitrogen-fixing bacteria of the genus Rhizobium. Effects on halo blight of kidney beans depended upon the segment of the disease cycle in which the acidic treatment occurred. It was concluded that there is a need for study of the consequences of prolonged exposure of both agronomic and natural ecosystems to the influences of acidic precipitation. (Chilton-ORNL)
W77-11542

HEAVY METAL ENRICHMENT IN MINE DRAINAGE 2. THE WITWATERSRAND GOLDFIELDS,
Pretoria Univ. (South Africa). Dept. of Chemistry.
G. T. Wittmann, and U. Forstner.
South African Journal of Science, Vol 72, No 12, p 365-370, December 1976. 2 maps, 2 tab, 31 ref.

Descriptors: *Heavy metals, *Mine drainage, Sediments, Water analysis, Toxins, Mercury, Mine wastes, Water pollution, Leaching, Seepage, Spectroscopy, X-ray diffraction, Clays, Hydrogen ion concentration.
Identifiers: Witwatersrand, Klip River, Mooiriversloop, Natalspruit, Elsburgspruit, Rietspuit, Blesbokspruit, South Africa.

By the end of 1972, a cumulative total of 31 046 625.9 kg gold had been produced from approximately 3 150 000 000 tonnes of auriferous ore milled. The main residues from goldmining operations consist of waste rock, cyanided sand and slimes, and surplus underground water (100 000 t/day). the slimes dams are also used for th disposal of other effluents, such as discarded cyanide solutions and sulphuric acid. The disposal of cyanide solution or inadvertent spillage is not regarded as being hazardous due to the low cyanide concentrations (<0.010% KCN) and the rapid decomposition to values below 0.001% within 24-36 h from atmospheric exposure and irradiation by sunlight. Considerable quantities of water - approximately 100 million m3/d - originate from the Witwatersrand and are discharged into the streams and rivers which feed the Vaal River. Mine drainage not only occurs from the mine itself but also from waste rock dumps and tailings areas. Often the latter two cources contain a high concentration of sulphides and/or sulphosalts which are associated with most ore and coal bodies. The most commonly occurring sulphides are those of iron, namely the minerals pyrite, pyrrhotite and marcasite. The mining effluents exhibited extremely low pH values, typical of acid mine drainage, and also contained characteristically high sulphate concentrations. The contents of dissolved manganese, iron, cobalt, nickel, copper and zinc exceeded the normal surface water values by a factor > 1000 for each individual metal in the case of maximum values Enrichment of dissolved chromium, cadmium and lead was less widespread but, nevertheless, the respective values were alarmingly high in several of the investigated samples. (See also W77-10199) (So Africa Water Info Center)
W77-11544

FRESHWATER ALGAE OF SOUTHERN AFRICA:3. PLEUROTAENIUM BREVE RACIBORSKI VAR. ENGLERI (SCHMIDLE) KRIEGER AND PENIUM GONATOZYGIFORME CLAASSEN SP. NOV. FROM TRANSVAAL,
Pretoria Univ. (South Africa). Dept. of Botany.
M. I. Claassen.
Journal of South African Botany, Vol. 42, No. 4, p 377-381, 1976. 20 fig, 4 ref.

Descriptors: *Aquatic algae, Freshwater.
Identifiers: *Pleurotaenium breve, *Penium gonatozygiforme, Transvaal, *South Africa, Desmidiaceae.

Pleurotaenium breve Raciborski var. engleri (Schmidle) Krieger is reported for the first time from South Africa and a new desmid species,

Penium gonatozygiforme Claassen, is described. Details of water composition, fixation and investigational procedures are supplied. (So African Water Info Center)
W77-11546

EPIDEMICS OF WEST NILE AND SINDBIS VIRUSES IN SOUTH AFRICA WITH CULEX (CULEX) UNIVITTATUS THEOBALD AS VECTOR,
Department of Health, Johannesburg (South Africa). Arbovirus Research Unit.
B. M. McIntosh, P. G. Jupp, I. Dossantos, and G. M. Meenehan.
South African Journal of Science, Vol. 72, No. 10, p 295-300, October 1976. 7 tab, map, 12 ref.

Descriptors: *Viruses, *Human diseases, Mosquitoes, Birds, Geographical regions, Floods, *Epidemiology.
Identifiers: *Culex univittatus, Culex theileri, Karoo, West Nile virus, Sindbis virus, Orange River, Upington, Orange Free State, North Western Cape, *South Africa.

The epidemiological findings on the largest epidemics caused by West Nile and Sindbis viruses ever recorded in South Africa are described. The epidemics occurred simultaneously in 1974 in an arid region of some 2500 km2 of the Cape Province following heavy rains. West Nile virus was isolated from 6 ill persons. Post-epidemic antibody surveys on the affected human population indicated that 55% had been infected by West Nile virus and 16% by Sindbis virus. Multiple isolations of both viruses were made from Culex univittatus and Culex theileri collected in the town of Upington. Infection rates in C. univittatus were 1 infected mosquito per 26 for West Nile virus and 1 per 154 for Sindbis virus. In C. theileri the infection rate for each virus was 1 infected mosquito per 1204. Observations on the mosquitoes in Upington indicated that C. univittatus, which is mainly ornitophilic, also fed readily on man, at least when abundant. It is concluded that C. univittatus was the main epidemic vector of both viruses. An antibody survey of the wild birds in Upington after the epidemic showed high immune rates for both viruses in several avian species. It is postulated that an avian epizootic also occurred and that viraemic birds were the main source of infection for C. univittatus. (So African Water Info Center)
W77-11547

VIBRIO PARAHAEMOLYTICUS - A MARINE PATHOGEN DETECTED IN SOUTH AFRICAN COASTAL WATERS,
South African Inst. for Medical Research, Port Elizabeth.
H. D. Bubb.
South African Medical Journal, Vol 49, No 37, p 1514-1516, August 1975.

Descriptors: *Viruses, *Public health, Pathogenic viruses, Shellfish.
Identifiers: Natal, South Africa, *Vibrio parahaemolyticus, Eastern Cape, Marine pollution.

Vibrio parahaemolyticus has been detected in the Natal and Eastern Cape coastal waters of South Africa. As a proven cause of gastro-enteritis or a potential pathogen to humans, it is an organism of importance to public health. Outlines of the history, pathogenicity and identification are given, as well as the results of the local investigation of this organism. V. parahaemolyticus has been isolated from water and shellfish in the area stretching from Coega River mouth to Willows on the Port Elizabeth coastline. The incidence appears to be seasonal and confined to the months January to July, with sea temperatures ranging from 21 degrees to 14 degrees C. Genera which have yielded the organism are Patella, Turbo, Oxystele, Perna, Crassostrea, Haliotis and Burnupena. (So African Water Info Center)
W77-11553

SERUM IMMUNOGLOBULIN LEVELS IN WHITE AND BLACK PATIENTS WITH VIRUS-A AND VIRUS-B HEPATITIS,
South African Inst. for Medical Research, Johannesburg.
T. Ipp, G. M. MacNab, R. Sher, and M. C. Kew.
South African Journal of Medical Sciences, Vol 41, No 4, p 259-263, 1976. 1 fig, 2 tab, 13 ref.

Descriptors: *Viruses, *Human diseases, *Public health.
Identifiers: South Africa, *Hepatitis(Humans).

Serum immunoglobulin G, M and A levels were measured in 106 White patients with acute virus-A (hepatitis-B surface antigen-negative) hepatitis and 27 White patients with acute virus-B (hepatitis-B surface antigen-positive) hepatitis and compared with the values previously obtained in Black patients with these diseases. The mean serum IgM level in the White patients with virus-A hepatitis was significantly higher than that in virus-B hepatitis ($p < 0.001$). This difference was much more obvious than that in Black patients, mainly due to a much lower mean serum IgM level in the Black patients with virus-A hepatitis. The reason for the blunted IgM response in Black patients with virus-A hepatitis is not known, but it may be related to a difference in the reaction against the host tissues rather than any difference in antibody production against the virus per se. The mean serum IgM and IgA levels were not significantly different in the White patients with virus-A and virus-B hepatitis and they were lower than the corresponding figures in Blacks. (So African Water Info Center)
W77-11562

NOTES ON THE CONSERVATION OF UMNGAZANA ESTUARY,
Cape Town Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W77-11563

PROBLEMS ENCOUNTERED WITH EDTA AS AN ANTICOAGULANT FOR FISH BLOOD,
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W77-11564

SURVIVAL AND REPRODUCTION OF OSTRACODS AS AFFECTED BY PESTICIDES AND TEMPERATURE,
Northeastern Univ., Boston, Mass. Dept. of Biology.
S. Y. A.-D. Khudairi, and E. Ruber.
J Econ Entomol. 67(1), p 22-24, 1974.

Descriptors: *Pesticide toxicity, *DDT, Toxicity, Insecticides, *Reproduction, *Temperature, Mortality, Water pollution effects.
Identifiers: Chlamydotheca-arcuata, *Chlorpyrifos, Cypridopsis-vidua, Cyprinotus-incongruens, *Fenthion, *Ostracods.

Toxicities of DDT, chlorpyrifos, and fenthion to Cyprinotus incongruens Ramdohr and Chlamydotheca arcuata Sars were evaluated in laboratory cultures. For the 1st species, the series from most to least toxic was chlorpyrifos, fenthion, DDT; and for the 2nd species, it was chlorpyrifos, DDT, and fenthion. Data for 24 h were inadequate to predict field effects because mortalities in test plates increased each day, even at concentrations where no 24 h mortalities were recorded. Temperature stress which would be likely to occur in early spring and in late summer (5 and 35 C) increased insecticide toxicities at a given concentration; lowest mortalities occurred at intermediate temperatures (15 and 25 C). There is some tendency towards induction of egg-laying in these 2 spp. by toxic doses of the insecticides; the effect is even more pronounced in Cypridopsis vidua O. F. Muller. At all intermediate doses, some fraction of the eggs hatched and matured, which could be a mechanism for reestablishment of populations, but at the highest DDT doses (5.0 ppm) 0 eggs hatched.–Copyright 1974, Biological Abstracts, Inc.
W77-11567

EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS 3. ROODEPLAAT DAM,
National Inst. for Water Research, Pretoria (South Africa).
D. J. Steyn, D. F. Toerien, and J. H. Visser.
Water SA, Vol. 2, No. 1, p 1-6, 1976. 2 tab, 6 fig, 12 ref.

Descriptors: Algae, Bioassay, *Eutrophication, Productivity, Phosphorus, Nitrogen, Inhibition, Sewage effluents, Growth rates, Water pollution effects.
Identifiers: Roodeplaat Dam, South Africa.

Algal bioassays indicated that the waters of Roodeplaat Dam are severely eutrophied since algal growth potentials (AGP) of up to 200 mg/l and batch culture algal growth rates of up to 2,2 d-1 were registered with Selenastrum capricornutum as test alga. Phosphorus was usually the primary growth-limiting nutrient in the samples except at the end of winter when nitrogen was primary growth limiting. The secondary limiting nutrient was either nitrogen or phosphorus, depending on the identity of the primary growth-limiting nutrient. Addition of secondary effluent linearly increased the AGP of Roodeplaat Dam water by 7,2 to 12,4 mg/l for each one per cent (v/v) of secondary effluent added. Addition of secondary treated sewage effluent resulted in a shift to nitrogen as the primary growth-limiting nutrient. Dilution with a low nutrient water linearly decreased the AGP. The control of phosphorus inputs into the impoundment could be used to reduce the eutrophication level. (See also W77-01392; W77-01391; and W77-11575) (So African Water Info Center)
W77-11568

EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS. IV. VAAL DAM,
National Inst. for Water Research, Pretoria (South Africa).
D. J. Steyn, D. F. Toerien, and J. H. Visser.
Water SA., Vol. 2, No. 2, p 53-57, 1976. 5 fig, 1 tab, 15 ref.

Descriptors: Bioassay, Algae, *Eutrophication, Phosphorus, Nitrogen, Soil conservation, Growth rates, Water pollution effects.
Identifiers: South Africa, Vaal Dam, Vaal River, Selenastrum capricornutum.

The Vaal Dam shows algal bioassay growth rates and algal growth potentials (AGP) as high as 1,6 d-1 and 146 mg/l-1 respectively using Selenastrum capricornutum as test alga. Addition of secondary treated sewage effluents to Vaal Dam water increased the AGP by between 7,4 and 11,2 mg/l-1 for every one per cent (v/v) added. Nitrogen and phosphorus were the important algal growth-limiting nutrients in the impoundment. Plant nutrients adsorbed onto clay particles could be important in the eutrophication of the impoundment, indicating the importance of soil conservation techniques in eutrophication control. The significance of the impoundment and the paucity in knowledge of its physical, chemical and biological characteristics suggest that such studies should be undertaken as a matter of urgency. (See also 77-01392; W77-01391; and W77-11568) (So African Water Info Center)
W77-11575

PRELIMINARY EVALUATION OF WATER QUALITY OF PROPOSED LAFARGE LAKE, KICKAPOO RIVER, VERNON COUNTY, WISCONSIN,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
K. W. Thornton, D. E. Ford, and D. L. Robey.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A031415, Price codes: A10 in paper copy, A01 in microfiche. Miscellaneous Paper Y-76-5, October 1976. 204 p, 106 fig, 14 tab, 33 ref, 1 append.

Descriptors: *Mathematical models, *Algae, *Bioassay, *Wisconsin, *Nutrients, *Water quality, Model studies, Analytical techniques, Mathematics, Eutrophication, Nitrates, Phosphates, Fisheries, Flood control, Dissolved oxygen, Temperature, Recreation.
Identifiers: *Ecological models, *Nutrient loadings, *LaFarge Lake(Wis), *Kickapoo River(Wis), *Vernon County(Wis), Algae concentrations, Algal bioassays, Impoundment water quality.

The water quality of the proposed LaFarge Lake, Wisconsin, was investigated using a version of the reservoir portion of the Water Quality for River-Reservoir Systems (WQRRS) ecological model. Although other water quality constituents were simulated, the study concentrated on temperature, dissolved oxygen, and algae concentrations. Daily field measurements of phosphorus and nitrogen on the Kickapoo River were used in the simulations. Algal bioassays also were conducted on the Kickapoo River surrounding impoundments. The assays indicated that essentially all of the soluble nitrogen and phosphorus in the river were in forms available for algal growth and that phosphorus was most likely to be the limiting nutrient in the proposed impoundment. The simulations indicated that LaForge Lake probably will be thermally stratified from May through September. Dissolved oxygen was distributed throughout the reservoir except for a period of approximately one month in late summer when the hypolimnion became anoxic. A bloom of diatoms and green algae during the spring and two major blooms of blue-green algae during summer and fall were predicted. The blooms of algae were found to be similar in magnitude and timing to blooms observed in surrounding lakes. Secchi disk depths should be greater than 1.3 m. Phosphorus loadings were calculated and examined. The loadings were found to be of the same magnitude as other impoundments in the area. Steady-state temperature routings of the release water were conducted to determine the extent of the river reach that can be expected to support a cold water fishery. For the recommended operational schedule, temperatures remained below 22.0 C for a distance of 35.7 km below the project. (Henley-ISWS)
W77-11584

PLUTONIUM-237: COMPARATIVE UPTAKE IN CHELATED AND NON-CHELATED FORM BY CHANNEL CATFISH (ICTALURUS PUNCTATUS),
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
L. D. Eyman, and T. R. Trabalka.
Health Physics, Vol 32, June 1977, p 475-478, 1 fig, 1 tab, 16 ref.

Descriptors: Environmental effects, *Plutonium, Behavior, Aquatic environment, Chelation, *Channel catfish, *Absorption, *Radioisotopes, Radioactivity.

Three chemical forms of plutonium 237 (Pu-citrate, Pu-fulvate and Pu-hydroxide) were administered to channel catfish by intragastric injection. From experimental results it was concluded that chelation can either enhance or reduce uptake of plutonium relative to PuOH (monomer) in channel catfish. Pu-citrate penetrates the gut membrane due to a net negative charge of the complex. Reduced uptake of Pu-fulvate may be attributable to its stability in the presence of digestive systems and high molecular weight which decreases passage of the complex through the gut wall. (Chilton-ORNL)
W77-11642

SUSCEPTIBILITY OF THREADFIN SHAD TO IMPINGEMENT,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
J. S. Griffith, and D. A. Tomljanovich.
In: The Proceedings of the 29th Annual Conference of the Southeastern Association of Game and Fish Commissioners, 1975. p 223-234, 4 fig, 5 tab, 6 ref.

Descriptors: Environmental effects, *Thermal pollution, Temperature, Fish, Powerplants, Tennessee Valley Authority.
Identifiers: Cold-stress, Impingement, *Threadfin shad.

The objectives were to descibe the behavior and swimming ability of threadfin shad exposed to laboratory induced cold temperatures, to evaluate the susceptibility of cold-stressed shad to, and ability to recover from, impingement, and to examine the quantitative seasonal effects of impingement. Results indicated that water temperatures below approximately 12 C induced stress in adults, leading to increased impingement and mortality rates. Their ability to resist impingement in a test flume was severely impaired below 8 C. Most unstressed adults were capable of swimming against the intake velocities encountered at most TVA power plants during warm periods of the year. Unstressed shad were observed to explore the intake screen area and then attempt to swim upstream leaving the vicinity of the screen. Shad that were severely cold-stressed displayed a symptomatic uncoordinated swimming behavior that lasted for several hours. Data collected at five TVA fossil-fuel plants indicated the existence of a strong relationship between shad impingement and low ambient water temperature. Sampling at Brown's Ferry Nuclear Plant suggested a hypothetical annual shad impingement cycle for that plant which was largely dependent on the size of the fish and the yearly temperature pattern. (Chilton-ORNL)
W77-11643

FEEDING ECOLOGY OF EELGRASS FISH COMMUNITIES,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
S. M. Adams.
Transactions of the American Fisheries Society, Vol 105, No 4, July 1976, p 514-519, 2 fig, 3 tab, 17 ref.

Descriptors: *Ecology, Communities, Fish, Food, Growth stages, *Fish population, Fish diets.
Identifiers: *Eelgrass fish communities.

Fish were collected from two eelgrass beds located in shallow estuaries. Analysis showed that detritus was the most important food item in the diets of juvenile pinfish, pigfish, adult pinfish, spot and filefish. Other important food items were planktonic copepods and epifaunal crustaceans. Food material produced within the eelgrass beds probably contributed up to 56% by weight of the diet of the eelgrass fish community. Pinfish were the dominant fish in the community. The general trend in the feeding habits of pinfish appeared to be a dominance of planktonic copepods in the diet un til the pinfish reach a length of about 35 mm, followed by a gradual replacement by detritus, and then an omnivorus stage at about 70 mm at which time an increasingly larger percentage of polychaetes and plant material is consumed. (Chilton-ORNL)
W77-11644

ORGANIC CONTAMINANTS IN AQUEOUS COAL CONVERSION EFFLUENTS: ENVIRONMENTAL CONSEQUENCES AND RESEARCH PRIORITIES,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
S. E. Herbes, G. R. Southworth, and C. W. Gehrs.
In: Trace Substances in Environmental Health-X, 1976. A symposium held at the University of Missouri, Columbia. D. D. Hemphill, Ed. p 295-303, 4 fig, 2 tab, 11 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Effluents, *Organic compounds, Toxicity, Absorption, *Organic wastes.
Identifiers: Coal conversion.

A literature review is presented which compiles a list of organic components of aqueous coal liquefaction effluents. Five major classes of organics are identified: (1) phenols, (2) arylamines, (3) aliphatic hydrocarbons, (4) mono- and polycyclic hydrocarbons, and (5) sulfur-containing compounds (thiophenes and mercaptans). Each class is assessed on the basis of concentrations anticipated in coal liquefaction effluents, removal by wastewater treatment systems, acute toxicity, chronic toxic effects on aquatic organisms, and environmental transport and persistence. It was concluded that while phenols and monoaromatic hydrocarbons constitute major constituents of coal conversion effluents, their potential environmental impacts may be far less than those of polycyclic hydrocarbons and heteroatomic compounds. Multi-ring compounds may be difficult to remove from wastewaters, are slowly degraded, possess potentials for both bioaccumulation and carcinogenic and mutagenic effects, and their environmental behavior at trace concentrations is poorly understood. (Chilton-ORNL)
W77-11647

EFFECTS OF WATER VELOCITY ON ACTIVITY OF JUVENILE STRIPED BASS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
R. R. Bowles, J. S. Griffith, and C. C. Coutant.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/TM-5368, Price cos: A05 in paper copy, A01 in microfiche. Report ORNL/TM-5368, July 1976, 73 p, 17 fig, 5 tab, 51 ref.

Descriptors: *Environmental effects, Water velocity, *Bass, Fry, Larvae, Behavior, Swimming, Temperature, Food, Cooling water.
Identifiers: Morone saxatilis, Striped bass.

Juvenile striped bass 8 - 80 mm long were tested in a simulation of a fixed screen cooling water intake structure. Water velocity increases of 0 - 30 cm/sec resulted in decreases in the area and distance traveled by juveniles 10 - 80 mm long. Water velocity increases of 0 - 30 cm/sec resulted in increases in area and distance traveled by larvae. The activity of larval bass increased in the presence of food while the presence of food decreased the activity of juveniles. It was concluded that approach velocity limits swimming activity in proportion to body size. Investigations also showed that low temperature reduced swimming activity. (Chilton-ORNL)
W77-11648

CONTRIBUTION OF GUT CONTENTS TO THE CONCENTRATION AND BODY BURDEN OF ELEMENTS IN TIPULA SPP. FROM A SPRING-FED STREAM,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
J. W. Elwood, S. G. Hildebrand, and J. J. Beauchamp.
Journal of the Fisheries Research Board of Canada, Vol 33, No 9, 1976. p 1930-1938, 5 fig, 3 tab, 17 ref.

Descriptors: Environmental effects, *Water pollution effects, Laboratory tests, Aquatic animals, Insects, Food chains, Streams, *Trace elements, Larvae, Regression analysis.
Identifiers: Trophic transfer factors, Gastrointestinal tract, *Tipula spp, Whole-body concentrations.

Whole body concentrations of 30 elements were measured in larvae of Tipula spp. before and after the larvae had egested their gut contents. Linear regression analyses of concentration of each element on mean dry wt/individual showed that for larvae with gastrointestinal tracts filled, there was a highly significant inverse relationship between Cr concentration and mean individual dry weight. Slopes of the remaining elements were not significantly different from zero. For larvae with gastrointestinal tracts evacuated, there was a highly significant inverse relationship between concentrations of Cr and Al and mean dry weight with all other slopes not being significantly different from zero. Trophic transfer factors were calculated to determine if there is food chain enrichment of the 30 elements analyzed. Most of the calculated ratios were less than 1, indicating that enrichment of most elements is not occurring at this level of the detritus food chain. (Chilton-ORNL)
W77-11649

DISTRIBUTION OF NITRIFYING AND HETEROTROPHIC MICROORGANISMS IN CUTOVER PEATS,
M. Herlihy.
Soil Biol Biochem. 5(5), p 621-628, 1973.

Descriptors: Microorganisms, *Bacteria, Nitrogen fixing bacteria, Actinomycetes, *Peat, Fungi, Path of pollutants, Distribution.
Identifiers: *Heterotrophic bacteria, *Nitrifying bacteria, Nitrobacter, Nitrosomonas.

The distribution of chemoautotrophic nitrifiers, heterotrophic bacteria, actinomycetes and fungi was studied in raised peats and compared with a mineral garden soil. Nitrosomonas was not detectable but a few Nitrobacter were counted 350 cm below the surface of undrained peat, in the surface areas of drained non-cutover peat and in an area cutover before sampling. After only 3 yr cultivation and cropping the average numbers, over 12 monthly samplings, of Nitrosomonas and Nitrobacter had risen to 1.25 x 106, and 32.7 x 106, respectively. The possible reasons for the anomalously high proportion of Nitrobacter are discussed, including the effect of media composition. A NaHCO3 medium gave lower numbers of Nitrosomonas and higher numbers of Nitrobacter than CaCO3 medium. The proportional increase in the heterotrophs was lower than that of the autotrophs. This suggested that low availability of organic substrate and not the physical environment was the limiting factor. Only fungi showed a definite seasonal variation.—Copyright 1974, Biological Abstracts, Inc.
W77-11651

EMERGENCE OF CHIRONOMIDAE (DIPTERA) FROM CHAR LAKE, RESOLUTE, NORTHWEST TERRITORIES,
Biol. Stn., Saint Andrews, N. B., Can.
H. E. Welch, Jr.
Can J Zool. 51(11), p 1113-1123, 1973.

Descriptors: *Canada, *Diptera, Lakes, Insects, Invertabrates, *Aquatic insects.
Identifiers: Cricotopus, Heterotrissocladius, Lauterborniella, Orthocladius, Pseudodiamesa, Trissocladius, *Char Lake(NWT).

Quantitative data, using 1/4-m2 submerged traps, were obtained on the 6 common chironomid genera (Pseudodiamesa, Trissocladius, Orthcladius, Lauterborniella, Heterotrissocladius and Cricotopus) in Char Lake, Northwest Territories, Canada, at latitude 74 56' N. Emergence of each species was highly synchronized and in 1972 occurred partly or wholly beneath ice. Each species had different emergence distributions compared with depth, with only 2 spp. constituting virtually the entire emergence in the deep sediment zone below 15 m. Emergence/m2 was highest in the shallow areas and the bulk of emergence came from the upper 3rd of the lake. Total emergence was 690 individuals m-2 lake surface in 1971, equal to 0.143 g m-2 year-1 or 0.798 kcal m-2 year-1; this is equal to 0.5% of the lake's total energy flow.—Copyright 1974, Biological Abstracts, Inc.
W77-11652

LAKE ONTARIO ATLAS: CHEMISTRY,
New York Sea Grant Inst., Albany.
E. R. Allen.
Lake Ontario Atlas No. NYSSGP-OA-77-010, 1977. 193 p. 11 tab, 230 ref.

Descriptors: *Water quality, Lakes, Great Lakes, *Lake Ontario, Eutrophication, Chemistry, Bioindicators, Organic compounds, Water pollution.
Identifiers: *Oligotrophic lakes, International Field Year for the Great Lakes(IFYGL).

The chemical and water quality characteristics of Lake Ontario reported prior to the International Field Year for the Great Lakes (IFYGL, 1972-73) study have been reviewed and summarized. The low surface-to-volume ratio of this lake has allowed it to retain oligotrophic characteristics based upon biological parameters. However, some of the chemical parameters, including the nutrient imputs and concentrations, suggest that eutrophication is imminent. In general, the water quality of Lake Ontario is good and projected increases in the loadings of major ions do not pose a threat to the use of this natural water resource during the rest of this century. The input of trace materials, such as the heavy metals and refractory organic compounds, is cause for concern since a significant contribution is made by an uncontrollable source, namely atmospheric precipitation. More stringent controls on the discharge of phophorus, trace elements and sythetic organic compounds are recommended to preserve the integrity of lake Ontario for the continued benefit of all users of its water. (NOAA)
W77-11654

OBSERVATIONS OF CRASSOSTREA VIRGINICA CULTURED IN THE HEATED EFFLUENT AND DISCHARGED RADIONUCLIDES OF A NUCLEAR POWER REACTOR,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
A. H. Price II,, C. T. Hess, and C. W. Smith.
Maine Sea Grant Technical Report No. 14, Reprinted from: Proceedings Of the National Shellfisheries Association, Vol 66, 1976. Also as Ira C. Darling Center Contribution No. 88. 16 p, 18 fig, 24 ref. SG-04-3-158-63 and 04-5-158-39.

Descriptors: *Maine, *Aquaculture, *Heated water, *Nuclear powerplants, *Nuclear reactors, *Oysters, *Thermal pollution, Water pollution, Radioisotopes, Bays, Maine.
Identifiers: Waste heat utilization, Montsweag Bay(Maine).

American oysters (Crassostrea virginica) were rafted for 26 months at four sites in the effluent waters near Maine Yankee Nuclear Power Reactor in Montsweag Bay and at a control site in the adjacent Damariscotta River. In an evaluation of the thermal effluent for aquaculture, comparisons are made among the sites of the effects of heated effluent on oyster growth and condition, and the uptake and retention of gamma-ray emitting radionuclides. Growth and uptake of radionuclides were accelerated at the warmer water sites. Observed variations in concentrations of gamma-ray emitting radionuclides in the biological component of this study are compared with a pulse driven relaxator model and an existing concentration factor model. Results show that although the concentration factor model is adequate for simple laboratory studies, the pulse driven relaxator is necessary to describe both the amplitude and time variation observed in this field study. Both experimental results and calculations for 58Co and 54Mn are presented. (NOAA)
W77-11655

NEW ENGLAND OFFSHORE MINING ENVIRONMENTAL STUDY (PROJECT NOMES),
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2L.
W77-11660

WASTE HEAT EMPLOYMENT FOR ACCELERATED REARING OF COHO SALMON,
Washington Univ., Seattle. Div. of Marine Resources.
E. L. Brannon, R. E. Nakatani, and L. R. Donaldson.
Sea Grant Reprint No. WSG-TA 77-9, Reprinted from: Proceedings of the Conference on Waste Heat Management and Utilization, held Miami Beach, FL, 9-11, May 1976. 10 p, 1 tab, 11 ref.

Descriptors: *Industrial wastes, *Growth rates, *Heated water, *Salmon, Biomass, Thermal pollution.
Identifiers: Waste heat, *Coho salmon.

Studies conducted at the College of Fisheries, University of Washington on the use of waste heat to accelerate growth of coho salmon (Oncorhynchus kisutch) have shown that a year reduction in freshwater rearing can be induced, without altering the marine residence period of this species. The result of this strategy has been to reduce coho generation time from three to two years, with substantial savings in hatchery production costs and increased biomass return. Application of this concept is considered in utilization of industrial waste heat. (NOAA)
W77-11664

DISINFECTION OF WASTEWATER, TASK FORCE REPORT.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W77-11672

WATER-QUALITY EFFECTS FROM URBAN RUNOFF,
Woodward-Clyde Consultants, San Francisco, Calif.
R. Pitt, and R. Field.
Journal of the American Water Works Association, Vol 69, No 8, p 432-436, August, 1977. 3 fig, 6 tab, 13 ref.

Descriptors: *Urban runoff, *Storm water, *Model studies, *Urban hydrology, *Water management(Applied), Cities, Oxygen sag, Water quality, Costs, FOrecasting, Runoff forecasting, Precipitation(Atmospheric), Hydrographs, Sewage treatment, Waste water treatment.

A hypothetical example was used to demonstrate potential problems and possible solutions for urban storm water runoff. Hypothetical inputs, loading, worst-case storm predictions, quality-quantity hydrographs, a comparison of storm water quality and sanitary waste water effluent quality, effects on receiving waters, and costs of required treatment were included in the example case study for a hypothetical city of 100,000 people. Total solids concentration curves were calculated for receiving waters using various storms simulated in the study. Oxygen sag curves were calculated to show oxygen depletion in receiving

waters caused by secondary treated sewage and untreated urban runoff. Costs for treatment processes in use at various locations within the United States are compared. Total waste discharge analysis, water quality management planning, and more research on the long-term toxic effects of storm flow were suggested to help solve urban runoff problems. (Schulz-FIRL)
W77-11676

LIMNOLOGICAL STUDIES OF THE ONO RESERVOIR: THIRD REPORT, (IN JAPANESE),
S. Chiba.
Jap J Limnol. 34(1), p 35-40, 1973.

Descriptors: Zooplankton, *Nutrients, Limnology, *Reservoirs, *Distribution, Water temperature, Dissolved oxygen, Hydrogenion concentration.
Identifiers: Bosmina-longirostris, Bosminopsis-deitersi, Chonochiloides-dossuarius, Cyclops-sp, Eudorina-elegans, Japan, Keratella-cochlearis, Oscillatoria-tenuis, Pediastrum-tetras, Ploesoma-truncatum, Polyarthra-sp, Scenedesmus, Stavrastrum-sp, Synchaeta-pectinata, Synedra-ulna, *Ono Reservoir(Japan).

The vertical distributions of water temperature, pH values, amounts of dissolved oxygen and plankton in the Ono Reservoir (Japan) are described. No epilimnion developed in summer, a slight metalimnion being recognized just below the water surface. In Sept., however, a thin epilimnion developed down to the depth of 2 m. In autumn and winter, the dissolved O2 was about equal from the surface to the bottom, but it was especially rich in Feb. In summer, the O2 in the deeper layers decreased remarkably. In 1964, this phenomenon occurred in June, earlier than in the preceding yr (1962, 1963). This seems to be due to the density current of cold inflowing river water after rain. The difference of pH was scarcely seen throughout the layers, except in summer. In winter it remained unchanged. The zooplankton decreased in 1964 in the number of species and in abundance. Synchaeta pectinata occurred in small numbers in the seasons other than summer. Keratella cochlearis, Ploesoma truncatum, Polyarthra sp. were also fewer in numbers than in the previous 2 yr, and the time of their appearance was different. In 1964 Chonochiloides dossuarius was found which appeared also in 1962, but not in 1963. Only 2 spp., of Cladocera, Bosmina longirostris and Bosminopsis deitersi were found. The abundance of Cyclops sp. decreased, the time of appearance being the same as in 1963. In 1964 the following 4 spp. appeared for the 1st time: Pediastrum tetras, 2 spp. of Scenedesmus and Staurastrum sp. The occurrence of 3 spp. of algae, Oscillatoria tenuis, Synedra ulna and Eudorina elegans suggest that the water of this artificial lake is rich in nutrient salts.–Copyright 1974, Biological Abstracts, Inc.
W77-11713

PROBLEMS RELATED TO WATER QUALITY OVER THE DANUBE SECTION BETWEEN RAJKA AND ESZTERGOM (A RAJKA-ESZTERGOM KOZOTTI DUNA-SZAKASZ VIZMINOSEGI PROBLEMAI),
Eszakdunantuli Vizugyi Igazgatosag, Gyor(Hungary).
For primary bibliographic entry see Field 5B.
W77-11738

DISINFECTION EFFICIENCY AND RESIDUAL TOXICITY OF SEVERAL WASTEWATER DISINFECTANTS: VOLUME I - GRANDVILLE, MICHIGAN,
Grand Valley State Colleges, Allendale, Mich. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W77-11762

OBSERVATION ON THE HYDROLOGY OF THE RIVER KHAM,
Marathwada Univ., Aurangabad (India). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W77-11769

AN INVESTIGATION INTO ENVIRONMENTAL EFFECTS OF SEWAGE EFFLUENT REUSE AT THE KANE'OHE MARINE CORPS AIR STATION KLIPPER GOLF COURSE,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W77-11792

MODELING THE IMPACT OF STRIP MINING AND RECLAMATION PROCESSES ON QUALITY AND QUANTITY OF WATER IN MINED AREAS: A REVIEW,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
A. S. Rogowski, H. B. Pionke, and J. G. Broyan.
Journal of Environmental Quality, Vol. 6, No. 3, p 237-244, July-September 1977. 64 ref.

Descriptors: *Strip mines, *Water quality, Reclamation, Physical models, Soil water, Soil chemistry, Erosion, Acid generation, Spoil temperature.

Current literature contains numerous studies of acid generation, neutralization, and transformation in strip-mine spoil materials, yet the rate-determining processes on the field scale are not well understood. Even less seems to be known about the spoil water flow, oxygen diffusion, surface runoff, erosion, evapotranspiration, and temperature distributions within the spoil banks. Most spoils seem to be principally considered from the standpoint of rapid revegetation, use of amendments, and favorable placement of acid-producing materials. It is concluded that hydrology of the spoil system could be simulated using standard modeling techniques. It also seems probable that experimentally obtained temperature and oxygen distributions could delineate acid-producing areas, assuming pyrite is not limiting and is distributed evenly throughout the zone of interest. (ARS)
W77-11833

STUDIES ON THE GUPPY, LEBISTES-RETICULATUS PETERS IN YOSHIKAWA RIVER, CHIBA CITY, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Parasitology.
S. Katayama, M. Fujimagari, J. Otawara, J. Miyamoto, and N. Nihei.
Jap J Sanit Zool. 23(3), p 169-179, 1973.

Descriptors: Ecology, Water pollution effects, Sewage, Water temperature, Asia, Water wells, Rivers.
Identifiers: Chiba City, Japan, *Lebistes-Reticulatus, Tokyo, *Yoshikawa River(Japan), Tropical fish.

A joint study was conducted for a period of over 1 yr on the ecology of the guppy. L. reticulatus, which was discovered in the autumn of 1970 to be breeding in highly polluted water of Yoshikawa River running through the heart of Chiba City neighboring Tokyo, Japan. Being a tropical fish of the family Poecilidae, the guppy, a native of South America is known widely as a popular aquarium fish and also as an efficient natural enemy of mosquitoes that breed in sewage waters. Previous observations in Japan have shown that the fish cannot survive outdoors over the freezing temperature during the winter season, but is established as wild colonies in sewage ditches in several hotspring areas, where the water temperature is above 15C throughout the year. Yoshikawa is a small river of about 8 km in length and 0.2/1,000 in the average slope. The upper stream receives sewage water of public housing areas built in the outskirts of the city and a large quantity of underground water pumped up from natural gas wells is discharged continuously into the river. The well water is about 30C, and keeps the water temperature downstream not lower than 20C even during the winter. The guppies breed along the full length of the river during the summer season from July-Oct. but their distribution became restricted during the winter season to downstream of the natural gas well where the water temperature was higher than 17C. Seasonal observations of the chemical, physical and biological characters of the river water were caried out at 3 stations, at least 4 times a year. Results of both chemical and biological analysis of the water samples showed that the river water was highly polluted, with BOD (biological oxygen demand) values from 6.5-20.7 ppm and with either beta-polysaprobic or alpha-mesosaprobic biological systems. –Copyright 1974, Biological Abstracts, Inc.
W77-11857

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULATIONS IN LAKES,
Wisconsin Univ.-Madison. Water Chemistry Lab.
B. W. Vigon, and D. E. Armstrong.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 315, Price codes: A07 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 77-06, 1977. 117 pp, 26 tables, 28 figs, 109 refs. OWRT A-061-WIS(1), 14-31-001-3850, 14-31-0001-5050.

Descriptors: *Silica, *Phosphorus, *Diatoms, *Eutrophication, Lakes, *Algal control, *Nuisance algae, Growth rates, Wisconsin, Dissolved solids, Cyanophyta, Water pollution effects, Pollution abatement.
Identifiers: *Lake Mendota(Wisc).

The role of the vernal diatom population in the removal of P and Si from the lake water was evaluated for Lake Mendota, Madison, Wisconsin in 1974. Measurements were made of total and dissolved reactive P and Si (DRP and DRSi) in the lake water as thermal stratification (3 June). The amounts of P and Si in the lake water decreased markedly between 3 March and 1 May. This time period corresponded to the development and sedimentation of the vernal diatom population. Maximum apparent removals of DRP and DRSi were about 40 and 94%, respectively. Corresponding values for removal of total P and diatom Si were 21 and 72%, respectively. Following sedimentation, mineralization of the diatom population apparently contributed to an increase in the levels of both P and Si in the lake water. Through a combination of field and laboratory measurements, the inputs of Si and P from the drainage basin and the bottom sediments and the losses via outflow were estimated. Using this information and the apparent removal values, the net amounts of P and Si removed by the diatom population were estimated. The net amounts removed prior to thermal stratification were 62% for DRP and 72% for DRSi. The results show that the vernal diatom population can substantially reduce the amounts of P available to support the growth of nuisance blue-green algae during the summer.
W77-11864

NUTRIENTS IN THE NEUSE RIVER ESTUARY.
North Carolina State Univ. at Raleigh. Dept. of Zoology.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 092, Price codes: A09 in paper copy, A01 in microfiche. Sea Grant Report No. UNC-SG-75-21, December 1975. 191 p, 71 fig, 8 tab, 19 ref, 2 append. SG-04-3-158-40.

Descriptors: *Nutrients, *Water quality, *Baseline studies, *Estuaries, *North Carolina, Algae.

Identifiers: Outer Continental Shelf, *Neuse River Estuary(NC).

The Neuse River Estuary extends some 42 miles from slightly upstream of New Bern, North Carolina, to Pamlico Sound. The estuary is quite shallow with depths ranging from 10 to 20 feet on the average. Tides are small so the amount of inflowing water is the single most important factor controlling circulation and salinity. The objective of this research was to determine the extent of eutrophication and the annual cycle of nutrient concentrations in both the Neuse River Estuary and the Albemarle Estuary. The report covers the data collected from September 1970 to January 1974. The estuary of the Neuse River is currently biologically rich. Fish are abundant at certain times of the year and crabs and shrimp are common. The estuary is functioning properly despite the algal blooms and high respiration rates, however one unanswered question is whether the condition of the river would be improved if the organic load were to be reduced. (Sinha-OEIS)
W77-11886

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. NORTHEAST GULF OF ALASKA.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-11887

VLCC 'METULA' OIL SPILL,
Texas A and M Research Foundation, College Station.
For primary bibliographic entry see Field 5G.
W77-11889

SUBLETHAL EFFECTS OF PETROLEUM FRACTIONS ON THE BEHAVIOR OF THE LOBSTER, HOMARUS AMERICANUS, AND THE MUD SNAIL, NASSARIUS OBSOLETUS,
Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.
J. Atema.
Reprinted from: Proceedings of Estuarine Research Federation Meetings, 1975. 24 p, 4 tab, 11 ref. ERDA-AT(11-1)-3567.

Descriptors: *Water pollution effects, *Toxicity, *Animal behavior, Crustaceans, Mollusks, Invertebrates, Lethal limit, *Lobster, *Snails.
Identifiers: *Outer Continental Shelf, Petroleum, Hydrocarbons, *Sublethal effects, Pollution effects, Nassarius obsoletus, Mud snails.

Studies on sublethal effects of petroleum fractions on behavior of H. americanus and N. obsoletus are summarized in an attempt to clarify contradictory results and to gain an understanding of the underlying principles. There appear to be a surprising number of similarities in the way specific petroleum fractions affect the behavior of a crustacean arthropod and a gastropod mollusc. The hypothesis is advanced that (1) specific hydrocarbon fractions in specific amounts are responsible for distinct behavioral changes; (2) these fractions are present in varying quantities in different oils; (3) the changes in behavior are general enough to affect a large number of marine invertebrates in a similar manner. (Sinha - OEIS)
W77-11890

SOCIAL COST OF OIL POLLUTION,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5G.
W77-11892

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME I: AN OVERVIEW,
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6G.
W77-11897

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME II: APPENDICES,
North Carolina Univ. at Chapel Hill. Urban Services Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6G.
W77-11898

AN ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT: 6TH QUARTERLY REPORT.
National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-026 347, Price codes: A06 in paper copy, A01 in microfiche. Informal Report No. 107, April 1976. 97 p, 3 fig, 2 tab, 2 ref, 4 append.

Descriptors: *Environmental effects, *Dredging, *Water pollution effects, *Connecticut, Waste disposal.
Identifiers: Spoil disposal, Species diversity, Thames River(CT).

The Middle Atlantic Coastal Fisheries Center presented comparative data on benthic macrofauna populations of June 1974 (predisposal) versus June 1975 and October 1974 versus October 1975. At a station representing the original disposal point, significant decreases (according to 95% confidence limits) were found between Junes in number of individuals (N), number of species (S) and Shannon-Weaver species diversity (H'). The species primarily responsible for these changes were listed. No species had systematic increases or decreases which might dictate their use as indicators of spoiling impacts. These changes were thought attributable more to natural yearly fluctuations than to spoil effects, since large declines in density were seen at 'control' stations two n. mi. from the disposal buoy, while much smaller decreases were found at five stations at one n. mi. distances from dumping. Preliminary comparisons of October 1974 versus October 1975 samples again reveal apparently random, rather than spoil-related, changes outside of the spoil pile itself. The University of Connecticut found only limited correlations between suspended loads in the Thames River and season or streamflow. The New York Ocean Science Laboratory, conducting current measurements over a lunar day, again found net bottom drift to be in a WNW direction on a flooding tide. On the next ebb, resultant bottom blow was toward the ESE, whereas prior surveys had documented NE to E net drifts. (Sinha - OEIS)
W77-11899

A STUDY ON THE EFFECTS OF MAINTENANCE DREDGING ON SELECTED ECOLOGICAL PARAMETERS IN GULFPORT HARBOR, MISSISSIPPI.
Water and Air Research, Inc., Gainesville, Fla.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-024 069, Price codes: A15 in paper copy, A01 in microfiche. Final Report to U.S. Corps of Engineers, Mobile, Ala., Mobile District, July 1975. 552 p, 7 append. DACW01-74-C-0156.

Descriptors: *Dredging, *Environmental effects, *Resources development, *Baseline studies, Ecology, Mississippi.
Identifiers: Natural variations, Seasonal variations, *Mississippi Sound.

An assessment of the environmental effects of maintenance dredging in Mississippi Sound in 1974 is given. Background conditions were measured before and after dredging, and extensive monitoring was conducted during the dredging operation. It was found that dredging had no significant or lasting effect on any of the conditions evaluated in this investigation. Turbidities and suspended solids were measured in the Sound and the size and dispersion of the discharge plume were defined. Distributions and levels of bacteria and heavy metals were studied to measure their release from the sediments to the waters. The biological parameters investigated were: plankton, coliform bacteria, and benthic invertebrates. Biological changes in the Sound were dominated by natural variations and seasonal changes rather than by dredging. No significant environmental impact was caused by maintenance dredging. (Sinha-OEIS)
W77-11901

APPLICATION OF LANDSAT-2 TO THE MANAGEMENT OF DELAWARE'S MARINE AND WETLAND RESOURCES,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas, D. Bartlett, W. Philpot, and G. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as N76 23652, Price codes: A02 in paper copy, A01 in microfiche. Progress Report to NASA Goddard Space Flight Center, April 30, 1976. 16 p, 4 fig, 1 tab, 9 ref. NAS5-20983.

Descriptors: *Delaware, *Oil spills, *Oil pollution, *Environmental effects, *Water pollution effects, Wetlands, Resources, Bay, Estuaries, Remote sensing.
Identifiers: *Outer Continental Shelf, Oil slicks, Resources management, Ocean dumping, *Delaware Bay region.

Studies of the Delaware Bay region with LANDSAT-land-2 have so far produced useful results for all six objectives outlined in the work statement. The objectives are: (1) Monitoring the dispersion and movement of ocean dump plumes; (2) suspended sediment concentration mapping; (3) current circulation and boundary charting for a model which predicts the movement of oil slicks; (4) coastal land use and vegetation studies; (5) comparison of training site and spectral signature (with atmospheric correction) techniques for classifying coastal land cover and environmental impact; and (6) impact of Outer Continental Shelf development on the coastal zone of Delaware. (Sinha-OEIS)
W77-11903

INFLUENCE OF PUMP STORAGE AND GENERATION ON COMMERCIAL FISHERIES POTENTIAL OF RESERVOIRS,
Arizona State Univ., Tempe. Lower Colorado River Basin Research Lab.
W. L. Minckley, and R. M. McNatt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 488, Price codes: A03 in paper copy, A01 in microfiche. Arizona Game and Fish Department Completion Report for Project No. 4-19-R, for the Period June 1972 to June 1975, November 1975. 31 p, 26 fig, 19 ref.

Descriptors: *Water quality, *Baseline studies, *Water quality standards, *Pumped storage, Reservoirs, Hydroelectric plants, Water storage, Arizona, Water management, Water temperature, Eutrophication, Thermal pollution.
Identifiers: Salt River reservoirs(AZ), Total dissolved solids.

A compilation of selected information on the impacts of pumped-storage - generation installations and operations on the two, lowermost, on-river reservoirs of the Salt River chain in Central Arizona is given. These water storage and

delivery, plus hydroelectric generating reservoirs are situated at low elevation in Lower to Upper Sonoran Desert habitats; and have been subjected to massive, and somewhat unique modifications over the past 12 years. The most massive changes have been drying and refilling of the three lowermost reservoirs for repair and/or modifications of outlet structures, installation of pump-storage - generation units on two of the dams, and changes in the generation capacities and operations of the upstream dam (Roosevelt Dam, impounding Roosevelt Lake). It appears that on-line pump - generation operations effect substantial thermal loading of downstream reservoirs. Also, disruption of the tremendous thermal stability achieved in these bodies of water prior to high levels of pump - generation operation is evident. With increased surface temperatures, increased evaporation rates would be expected, with an attendant increase in total dissolved solids. The marked variablity of these features in the Salt River system of reservoirs, resulting from sporadic inflows of waters in years of flood and in years of drought, make interpretation of data contingent upon examination of many past years of information. (Sinha-OEIS)
W77-11907

LIMNOLOGICAL STUDIES OF THE ISLAND AREA OF WESTERN LAKE ERIE,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 2H.
W77-11926

THE EFFECT OF INCREASED REGULATION ON A NORWEGIAN LAKE, (IN NORWEGIAN),
Zoologisk Museum, Oslo (Norway).
For primary bibliographic entry see Field 5G.
W77-11931

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT - PHASE III,
Washington Univ., Seattle, Coll. of Forestry.
For primary bibliographic entry see Field 4C.
W77-11941

THE EFFECT OF FEEDLOT RUNOFF ON COMMUNITY STRUCTURE IN THE COTTONWOOD RIVER, KANSAS,
Kansas State Teachers College, Emporia. Dept. of Biology.
N. L. Edwards.
M. S. Thesis, Kansas State Teachers College, May, 1970, 25 p. 3 fig, 8 tab, 15 ref.

Descriptors: *Agricultural runoff, Feed lots, *Kansas, *Water pollution effects, *Benthic fauna, Farm wastes.
Identifiers: Cottonwood River(Kan), Neosho River(Kan).

Water pollution from feedlots has become a serious problem throughout many central and southwestern states due to increase of the concentration of livestock and the number of feedlots. This study exemplifies this situation. Five stations on the Cottonwood and Neosho Rivers in Kansas were sampled periodically from September, 1968, to October, 1969. Benthic invertebrate community structure was subjected to conventional and species diversity analyses. Although there were several possible sources of pollution other than feedlots, feedlot runoff did appear to significantly effect community diversity. This was seen by the decreasing diversity downstream from Station I, by an increase in diversity at those stations farthest downstream from feedlots, and by the higher diversity downstream from Emporia's sewage treatment plant which inferred that the Strong City and Cottonwood Falls domestic effluents had little or no effect on community structure. Additional studies are needed to: (1) pinpoint the various sources of pollution, (2) determine the presence of any significant introduction of drift organisms from tributaries, (3) evaluate the effects of the possible introduction of pollutants from tributaries, and (4) determine the direct effect on community structure of a 'slug' moving downstream. (Keel-East Central)
W77-11972

HEALTH HAZARDS OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL WASTES APPLIED TO LAND,
Universitaet Hohenheim (Landwirtschaftliche Hochschule). (West Germany). Inst. of Animal Medicine and Animal Hygiene.
D. Strauch.
In: Land as a Waste Management Alternative, Proceedings of the 1976 Cornell Agricultural Waste Management Conference, Ann Arbor Science Publishers Inc., Ann Arbor, Michigan, 1977, p. 317-342. 7 fig, 10 tab, 34 ref.

Descriptors: Confinement pens, Diseases, Toxicity, Pathogenic bacteria, Nitrates, Phosphates, Water pollution, Groundwater, Slurries, Antibiotics, Industrial wastes, Sewage, Sewage sludge, Biological treatment, Waste treatment, Farm wastes.
Identifiers: Public health, Land disposal, Waste management, Hygiene, Chemical treatment, Physical treatment.

Confinement of animals has increased the number of latent infections in animal production all over the world. The adoption of slurry systems for handling wastes is charged as being largely responsible for this situation. Infective agents occur in the liquid manure and survive the usual stroage time. When the slurry is disposed of on pasture lands, infections may be transmitted to livestock. For an effective interruption of the infection cycles, hygiene on-site treatment of infectious slurry may be necessary before land disposal of the wastes. An additional danger to public health arises when too large amounts of slurry are distributed on land. Pollution of surface and groundwaters may arise due to infective agents, phosphates, and nitrates. Another hygienic risk for man and animals is the occurence of transmissible resistance of microorganisms caused by feeding antibiotics to improve growth in animal production. Use of newly developed substances which are not resorbed and are said not to cause resistance may solve this problem. Land disposal of industrial wastes may result in toxic organic and inorganic substances which may enter the food chain. High concentrations in plants and food derived from animals can be a health hazard for animals and man. Consequently, the maximum concentrations in soil and plants should be determined and routinely controlled. Land disposal of infected sewage and sewage sludge can cause infections of animals and man. Sewage and sludge should be disinfected before being applied to the land. If this is not feasible, the wastes should only be disposed of on arable land and not on pastures and other green fodder areas. Because sewage and sludge also contain undesired chemical compounds which may be hazardous to animals and man, the same control measures as for the land use of industrial wastes should be employed. (Merryman-East Central)
W77-11975

MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
J. W. Doran, J. R. Ellis, and T. M. McCalla.
In: Land as a Waste Management Alternative, Proceedings of the 1976 Cornell Agricultural Waste Management Conference, Ann Arbor Science Publishers Inc., Ann Arbor, Michigan, 1977, p. 343-361. 1 fig, 7 tab, 47 ref.

Descriptors: *Soil microbiology, Sewage, Pathogenic bacteria, Water pollution effects, Groundwater, Ammonification, Nitrification, Denitrification, Volatilization, Trace elements, Toxicity.
Identifiers: Land disposal, Mobilization, Methylation.

As a result of implementation of the National Environmental Policy Act of 1969 and, more specifically, the respective amendments for the Clean Air Act and Federal Water Pollution Control Act of 1970 and 1972, land application seems the most feasible means of disposing of animal wastes and domestic sewage wastes. Disease transmission due to this practice is no problem if the wastes have been adequately treated, applied to the land at acceptable rates, and applied in such a way that rapid percolation and runoff are minimized. However, surface and groundwaters should be monitored frequently for indications of fecal contamination in areas where wastes are applied to land. An important concern in assessment of land application of wastes is the effects of disposal practices on microbial processes of decomposition and nutrient cycling. Excessive loading of soils with waste materials will result in oxygen depletion, slower decomposition, and accumulation of odorous, phototoxic end products that may result in optimal balance between nitrogen removal and reduction in pollution. The stimulation of microbial methylation by wastes added to the soil may be of importance because this transformation can result in the mobilization of many toxic trace elements through volatilization. (Merryman-East Central)
W77-11976

PHYSIOLOGICAL CHARACTERISTICS OF MERCURY UPTAKE BY TWO ESTUARINE SPECIES,
Hawaii Univ., Honolulu. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W77-12007

NITROFURAZONE FOR CONTROL OF THE MICROSPORIDAN PARASITE PLEISTOPHORA OVARIAE IN GOLDEN SHINERS,
Oklahoma Cooperative Fishery Research Unit. Stillwater.
For primary bibliographic entry see Field 5G.
W77-12008

OXYGEN CONSUMPTION BY SPHAERIUM SIMILE,
Kansas State Teachers Coll., Emporia. Div. of Biology.
J. Waite, and G. Neufeld.
Comparative Biochemistry and Physiology, Vol. 57A, p 373-375, 1977. 2 fig, 1 tab, 10 ref.

Descriptors: *Invertebrates, *Molluscs, *Clams, *Oxygen, *Oxygen requirements, *Oxygenation, Biochemical oxygen demand, Respiration, Temperature, Mode of action, Bioassay, Thermal stress, Environmental effects.
Identifiers: *Fingernail clam, Sphaerium simile, Tissue analysis, Oxygen consumption.

Oxygen consumption by fingernail clams (Sphaerium simile) was determined as a function of temperature and oxygen tension in both whole organism and excised gill and mantle tissue. The whole organism demonstrated a homeostatic mechanism that resisted gross environmental fluctuations. Excised tissue exhibited no regulation of oxygen consumption. (Klein)
W77-12009

EFFECTS OF ACUTE CHANGES IN TEMPERATURE AND SALINITY ON PULSATION RATES IN EPHYRAE OF THE SCYPHOZOAN AURELIA AURITA,
Texas A and M Univ., College Station. Dept. of Biology.
T. M. Dillon.
Marine Biology, Vol. 42, p 31-35, 1977. 3 fig, 2 tab, 15 ref.

Descriptors: *Invertebrates, *Jellyfish, *Temperature, *Thermal stress, *Salinity, *Resistance, *Osmotic pressure, Aquatic animals, Animal physiology, Water quality, Laboratory tests, Ions, Water properties, Texas, Respiration, Environmental effects, Animal behavior.
Identifiers: *Ephyrae, *Aurelia aurita, *Pulsation rates.

The response of Aurelia aurita to abrupt temperature and salinity differentials was expressed as changes in bell pulsation rates. Acute temperature rate-responses reflected a reduced temperature sensitivity over a broad range (10 to 35 C), with a Q10 value of 0.97 between 20 and 25C. The initial relationship between salinity change and pulsation rate was linear and direct. This pattern was disrupted after 24h, with those ephyrae experiencing a salinity decrease pulsing significantly faster than those experiencing no change or an increase in salinity. This response to low salinities dissipated after 2 days. Holding osmotic pressure constant and disrupting ionic ratios had more of an immediate and persistent effect than solely decreasing salinity. (Klein)
W77-12010

THERAPEUTIC TREATMENT FOR EPIBIOTIC FOULING ON DUNGENESS CRAB (CANCER MAGISTER) LARVAE REARED IN THE LABORATORY,
California Univ., Bodega Bay. Bodega Marine Lab.
W. S. Fisher, and R. T. Nelson.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 432-436, 1977. 4 fig, 18 ref.

Descriptors: Invertebrates, *Crabs, *Shellfish, *Crustaceans, Larvae, Microbiology, *Algae, *Marine fungi, *Toxicity, *Diatoms, *Fungicides, Toxins, Phytoplankton, Algal toxins, Mortality, Resistance, Larval growth stages, Organic compounds, Mode of action, Bioassay, Laboratory tests.
Identifiers: *Dungeness crab, Cancer magister, Phaeodactylum tricornutum, Survival rates, Antibiotics, Bioaccumulation.

This study shows that larvae of the Dungeness crab (Cancer magister) reared in the laboratory are susceptible to epibiotic microbial infestation similar to that described for eggs of the same species. Larval survival in the laboratory was increased by increased additions of antibiotics to the sea water; however, the chemotherapeutic agent, malachite green, was unsuccessful due to its toxicity to the sensitive larval stages. The addition of the diatom Phaeodactylum tricornutum was beneficial to larval survival in the light but detrimental in dark conditions, supporting the suggestion of a photosynthetic excretion from the algae capable of antibiotic activity. (Klein)
W77-12011

EFFECTS OF ORAL ADMINISTRATION OF CADMIUM ON FISH - I. ANALYTICAL RESULTS OF THE BLOOD AND BONES, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5A.
W77-12012

TEMPERATURE PREFERENCES OF FOUR FISH SPECIES IN AN ELECTRONIC THERMOREGULATORY SHUTTLEBOX,
Pennsylvania State Univ., Wilkes-Barre. Dept. of Biology.
W. W. Reynolds, and M. E. Casterlin.
The Progressive Fish Culturist, Vol. 39, No. 3, p 123-125, 1977. fig, 17 ref.

Descriptors: *Temperature, *Freshwater fish, *Carp, *Thermal properties, *Resistance, *Thermal stress, *Water temperature, Environmental effects, Fish physiology, Water quality, Sunfish, Fish behavior.
Identifiers: Temperature Optimum, *Thermoregulation, *Black crappie, *Chain pickerel, *Pumpkinseed.

Temperature preferences of four fish species were studied in an electronic thermoregulatory shuttlebox. The model temperature preferences of the four species were: black crappie (Poxomis nigromaculatus), 24C; carp (Cyprinus carpio), 29C; chain pickerel (Esox niger), 24C; and pumpkin seed (Lepomis gibbostus), 26C. The species differed in thermoregulatory precision as well as in final preferred temperature, indicating the species-specific nature of thermal behavior. There was little intraspecific variation among individuals tested. (Klein)
W77-12013

INVESTIGATIONS ON THE SIMULTANEOUS UPTAKE AND RELEASE OF MERCURY BY DUNALIELLA TERTIOLECTA,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
M. Betz.
Marine Biology, Vol. 41, 1977, p 89-97. 5 fig, 26 ref.

Descriptors: Metals, *Mercury, Metabolism, *Phytoplankton, *Algae, Sea water, Path of pollutants, Biochemistry, Laboratory tests, *Isotope studies, Chlorophyll, Nutrients, Organic matter, Organic compounds, Dispersion, *Absorption.
Identifiers: *Mercury uptake, *Mercury release, Dunaliella tertiolecta, *Radioactive mercury, Isotopes, Hg-203, Chlorophyll a.

By using two different radioactive mercury isotopes, detailed information was obtained on the uptake and simultaneous release of mercury by Dunaliella tertiolecta. Hg-203 was added to a well-aged culture, which 2 days later was separated from the medium, washed and cultivated again in a fresh medium containing Hg-197. It was found that an exchange of mercury takes place between the cells and the medium. An increase in the concentration of volatile mercury occurs simultaneously with the maximum concentration of chlorophyll a. Comparing the culture solutions with the blanks, the dissolved mercury shows similar volatility. This leads to the assumption that the main part of the dissolved mercury in the culture solutions is in the inorganic state. (Katz)
W77-12014

ORGANOCHLORINES AND HEAVY METALS IN THE HARBOUR SEAL PHOCASVITULINA FROM THE GERMAN NORTH SEA COAST,
Kiel Univ. (West Germany). Institut fuer Haustierkunde.
H. E. Drescher, U. Harms, and E. Huschenbeth.
Marine Biology, Vol. 41, 1977, p 91-106, 2 tab, 2 fig, 16 ref.

Descriptors: *Chlorinated hydrocarbons, *Metals, *Arochlor, *Polychlorinated biphenyls, Copper, Zinc, Mercury, Cadmium, Lead, DDT, *Dieldrin, Seals, *Mammals, Juveniles, Biochemistry, Animal physiology, Pathology, Water pollution effects.
Identifiers: *Lindane, *Harbour seals, Phoca vitulina, *North Sea, Tissue concentrations, Organochlorine residues, German Coast.

Samples of various tissues and organs from healthy, sick and dead harbour seals (Phoca vitulina) from the North German Waddensea collected during the years 1974-1976 were analyzed for copper, zinc, total mercury, cadmium, lead, and organochlorine pesticide residues (PCB, DDT, Lindane, and Dieldrin). There was great variation within all series of compounds investigated, but in general the analytical data obtained indicated that high amounts of heavy metals and organochlorine pesticides can be present even in young seals. An age-specific increase in the mercury and cadmium content in liver samples could be demonstrated. The results are compared with data published by British and Dutch authors for other North Sea regions, and with a few exceptions, no significant differences can be established: cadmium (kidney) and DDT (blubber) contents in areas off the British coast are usually higher than corresponding values for seals from the German coast. There was no clear evidlnce that the concentrations of any of the compounds investigated had negative effects on the health of the seals. However, possible combined effects cannot be excluded. (Katz)
W77-12015

DETECTION OF TRACE CONTAMINANT EFFECTS IN AQUATIC ECOSYSTEMS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W77-12017

ORGANOCHLORINE RESIDUES IN MATERNAL BLUBBER, MILK, AND PUP BLUBBER FROM GREY SEALS (HALICHOERUS GRYPUS) FROM SABLE ISLAND, NOVA SCOTIA,
Bedford Institute of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5B.
W77-12019

EARLY DEVELOPMENTAL EFFECTS OF LIME NEUTRALIZED IRON HYDROXIDE SUSPENSIONS ON BROOK TROUT AND COHO SALMON,
Army Engineer District, Pittsburg, Pa.
E. J. Smith, and J. L. Sykora.
Transactions of the American Fisheries Society, Vol 105, No 2, p 308-312, 1976. 3 tab, 13 ref.

Descriptors: *Salmonids, *Trout, *Salmon, *Brook Trout, *Iron Compounds, *Chemical reactions, *Lime, *Fish eggs, *Immature growth stage, Inorganic compounds, Fish physiology, Metals, Growth rates, Water quality, Mortality, Bioassay, Resistance.
Identifiers: *Coho salmon, *Alevins, *Lime-neutralized iron hydroxide suspensions, Survival rates.

A study of the effect of lime-neutralized iron hydroxide suspensions on eggs and alevins of brook trout (Salvelinus fontinalis) and coho salmon (Oncorhynchus kisutch) was conducted with a modified proportional diluter. Effects were interpreted from data on hatchability, survival, and growth in five test concentrations and control. Growth of 90-day-old coho salmon alevins was reduced in water containing 1.27 mg Fe/liter of lime-neutralized suspended iron, whereas hatchability was unaffected in the highest concentration tested, 10.5 mg Fe/liter. However, 10.5 mg Fe/liter water had no measureable effect on hatchability, survival, and growth of brook trout alevins. The safe upper limit of lime-neutralized suspended iron for hatchability, survival, and growth of coho salmon alevins may lie between o.97 and 1.27 mg Fe/liter. (Klein)
W77-12020

STUDIES ON THE CULTIVATION OF MARINE CLADOCERA - I. FACTORS AFFECTING THE HATCH OF RESTING EGGS, (IN JAPANESE),
Mie Prefectural Univ., Tsu (Japan). Faculty of Fisheries.
H. Iwasaki, A. Takami, and T. Onbe.
Bulletin of the Plankton Society of Japan, Vol 24, No 1, p 62-65, 1977. 3 fig, 2 ref.

Descriptors: *Environmental effects, *Temperature, *Fish eggs, *Light intensity, *Hatching, Growth stages, Water quality, Fish physiology, Crustacea, Zooplankton aquiculture, Fish farming, Fish diets, *Salinity.

Identifiers: *Hatching rates, *Cladocera sp., Chlorinity.

Environmental factors affecting the hatch of resting eggs of marine Cladocera were examined. The resting eggs of Penilia avirostris, Evadne sp., Podon sp., hatched in a wide range of chlorinity and light intensity. The highest hatching rate was obtained at 1,000 lux. In P. avirostris the highest hatching rate was observed at 14.1% Cl at 18C. In Podon sp. otimal chlorinity and temperature values measured 10.6% Cl and 15C, respectively. Hatching rates tended to increase with the lowering of temperature within a range from 15-21C. Optimal conditioning for Evadne sp. eggs were similar to those of Podon sp. (Katz)
W77-12021

EFFECTS OF SALINITY ON THE NET UPTAKE OF ZINC BY THE COMMON MUSSEL MYTILUS EDULIS,
Melbourne Univ., Parkville (Australia). Dept. of Zoology.
D. J. H. Phillips.
Marine Biology, Vol 41, 1977, p 79-88. 3 tab, 5 fig, 30 ref.

Descriptors: Metals, *Zinc, Molluscs, *Mussels, Water pollution effects, Path of Pollutants, Commercial shellfish, *Salinity, Seawater, Stress, Estuaries, Trace elements, Australia, Laboratory tests, Clinical analysis, *Cadmium, *Copper.
Identifiers: *Metal uptake, Net uptake, Stable salinity, Fluctuating salinity, Tissue analysis, Condition factors.

The net uptake of zinc by the common mussel Mytilus edulis (L.) has been investigated under different natural and artificial salinity stresses. The effects of stable and fluctuating salinities on the uptake of zinc by the mussel are discussed in terms of three possible modes of action. Under certain highly-stressful conditions, salinity may affect the uptake of zinc by the mussel. This factor should be considered when the mussel is used as an indicator of environmental pollution by zinc in estuarine areas, or spurious conclusions may result. (Katz)
W77-12022

DIEL VARIATIONS IN SENSITIVITY OF FISHES TO POTENTIALLY LETHAL STIMULI,
Milwaukee Public Museum, Wis.
R. Spieler, T. A. Noseke, and G. L. Seegert.
The Progressive Fish Culturist, Vol 39, No 3, p 144-147, 1977. 1 fig, 2 tab, 22 ref.

Descriptors: *Thermal stress, *Temperature, *Toxicity, *Chlorine, *Organic compounds, *Minnows, *Shiners, *Time, Fish physiology, Lethal limits, Water pollution, Resistance, Bioassay, Toxins, Mortality, Biorhythms.
Identifiers: *Formalin, Time-of-day, *Golden shiners, Fathead minnows, *Lethal stimuli, *Diel variations, Sensitivity, Pimephales, Notemigonus.

Fathead minnows (Pimephales promelas) and golden shiners (Notemigonus crysoleucas) exhibited differences in sensitivity to potentially lethal levels of chlorine, formalin, or heat, depending on the time of day of treatment. (Klein)
W77-12023

EFFECTS OF SALTON SEA WATER ON THE EGGS AND LARVAE OF BAIRDIELLA ICISTIA (PISCES: SCIAENIDAE),
Hawaii Inst. of Marine Biology, Honolulu.
R. C. May.
California Fish and Game, Vol 62, No 2, p 119-131, 1976. 5 fig, 5 tab, 27 ref.

Descriptors: Larvae, *Larval growth stage, *Mortality, *Salinity, Saline water, *Ions, *Salt tolerance, Lethal limit, Toxicity, Laboratory tests, Embryonic growth stage, Growth rates, Bioassay, *Saline Lakes, California.
Identifiers: Survival rates, *Sciaenidae, *Bairdiella icistia, *Salton Sea, Ionic composition.

In laboratory experiments, eggs and early larvae of the sciaenid fish Bairdiella icistia survived well in sea water but displayed extremely poor survival in water from the Salton Sea. Mortality in Salton Sea water was expressed mainly among hatched larvae prior to complete yolk absorption. Experiments conducted in both natural and artificial sea water and Salton Sea water indicated that this poor survival was related to the unusual inoic composition of the Salton Sea. (Katz)
W77-12025

DEVELOPMENT OF ATLANTIC SALMON (SALMO SALAR) EGGS AND ALEVINS UNDER VARIED TEMPERATURE REGIMES,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
R. H. Peterson, H. C. E. Spinney, and A. Sreedharan.
Journal of the Fisheries Research Board of Canada, Vol 34, p 31-43, 1977. 7 fig, 8 tab, 15 ref.

Descriptors: *Temperature, *Thermal stress, *Resistance, *Salmonids, *Fish physiology, *Salmon, *Atlantic salmon, Mortality, *Fish eggs, Juvenile growth stage, Bioassay, Immature growth stage, Fish behavior.
Identifiers: *Alevins.

Atlantic salmon (Salmo salar) eggs and alevins were raised under conditions where the temperature was systematically varied either at fertilization, at the eyed egg stage, or at hatching. Mortality was more than 20% in eggs started immediately after fertilization at constant incubation temperatures less than 4C as compared with 5% or less at temperatures more than 4C. Alevins that eyed at 8C and higher were progressively smaller the higher the temperature. The optimum temperature from fertilization to eye pigmentation was near 6C. Eyed eggs reared at lower temperatures until hatching were larger than those hatched at higher temperatures. This size differential was maintained until the yolk was completely absorbed at all posthatching temperatures investigated. Sudden decreases in temperature at the eyed egg and hatching stages induced severe edema of the alevin yolk sac, resulting in slower growth and increased mortality. (Klein)
W77-12026

HEAVY-METAL CONTAMINATION BY ATMOSPHERIC FALLOUT OF SEVERAL FLIN FLON AREA LAKES AND THE RELATION TO FISH POPULATIONS,
Toronto Univ. (Ontario). Dept. of Geology,; Toronto Univ. (Ontario). Dept. of Chemistry; and Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
For primary bibliographic entry see Field 5B.
W77-12027

INFLUENCE OF WATER TEMPERATURE ON THE GROWTH RATE OF THE LANDLOCKED SEA LAMPREY (PETROMYZON MARINUS) AND THE ASSOCIATED RATE OF HOST MORTALITY,
Guelph Univ. (Ontario). Dept. of Zoology.
G. J. Farmer, F. W. H. Beamish, and P. F. Lett.
Journal of the Fisheries Research Board of Canada, Vol 34, p 1373-1378, 1977. 2 fig, 1 tab, 23 ref.

Descriptors: *Growth rates, *Toxicity, *Water temperature, *Lampreys, *Suckers, Freshwater fish, *Thermal stress, *Fish parasites, *Mortality, Seasonal, Environmental effects, Teleosts, Heat resistance, Fish populations.
Identifiers: *Sea lampreys, Petromyzon marinus, *White suckers, Catostomus commersoni, Hosts.

Groups of sea lampreys (Petromyzon marinus) of 10-90 g initial weight were held at temperatures of 1-20C for 30 days and allowed to feed ad lib, on white suckers (Catostomus commersoni). Increases in water temperature and in lamprey size caused the rate of host mortality to increase in agreement with observations that mortality in the Great Lakes is seasonal. Instantaneous growth rates were maximal at 20C for lampreys of 10-30 g, the optimal temperature for growth shifting to 15C for larger lampreys of 30-90 g. Growth rates were intermediate at 10C and lowest at 4C for lampreys of all size. Accordingly, host mortality increased with temperature over the 4-20C range. At all experimental temperatures, increases in lamprey weight were accompanied by an exponential decline in instantaneous growth rates, a phenomenon also observed for teleosts. Laboratory growth rates at temperatures of 5-15C were comparable to rates observed for lampreys in Lake Huron between April and November and agree with the observation that lampreys feed in deeper waters between April and June before moving to warmer, shallower waters during the summer when growth rate increases. (Katz)
W77-12028

WHITE SUCKER (CATOSTOMUS COMMERSONI) EMBRYO DEVELOPMENT, AND EARLY GROWTH AND SURVIVAL AT DIFFERENT TEMPERATURES,
Environmental Research Lab.-Duluth, Minn.
J. H. McCormick, B. R. Jones, and K. E. F. Hokanson.
Journal of the Fisheries Research Board of Canada, Vol 34, p 1019-1025, 1977. 1 fig, 3 tab, 21 ref.

Descriptors: *Growth rates, *Growth stages, *Life cycles, *Embryonic growth stage, *Larval growth stage, *Water temperature, *Suckers, Biomass, Environmental effects, Mortality, Fish population, Fecundity, Analytical techniques.
Identifiers: *White sucker, Catostomus, *Thermal response, TL50, Spinal deformities.

White suckers were exposed from fertilization through hatching to seven constant temperatures from 6.2 through 24.1C. High percentages of apparently normal larvae hatched at temperatures from 9.0 through 17.2C. Maximum percent hatch occurred at 15.2C, while only a few normal larvae were produced at 6.2C and none at 24.1C. Growth rates increased from near zero at 10.0C to a maximum at 26.9C. At 29.7C growth fall below the maximum (P 0.05), and the incidence of spinal deformities was high. Death rates were uniformly low from 15.7 to 26.9C and were significantly higher at 10.0 and 29.7C (P 0.05). The rate of net biomass gain for test groups was maximum at 26.9C. Net rates of biomass gain declined progressively with temperatures below 26.9C until by 10.0C the rate of population growth became less than the rate of weight loss through deaths within the population. The temperature producing maximum hatching success, 15C, was nearly 12C lower than that providing for maximum growth and net biomass gain. This variation in optimal temperature during the life stages of the white sucker reflects the changes in preferred environment seen under natural conditions. The importance of maintaining seasonal temperature cycles, access to native spawning sites, and access to thermal retreats during periods of excessive temperatures becomes apparent. (Katz)
W77-12030

EFFECT OF SHOCK EXPOSURES OF CHLORINE ON THE PLASMA ELECTROLYTE CONCENTRATIONS OF ADULT RAINBOW TROUT (SALMO GAIRDNERI),
Consumers Power Co., Jackson, Mich. Dept. of Environmental Services.
I. H. Zeitoun, L. D. Hughes, and D. E. Ullrey.
Journal of the Fisheries Research Board of Canada, Vol 34, p 1034-1039, 1977. 3 tab, 19 ref.

Descriptors: *Rainbow trout, *Chlorine, *Electrolytes, Powerplants, Phosphorus, Magnesium, Copper, Zinc, Potassium, Calcium, Sodium, Salmonids, Toxicity, Environmental effects, Lethal limit, Chemical analysis, Bioassay.
Identifiers: Plasma, *Plasma electrolytes, *Hemolysis, *Mineral homeostasis, Hematology, Toxicology, Biocide.

Blood was pooled from randomly selected 3-yr-old rainbow trout before addition of chlorine to their water environment and afterward when fish began to gulp for air and lose equilibrium. In five duplicate tests, plasma concentrations of phosphorus, magnesium, iron, copper, zinc, and potassium increased substantially in the stressed fish. Calcium concentration was also higher, but not significantly so in the plasma of the test fish as compared with those of the controls. Sodium was the only electrolyte that dropped substantially ($p < 0.01$) in the test fish as compared with the controls. Chlorine toxicity appeared to disturb the mineral homeostasis in the fish blood. Rapid recruitment of electrolytes from the environment and movement into the plasma, a strong mineral retention mechanism, or mobilization of body mineral stores worked together or individually to compensate for those minerals lost with water during hemoconcentration. (Katz)
W77-12031

DISTRIBUTION AND DEGRADATION OF DINITROANILINE HERBICIDES IN AN AQUATIC ECOSYSTEM,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W77-12032

ABNORMAL TERNS, SICK SEA AND SHORE BIRDS, ORGANOCHLORINES AND ARBOVIRUSES IN THE INDIAN OCEAN,
Aberdeen Univ. (Scotland). Seabird Group.
W. R. P. Bourne, J. A. Bogan, D. Bullock, A. W. Diamond, and C. J. Feare.
Marine Pollution Bulletin, Vol 8, No 7, p 154-158, 1977. 2 tab, 23 ref.

Descriptors: *Polychlorinated biphenyls, *DDE, *Organic pesticides, *Viruses, *Carriers, Environmental effects, Animal growth, Water pollution effect, Diseases, Epidemiology, Shore birds, Water birds, Indian Ocean.
Identifiers: *Arboviruses, *Terns, *Teratology, Congenital abnormalities, Ticks.

It has been suggested that congenital abnormalities and defects of feather growth of young terns along the east coast of the USA may be due to organochlorine pollution. Similar abnormalities are also found in young terns and neurological symptoms in terns and other species in the Indian Ocean, where there is still little pollution, in association with an acute infestation of ticks infected with arboviruses. It is postulated that infection with the viruses provides an alternative explanation for the abnormalities seen in the birds. (Katz)
W77-12034

CHLORINATED COOLING WATERS IN THE MARINE ENVIRONMENT: DEVELOPMENT OF EFFLUENT GUIDELINES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5G.
W77-12036

DETERMINATION OF MERCURY IN FISH FROM RIVERS AND LAKES IN HUNGARY BY ATOMIC ABSORPTION TECHNIQUE,
Institute of Nutrition, Budapest (Hungary).
For primary bibliographic entry see Field 5A.
W77-12037

EFFECTS OF HEAVY METALS (CADMIUM, COPPER, CHROMIUM AND LEAD) ON A FRESHWATER SNAIL, BIOMPHALARIA GLABRATA SAY (GASTROPODA, PROSOBRANCHIA),
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
O. Ravera.
Malacologia, Vol 16, No 1, p 231-236, 1977. 4 fig, 1 tab, 7 ref.

Descriptors: *Heavy metals, *Cadmium, *Copper, *Chromium, *Lead, *Lethal limit, Fertility, Fecundity, Gastropods, *Embryonic growth stage, *Mortality, Laboratory animals, Toxicity, Mollusks, Growth rates, Growth stages, Laboratory tests, *Snails.
Identifiers: Sublethal effects, Biomphalaria, Freshwater pulmonates, Pulmonates.

This study concerns the effects of heavy metals on the mortality and fecundity of the adult snails and the viability of their embryos. Embryos were also tested for lead. The concentrations used ranged from 0 ppm th 4.0 ppm for cadmium and copper and from 0 to 1.4 ppm for chromium. Cadmium and copper were far more toxic than chromium. Fertility was abolished by 0.1 ppm of cadmium and copper and fecundity was severely affected by chromium. Some evident sublethal effects were observed. Survival of the hatchlings treated with chromium was of the same order of magnitude as that of the controls and sexual maturity did not show any delay. Forty-one percent of the embryos kept at concentrations of 0.1 ppm lead completed their development in 51 days, that is, with a delay of 37 days. The hatchlings at 0.1 ppm died after 15 days. The advantages of using freshwater pulmonates as a toxicity test was discussed. (Katz)
W77-12038

POWER PLANTS AND PLANKTON,
Scripps Institution of Oceanography, La Jolla, Calif.
J. T. Enright.
Marine Pollution Bulletin, Vol 8, No 7, p 158-161, 1977. 2 fig, 7 ref.

Descriptors: *Mortality, *Powerplants, *Electric powerplants, *Cooling water, *Thermal stress, *Heated water, *Plankton, *Mathematical models, *Larval growth stage, *Entrainment, Environmental effects, Water pollution sources, Statistical methods, Analytical techniques, Population, Aquatic populations, Density, Thermal pollution.
Identifiers: *Population dynamics.

The use of coastal oceanic waters in the cooling systems of power plants leads to the destruction of large numbers of planktonic larvae of nearshore fish and invertebrates. As a first-order approach toward assessing the maximum probable impact of such larval mortality upon adult populations, one can assume that recruitment to local populations is due to larvae from distant sources, which have a recruitment success independent of adult density; and that adult mortality is density-independent. These worst-possible-case assumptions lead to the interpretation that impact on adult populations could be adequately evaluated by measuring-or predicting-the power-plant imposed reductions in larval density in those nearshore waters from which recruitment occurs. (Katz)
W77-12039

SURVIVAL TIME AND LETHAL EXPOSURE TIME FOR THE BLACKNOSE DACE EXPOSED TO FREE CHLORINE AND CHLORAMINES,
Maryland Univ., College Park, Inland Environmental Lab.
J. A. Tompkins, and C. Tsai.
Transactions of the American Fisheries Society, Vol 105, No 2, p 313-321, 1976. 4 fig, 5 tab, 16 ref.

Descriptors: *Lethal limit, *Freshwater fish, *Resistance, *Time, *Chlorine, *Toxicity, Toxins, Chlorination, Mortality, Fishkill, Bioassay, Laboratory tests, Water quality, Analytical techniques, Water pollution effects.
Identifiers: *Chloramines, *Amines, Time of exposure, Survival rates, *Blacknose dace, *Survival time, Rhinichthys atratulus, Chlorine compounds.

Survival time and lethal exposure time were determined by continuous flow bioassay for blacknose dace, Rhinichthys atratulus, exposed to four concentrations each of free chlorine solutions and of chloramine solutions. For the concentrations tested, the lethal exposure time, a period of minimum exposure time of the fish in the test solutions to carry a toxic process to a point where recovery is no longer possible, was found to be shorter than the survival time, a period from the time of immersion to the time of death of the fish in the test solutions. The difference between the mdian lethal exposure time and median survival time decreased with a decrease in total chlorine concentrations. Using either the median survival time or median lethal exposure time as the toxicity index, chloramines were more toxic than free chlorine to the blacknose dace at high concentrations, but less so in low concentrations. (Klein)
W77-12040

CHLORINE DISSIPATION AND TOXICITY PRESENCE OF NITROGENOUS COMPOUNDS,
Florida Inst. of Tech., Melbourne. Dept. of Oceanography.
B. M. Katz.
Journal Water Pollution Control Federation, Vol 49, p 1627-1635, 1977. 13 fig, 8 ref.

Descriptors: *Toxicity, *Organic compounds, *Chlorine, *Nitrogen compounds, Light, Mode of action, Amino acids, Ureas, Water quality, Fish toxins, *Bioassay, Path of pollutants, Water pollution effects, Mortality, Phosphorous compounds, Laboratory tests.
Identifiers: Chlorine dissipation, Nucleotides, Phosphocreatine, Bioaccumulation, Sunlight, Gambusia.

Eighteen amino acids, 3 nucleotides, phosphocreatine, and urea were the nitrogenous compounds selected for the determination of chlorine dissipation in relation to toxicity prior to and after the addition of fish, Gambusia affinis, to water tanks. The toxicities of the organic compounds, which were much less than that of free chlorine, varied directly with the log of fish mortality and the slope of chlorine dissipation in the presence of fish. The nitrogenous compounds altered the toxicity of total residual chlorine. In the presence of sunlight, some of the compounds combining clorine residues were stabilized, decreasing tota toxicity values. (Klein)
W77-12042

INFLUENCE OF POLYPHENOLS AND QUINONES ON AQUATIC PLANTS AND THEIR BLOCKING OF SH-GROUPS,
Irkutskii Gosudarstvennyi Universitet (USSR). Scientific Research Inst. of Biology.
D. J. Stom.
Acta Hydrochimica et Hydrobiologiea, Vol 5, No 3, p 291-298, 1977. 1 fig, 3 tab, 22 ref.

Descriptors: *Aquatic plants, *Plant physiology, *Metabolism, *Mode of action, *Chemical reactions, *Chemical properties, *Biochemistry, *Organic compounds, *Phenols, Industrial wastes, Water pollution sources, Path of pollutants, Toxicity, Analytical techniques, Phenolic compounds.
Identifiers: Biochemical mechanisms, *Quinones, Mechanism of action, *SH-groups, *Sulfhydryl-groups, Nitella sp., Dunaliella sp., Elodea sp., Tissue analysis.

The influence of dioxybenzenes and their quinones on Dunaliella salina, Nitella sp. and Elodea canadensis was investigated. It was established

that the higher the rate of polyphenol oxidation by the aqueous plants, the higher the toxicity of the compound being studied is and the larger the reduction of the SH-group content due to the incubation of plants in these polyphenol solutions is. The conclusion is drawn that a higher degree of toxicity to the aquatic plants of pyrocatechol and hydroquinone, in comparison with other phenols, is due to their ability to oxidize phenols to quinones. It is suggested that one of the possible biochemical mechanisms for demonstrating the toxic station of the phenol oxidation products is the blocking of SH-groups. (Klein)
W77-12045

BHC RESIDUES OF DOMESTIC ORIGIN: A SIGNIFICANT FACTOR IN POLLUTION OF FRESHWATER IN NORTHERN IRELAND,
Queen's Univ., Belfast (Northern Ireland) Dept. of Agricultural and Food Chemistry.
For primary bibliographic entry see Field 5B.
W77-12046

RETENTION OF MERCURY IN THE MUSCLE OF YELLOW PERCH (PERCA FLAVESCENS) AND ROCK BASS (AMBLOPLITES RUPESTRIS),
Institute for Fisheries Research, Ann Arbor, Mich. Fisheries Div.
For primary bibliographic entry see Field 5B.
W77-12047

LONG-TERM CADMIUM STRESS IN THE CUNNER, TAUTOGOLABRUS ADSPERSUS,
National Marine Fisheries Service, Milford, Conn. Milford Lab.
J. R. MacInnes, F. P. Thurberg, R. A. Greig, and E. Gould.
Fishery Bulletin, Vol 75, p 199-204, 1977. 3 tab, 27 ref.

Descriptors: *Metals, *Fish physiology, *Toxicity, *Respiration, Biochemistry, *Enzymes, *Mode of action, *Teleosts, Bioassay, Absorption, Water pollution sources, Aquatic life, Lethal limit, Resistance, Water pollution effects, Mortality, Oxygen requirements, Environmental effects, *Cadmium.
Identifiers: *Cunner, Tissue analysis, Cadmium stress, Tautogolabrus adspersus.

The cunner, Tautogolabrus adspersus, was exposed for 30 and 60 days to 0.05 or 0.10 ppm Cd as cadmium chloride. The mean gill-tissue respiratory rates exhibited by the control fish and those exposed to 0.05 and 0.10 Cd were 972, 736, and 665 micro-l O2/h.g dry weight, respectively, after 30 days and 1,036, 702, and 587 micro-l O2 h.g, respctively, after 60 days. Changes were also observed in the activities of two liver enzymes, aspartate aminotransferase (depression) and glucose-6-phosphate dehydrogenase (induction). Results are compared with those from other metal-exposure studies with cunners and other teleosts. (Klein)
W77-12048

TANNIN AS AN AGENT TO ELIMINATE ADHESIVENESS OF WALLEYE EGGS DURING ARTIFICIAL PROPAGATION,
Southeastern Senior Coll., Juneau, Alaska. Div. of Fisheries.
For primary bibliographic entry see Field 5G.
W77-12049

A MASSIVE KILL OF POND-REARED MACROBRACHIUM ROSENBERGII,
Malaya Univ., Kuala Lumpur (Malaysia). Dept. of Zoology.
P. Green, T. L. Richards, and T. Singh.
Aquaculture, Vol. 11, p 263-272, 1977. 2 fig., 4 tab., 11 ref.

Descriptors: *Shellfish, *Oxygen demand, *Oxygen requirements, *Crustaceans, *Ponds, *Water pollution sources, *Fertilizers, Runoff, Rainfall, Animal physiology, Environmental effects, Water quality, Algae, Algal poisoning, Mortality, Water properties, Population, Growth rates, Path of pollutants.
Identifiers: *Prawns, *Macrobrachium rosenbergii.

Pond culture of Macrobrachium rosenbergii was progressing satisfactorily until reduced oxygen concentration killed 45% of the prawns within a 3-day period. A concentration of over-fertilization of the pond water with a mash-type supplemental food, bottom turnover due to heavy rains and an algal bloom led to this kill. Analysis of a 600-prawn sub-sample provided information on growth and population structure. (Klein)
W77-12050

TEMPERATURE TOLERANCES AND UPPER LETHAL LIMITS OF SALMO APACHE,
Midwest Research Lab., Kansas City, Mo.
S. R. Alcorn.
Transactions of the American Fisheries Society, Vol. 105, No. 2, p 294-299, 1976. 1 tab., 4 ref.

Descriptors: *Temperature, *Resistance, *Thermal stress, *Salmonids, *Trout, *Lethal limit, *Toxicity, Fish physiology, Fish behavior, Growth stages, Mortality, Feeding rates, Bioassay, Laboratory tests.
Identifiers: *Arizona trout, *Salmo apache, *Fingerlings, Endangered species.

Fingerlings of the endangered trout species Salmo apache Miller were subjected to increasing temperatures to determine upper lethal temperature limits. Most fish refused to take food at temperatures above 20C. Equilibrium loss occurred between 21.2 and 22.3C. Death occurred when temperatures exceeded 23C. (Katz)
W77-12052

LONG-TERM FLUCTUATIONS OF EPIBENTHIC FISH AND INVERTEBRATE POPULATIONS IN APALACHICOLA BAY, FLORIDA,
Florida State Univ., Fla. Dept. of Biological Science.
R. J. Livingston, G. J. Kobylinski, F. G. Lewis, III, and P. F. Sheridan.
Fishery Bulletin, Vol. 74, No. 2, p 311-322, 1976. 6 fig., 3 tab., 39 ref.

Descriptors: Populations, *Seasonal, *Fluctuations, *Biota, Ecotypes, *Fishes, *Invertebrates, *Distribution patterns, *Dominant organisms, Turnover, Aquatic life, Salinity, Turbulence, Nutrients, Detritus, *Florida, Reproduction, Biorhythms, Niches, Annual, Benthic fauna, Bays, Gulf of Mexico.
Identifiers: *Epibenthic fish, Species-specificity, *Apalachicola Bay(Fla).

A 3-yr study was made concerning seasonal changes in the biota of Apalachicola Bay. The Apalachicola River causes a temporal progression of changes of various environmental parameters in the bay such as salinity, turbidity, nutrients, and detritus levels. Fishes were more widespread in their distribution throughout the bay than invertebrates. This was thought to be related to trophic response and habitat preference. High levels of relative dominance prevailed for both groups with the top three species of each group accounting for more than 80% of the total number of individuals taken. Peak levels of monthly abundance of various dominant fish species tended not to overlap through a given 12-mo period. Invertebrate species abundance usually reached peak levels during summer and fall periods. The seasonal appearance and distribution of organisms in the Apalachicola Bay system was comparable to that found in other estuaries in the northern Gulf of Mexico. The temporal and spatial distribution of estuarine fishes and invertebrates was associated with species-specific reproductive cycles, trophic relationships, and habitat preferences. The Apalachicola estuary was viewed as a seasonally stable system, with regular temporal fluctuations of the biota through each annual cycle. (Klein)
W77-12053

EFFECT OF PH ON TOLERANCE OF HORMIDIUM RIVULARE TO ZINC AND COPPER,
Durham Univ. (England). Dept. of Botany.
J. W. Hargreaves, and B. A. Whitton.
Oecologia, Vol. 26, p 235-243, 1976. 6 fig., 1 tab., 19 ref.

Descriptors: *Algae, *Toxicity, *Metals, *Hydrogen ion concentrations, *Zinc, *Copper, Resistance, *Acid streams, Population, Path of pollutants, Growth rates, Streams, Water quality, Calcium, Mine drainage, Water pollution effects.
Identifiers: *Hormidium rivulare, pH range, Optimal pH.

The toxicity of zinc to a population of a common stream algae, Hormidium rivulare, isolated from an acid mine drainage was shown to be least at the optimum pH range for the growth of the algae, pH 3.5-4.0; toxicity markedly increased at higher pH values. Calcium antagonized the toxicity of zinc. Populations of H. rivulare, isolated from higher pH conditions and resistant to zinc, were especially resistant to low pH values. Raised levels of Ca incurred only a slight improvement of growth at very low pH values in the absence of zinc, indicating that the mechanism of pH and Zn tolerance were dissimilar. Although the acid stream population grew in the field in an environment with similar levels of Zn and Cu, Cu was less toxic than Zn at pH 3.5, but much more toxic at pH 6.0. (Klein)
W77-12054

EFFECT OF PULP MILL EFFLUENT ON THE SURFICIAL SEDIMENTS OF WESTERN NIPIGON BAY, LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
R. G. Sandilands.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p 817-823, 1977. 5 fig., 2 tab., 27 ref.

Descriptors: *Sediments, *Pulp wastes, *Sampling, *Lake sediments, *Bottom sediments, *Chemical wastes, *Effluents, Hydrogen ion concentration, Sediment distribution, Industrial wastes, Water pollution effects, Water pollution sources, Sulphur, Mercury, Distribution patterns, Soil analysis, *Lake Superior, Particle size, Canada.
Identifiers: *Nipigon Bay(Ontario).

Bottom sediment samples were obtained in June 1974 to determine the zone of influence of a point source discharge from the kraft paper mill at Red Rock, Ont. The composition of the samples were described by particle-size distribution, organic and inorganic carbon, major elements and trace element analyses. Correlation coefficients and cluster analysis were used to determine any characteristic associations. The results showed that the mill discharge decreased pH and increased organic matter in the sediment. Above average concentrations of total sulphur and mercury appeared to be associated with this organic matter. These effects were localized around the point source (1.5 km) and were detectable to about 5 km downstream from the mill outfall.
W77-12055

ACUTE TOXICOLOGICAL RESPONSE OF THE CRAYFISH (ORCONECTES LIMOSUS) TO MERCURY,
Montclair State Coll., Upper Montclair, N. J. Dept. of Biology.

M. Doyle, S. Koepp, and J. Klaunig.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 4, p 422-424, 1976. 1 fig., 1 tab., 5 ref.

Descriptors: *Mercury, *Mortality, *Toxicity, *Crayfish, *Chlorides, Metals, Path of pollutants, Environmental effects, Population, Water quality, Heavy metals, Growth stages, Absorption, Bioassay, Invertebrates.
Identifiers: Bioaccumulation, Orconectes limosus, *Mercuric chloride.

The dose-response of a single population (Orconectes limosus) to mercuric chloride as a preface to histopathological studies was investigated. 100% survival was obtained at a dosage of 0.25 mg/1. Survivors of the calculated LD-60 (1.0 mg/1) exhibited sluggish responses to mechanical stimulation, whereas only occasional ventilative movements characterized crayfishes surviving higher dosages. The decrease in percent survival was proportional to both time and toxicant concentration, with the greatest mortality occurring between 24 and 72 hours. (Katz)
W77-12056

THE FEEDING BEHAVIOR OF MYTILUS EDULIS IN THE PRESENCE OF METHYLMERCURY ACETATE,
Texas A and M Univ., College Station. Dept. of Biology.
P. Dorn.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 6, p 714-719, 1976. 1 fig., 3 tab., 19 ref.

Descriptors: *Mercury, *Metals, *Organic compounds, *Animal behavior, *Mussels, *Diatoms, *Feeding rates, Productivity, Food habits, Benthic fauna, Invertebrates, Mortality, Environmental effects, Path of pollutants.
Identifiers: *Feeding behavior, *Methylmercury acetate.

The effects of sublethal levels of methyl mercury upon the feeding behavior of a filter feeding bivalve, Mytilus edulis, was investigated. The results of feeding M. edulis in control conditions showed that the mussels were capable of ingesting and retaining large amounts of diatoms (Nitzschia) ranging from 145-34,045 cells per day. All concentrations of methyl mercury resulted in decreased feeding - as the toxicant level increased, feeding decreased. (Katz)
W77-12057

PULP AND PAPER MILL EFFLUENT IN A FRESHWATER ENVIRONMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W77-12059

A QUANTITATIVE STUDY OF THE INVERTEBRATE FAUNA OF THE RIVER TEES BELOW COW GREEN RESERVOIR,
Freshwater Biological Association, Cumbria (England). Cow Green Lab.
P. D. Armitage.
Freshwater Biology, Vol 6, No 3, p 229-240, 1976. 5 fig, 5 tab, 34 ref.

Descriptors: *Invertebrates, *On-site data collections, *Biomass, *Benthic fauna, Zooplankton, Phytoplankton, *Environmental effects, Water control, Sampling, Statistical methods, Analytical techniques, Mollusks, Life history studies, Dams, Methodology.
Identifiers: Tees River(England), *Cow Green Dam(England), *Organic enrichment.

Monthly samples were taken in the River Tees below Cow Green dam from four sites differing in flow conditions, by means of trays containing stones from the river, which were immersed for a period of 1 month. Information on the distribution, abundance and biomass of the benthos of the River Tees is given with additional data on the life-histories of some of the more common species, during the period May 1971 to May 1972. The composition and distribution of the fauna was discussed. It was suggested that the relative richness of the fauna in terms of biomass was attributable to the organic enrichment of the river following the building of the Cow Green dam. The regulation of the flow has allowed the dense growth of algae and mosses, and the development of large molluscan populations, and the reservoir itself provides a rich source of food, particularly zooplankton and phytoplankton, for the river benthos. (Katz)
W77-12060

THE UPTAKE AND INTERORGAN DISTRIBUTION OF MERCURY IN A CARNIVOROUS CRAB,
Hawaii Univ., Honolulu. Dept. of Zoology and Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-12063

THERMAL TOLERANCE AND RESISTANCE OF NORTHERN ANCHOVY, ENGRAULIS MORDAX,
University of Southern California, Los Angeles.
G. D. Brewer.
Fishery Bulletin, Vol 74, No 2, p 433-447, 1977. 10 fig, 4 tab, 45 ref.

Descriptors: *Thermal stress, *Water temperature, *Heat resistance, *Growth stages, *Fish, *Mortality, *Toxicity, Fish populations, Environmental effects, Teleosts, Resistance, Growth rates, Heated water, Bioassay, Laboratory tests.
Identifiers: *Thermal tolerance, *Northern anchovy, Engraulis mordax.

An experimental, flow-through seawater system, was used to determine aspects of thermal tolerance, resistance, rates of acclimation, and some effects of temperature on the development and growth of the anchovy. Thermal tolerance was determined for juvenile and adult fish, acclimated to six constant temperatures between 8 and 28C. Thermal resistance (minutes until death for fish exposed to a lethal temperature) was independent of photoperiod and fish size; however, females proved more resistant than males, and resistance decreased at night. Acclimation (as measured by resistance) from 12 to 20C was nearly complete after 2-day exposure to the higher temperature; acclimation from 20 to 12C was nearly complete after 5-day exposure to the lower temperature. Fish subjected to fluctuating water temperature between 12 and 20C proved less resistant to cold than a 12C (constant) acclimated group and less resistant to heat than a 20C (constant) acclimated group. Thermal tolerance was determined for larvae in the yolk-sac stage, acclimated to four constant temperatures between 12 and 24C. Although hatching occurred at temperatures as high as 29.5C and as low as 8.5C, the percentage of normally developed larvae equaled that of controls (incubated at 16C) only between temperatures of 27.0C and 11.5C. Embryos in the blastodisc stage proved most sensitive to acute temperature increases when compared to embryos in the blastopore closure stage and larvae in the yolk-sac stage. These same three stages proved insensitive to acute temperature decreases to 0.5C for 60-min exposure periods. (Katz)
W77-12069

GROWTH OF SIX SPECIES OF BIVALVE MOLLUSCS IN A WASTE RECYCLING-AQUACULTURE SYSTEM,
Woods Hole Oceanographic Institution, Mass.
R. Mann, and J. H. Ryther.
Aquaculture, Vol. 11, p. 231-245, 1977. 6 tab, 11 ref.

Descriptors: *Mollusks, *Aquiculture, *Phytoplankton, *Tertiary treatment, *Secondary treatment, *Biodegradation, *Recycling, *Commercial shellfish, *Growth rates, *Animal growth, Algae, Marine algae, Sewage treatment, Cultures, Waste water treatment, Laboratory tests, Mortality.

Growth of six species of bivalve molluscs (Crassostrea gigas, Tapes iaponica, Mercenaria mercenaria, Crassostrea virginica, Mytilus edulis, and Ostrea edulis) was compared in a waste recycling-aquaculture system. Tests were conducted at experimental temperatures of 15 and 20C, over the period November 1975 to May 1976. Experimental animals were fed algae grown in large outdoor cultures enriched with secondary treated sewage effluent. C. gigas, T. iaponica and O. edulis grew well. M. mercenaria, C. virginica and M. edulis exhibited poor growth. C. gigas exhibited a greater increase in total live weight at 20C but a greater increase in mean dry meat weight at 15C. Similarly, at 15C T. iaponica exhibited consistently higher increments of both live weight and dry meat weight. The economic feasibility of raising these commercially important molluscs in the waste recycling-aquaculture system was also discussed.(Katz)
W77-12070

ACUTE TOXIC EFFECTS OF TWO LAMPRICIDES TO TWENTY-ONE FRESHWATER INVERTEBRATES,
Bureau of Sport Fisheries and Wildlife, Millersburg, Mich. Hammond Bay Biological Station.
R. P. Rye Jr., and E. L. King Jr.
Transactions of the American Fisheries Society, Vol. 105, No. 2, p. 322-326, 1976. 1 tab, 9 ref.

Descriptors: *Bioassay, *Toxicity, *Mortality, *Lampreys, Invertebrates, *Larvicides, Laboratory tests, Lethal limit, Pesticides, Pesticide toxicity, Resistance, Annelids, Snails.
Identifiers: *LC50, *Lampricides, Freshwater invertebrates, Selective toxicity.

Laboratory static bioassays were conducted to determine acute toxicity of two lampricides-Bayer 73 and a mixture containing TFM and Bayer 73 (TFM-2B)-to 21 freshwater invertebrates. LC50 values were determined for 24-h exposure periods at 12.8 C. Organisms relatively sensitive to Bayer 73 were a turbellarian, aquatic earthworms, snails, a clam, blackflies, leeches and a daphnid. The invertebrates most sensitive to TFM-2B were turbellarians, aquatic earthworms, snails, blackflies, leeches and burrowing mayflies. Bayer 73 was generally much more toxic to the test organisms than TFM-2B. At lampricidal concentrations, TFM-2B was more highly selective than Bayer 73 against larval sea lampreys. (Katz)
W77-12071

OBSERVATIONS ON THE FISH FAUNA ASSOCIATED WITH OFFSHORE PLATFORMS IN THE NORTHEASTERN GULF OF MEXICO,
College of South Jersey, Camden. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W77-12072

THE TOXICITY OF ZINC TO THE IMMUNE RESPONSE OF THE ZEBRAFISH, BRACHYDANIO RERIO, INJECTED WITH VIRAL AND BACTERIAL ANTIGENS,
New York Univ., N.Y. Lab. of Aquatic Biology.
D. A. Sarot, and A. Perlmutter.
Transactions of the American Fisheries Society, Vol. 105, No. 3, p. 456-459, 1976. 2 tab., 16 ref.

Descriptors: *Laboratory tests, *Viruses, *Bacteria, *Zinc, *Toxicity, *Infection, *Fish physiology, *Fish toxins, Microbiology, Analytical techniques, Fish, Metals.

Identifiers: *Plasma neutralization test, Proteus, *Antigens, *Antibodies, *Immune response, Immune system, Immunosuppressors, *Infectious pancreatic necrosis virus(IPNV), *Zebrafish, LC50.

Groups of zebrafish, Brachydanio rerio, were injected with antigens prepared from infectious pancreatic necrosis virus (IPNV) or Proteus vulgaris. Zinc appeared to suppress the immune response against Proteus vulgaris, but not against IPNV. (Katz)
W77-12073

MODIFICATION OF RIVER BEDS AND OF THE COURSES OF RIVERS IN UPPER BELGIUM, (IN FRENCH),
For primary bibliographic entry see Field 6C.
W77-12183

CHAMBER FOR HOLDING AQUATIC MICROINVERTEBRATES DURING TOXICITY TESTS IN A FLOW-THROUGH DILUTER SYSTEM,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 5A.
W77-12185

INFLUENCE OF VARIOUS CONCENTRATIONS OF ORTHOPHOSPHATE ON THE DIVISION RATE OF AN ESTUARINE BENTHIC DIATOM, NAVICULA ARENARIA, IN CULTURE,
Groningen Rijksuniversiteit (Netherlands). Dept. of Systematic Biology.
W. Admiraal.
Marine Biology, Vol 42, p. 1-8, 1977; 2 fig, 3 tab, 30 ref.

Descriptors: *Diatoms, *Benthic flora, *Cytological studies, *Chlorophyll, *Phosphates, Organic compounds, Biology, Chromosomes, Reproduction, Genetics, Aquatic algae, Phytoplankton, Estuaries, Nutrients, Nutrient requirements, Growth rates, Plankton, *Diatoms.
Identifiers: Cell division, Division rates, *Orthophosphates.

The estuarine benthic diatom Navicula arenaria Donkin was grown in perfusion chambers in which the cells adhered to analytical sand. A synthetic medium, containing various concentrations of orthophosphate, was continuously pumped through the cultures to prevent exhaustion of the medium. The division rates of the diatoms were independent of phosphate concentration in the medium from about 0.3 to 8 ug-at/l; lower concentrations were limiting (Ks about 0.1 ug-at/l). The phosphate and chlorophyll a content of the N. arenaria cells was independent of phosphate concentration (even under limitation), except that the phosphate content of cells grown in media with 8 ug-at of phosphate increased. The data indicate that this benthic diatom uses low phosphate concentrations for growth as efficiently as several planktonic diatoms. The phosphate concentrations previously observed in the Eems-Dollard estuary (the original habitat of our strain of N. arenaria) were clearly higher than those limiting the growth rate of the cultures, and consequently may have no influence on benthic diatom growth. (Katz)
W77-12186

EFFECTS OF SALINITY ON THE EGGS AND FRY OF THE GOLDEN SHINER AND GOLDFISH,
Georgia Agricultural Experiment Station, Savannah; and Skidaway Inst. of Oceanography, Savannah, Ga.
T. Murai, and J. W. Andrews.
The Progressive Fish-Culturist, Vol 39, No 3, p 121-122, 1977. 1 tab, 10 ref.

Descriptors: *Salinity, Resistance, Saline water, *Toxicity, *Lethal limit, *Fish eggs, *Fry, *Shiners, Freshwater fish, Environmental effects, Water quality, Minnows, Juvenile fish.
Identifiers: *Golden shiner, *Goldfish.

The salinity tolerance of the eggs and fry of the golden shiner (Notemigonus crysoleucas) and goldfish (Carassius auratus) was tested. Salinities of 0, 2, 4, 6 and 8% were used. Eggs of both species were only slightly affected, but immediately after hatching a marked reduction in salinity tolerance was observed. Total mortality of fry of both species occurred at 8% salinity. The survival rates of both species decreased with increased salinity, but the survival of the shiner fry decreased at a greater rate than that of the goldfish. (Katz)
W77-12187

TOXICITY BIOASSAYS WITH PERIPHYTON COMMUNITIES: DESIGN OF EXPERIMENTAL STREAMS,
Minnesota Univ.-Duluth. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-12188

BEHAVIOR OF JUVENILE CHINOOK SALMON (ONCORHYNCHUS TSHAWYTSCHA) IN RELATION TO SIMULATED THERMAL EFFLUENT,
Battelle Pacific Northwest Lab., Richland, Wash., Ecosystems Dept.
R. H. Gray, R. G. Genoway, and S. A. Barraclough.
Transactions of the American Fisheries Society, Vol. 106(4), p. 366-370, 1977. 1 tab, 1 fig, 10 ref.

Descriptors: *Salmon, *Chinook, Juvenile fish, *Fish behavior, Laboratory tests, *Thermal water, Fresh-water fish, Water pollution effects, *Thermal stress, *Thermal pollution, Coldwater fish, Methodology, *Bioassay, Laboratory equipment.
Identifiers: *Simulated thermal effluent, *Juvenile Chinook salmon, Thermal plume, River-plume interface.

Instantaneous responses of juvenile salmonids that encounter a simulated river-thermal plume interface were assessed in a model raceway with a thermal discharge. Fish movement and response to the discharge were recorded on videotape. Juvenile chinook salmon (Oncorhynchus tshawytscha) tested under three discharge conditions (no plume, ambient plume, and heated plume) avoided heated plumes when plume delta T's were greater than 9-11C above ambient. Fish occasionally oriented to the discharge current, but were not attracted to the thermal component of the plume when plume delta Y's were below the avoidance level of 11C. Fish did not pass to the lower end of the raceway when plume delta T exceeded 9-11C. (Katz)
W77-12190

HYPOLIMNION OXYGENATION AND ITS EFFECTS ON THE DEPTH DISTRIBUTION OF RAINBOW TROUT (SALMO GAIRDNERI) AND GIZZARD SHAD (DOROSOMA CEPEDIANUM),
Ohio Cooperative Fishery Research Unit, Columbus.
W. J. Overholtz, A. W. Fast, R. A. Tubb, and R. Miller.
Transactions of the American Fisheries Society, Vol. 106(4), p. 371-375, 1977. 4 fig, 15 ref.

Descriptors: Ohio, *Rainbow trout, Gill nets, *Hypolimnion, *Epilimnion, Limnology, *Oxygen, Water quality, Water temperature, Fish management, Recreation, *Ponds, Reaeration, Oxygenation, Fresh water, Fish harvest, Fish stocking.
Identifiers: *Gizzard shad, Quarry pond, Hypolimnion oxygenation.

The hypolimnion of a quarry pond at Ottoville, Ohio, was artificially oxygenated by using a side-stream pump. Summer concentrations of dissolved oxygen were increased from almost 0 to 8 mg/liter in 1973 and were held at or above 7 mg/liter (range 7.0-21.5) in 1974; thermal stratification was maintained in both years. In previous years, when the pond was not artificially oxygenated or aerated by other means, rainbow trout (Salmo gairdneri) did not survive the summer. One thousand rainbow trout were stocked after oxygenation in August 1973 and 800 stocked in May 1974. Anglers creeled several hundred fish each summer and gill net catch per effort remained constant during the study periods indicating that survival was probably high. Gill netting in February 1974 confirmed that trout were still present from the previous summer stocking. Trout were largely confined to the hypolimnion during thermal stratification, and were usually near its upper boundary. The fish apparently suffered no ill effects from the oxygen concentrations of 21 mg/liter in 1974. Gizzard shad (Dorosoma cepedianum) remained in the epolimnion during both summers. (Katz)
W77-12191

SPAWNING SUCCESS OF THE BLACK CRAPPIE, POMOXIS NIGROMACULATUS, AT REDUCED DISSOLVED OXYGEN CONCENTRATIONS,
Environmental Research Lab.-Duluth, Minn.
R. E. Siefert, and L. J. Herman.
Transactions of the American Fisheries Society, Vol. 106(4), p. 376-379, 1977. 1 tab, 8 ref.

Descriptors: *Freshwater fish, *Oxygen, *Dissolved oxygen, *Bioassays, Laboratory tests, Fish physiology, Fish reproduction, Fish farming, Methodology, Fish eggs, Water pollution effects, Aquiculture, Water quality, Sea water, *Spawning.
Identifiers: *Black crappie.

Mature black crappies (Pomoxis nigromaculatus) were exposed to constant oxygen (DO) concentrations near or at 2.5, 3.5, 5.0, or 6.5 mg/liter, and near air saturation (control) to determine the effects of reduced DO on spawning success. The fish spawned successfully 39 times in laboratory tanks under a simulated natural temperature and high regime at all DO concentrations tested. Fish at 2.5 mg/liter DO started and finished spawning at earlier dates than those at the higher oxygen concentrations; fish at saturation started and finished spawning at later dates than those at reduced concentrations. The number of embryos from a single spawning ranged from 14,600 to 155,300. Number of spsawnings, viability of embryos, hatching success, and survival through swimup were similar between control fish and those exposed to reduced oxygen concentrations. (Katz)
W77-12192

INFLUENCE OF ACCLIMATION TEMPERATURE ON PREFERRED TEMPERATURE IN THE RAINBOW TROUT SALMO GAIRDNERI,
Wilfrid Laurier Univ., Waterloo (Ontario). Dept. of Physics.
R. W. McCauley, J. R. Elliott, and L. A. A. Read.
Transactions of the American Fisheries Society, Vol. 106(4), p. 362-365, 1977. 1 tab, 16 ref.

Descriptors: *Fish physiology, *Fish behavior, *Rainbow trout, Freshwater fish, Water pollution effects, *Water temperature, *Thermal stress, *Thermal pollution, Thermal power plants, Laboratory tests, Methodology, Bioassay, Laboratory equipment.
Identifiers: Acclimation, Acclimation temperature, *Preferred temperature(Trout), Body temperature, Environmental temperature.

The relation of preferred temperature to acclimation temperature of 29 rainbow trout 15 months old was examined during summer. Fish were acclimated to 5, 10, 15, 20 and 25C, respectively, and

tested individually in an electrically controlled shuttle-box device. Body temperatures monitored by a radiothermometer ingested by the fish closely approximated occupied temperatures to within 0.2C. No significant differences were found in preferred temperature over the acclimation range studied. The calculated final preferendum was 11.3C. Fish regulated environmental and body temperature with the same precision as they selected temperature in a spatial gradient. (Katz)
W77-12193

SUPPRESSION OF THE PRIMARY IMMUNE RESPONSE IN RAINBOW TROUT, SALMO GAIRDNERI, SUBLETHALLY EXPOSED TO TRITIATED WATER DURING EMBRYOGENESIS,
Battelle Pacific Northwest Labs. Richland, Wash. Ecosystems Dept.
J. J. Strand, M. F. Fujihara, R. D. Burdett, and T. M. Poston.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 1293-1304, 1977. 4 fig, 6 tab, 22 ref.

Descriptors: *Salmonids, *Rainbow trout, *Trout, *Embryonic growth stage, *Fish diseases, *Fish parasites, *Irradiation, *Radiochemical analysis, *Tritium, Proteins, Biochemistry, Biology, Laboratory tests, Analytical techniques, Water quality, Toxicity, Environmental effects, Genetics, Bioassay.
Identifiers: *Flexibacter columnaris, Bioaccumulation, Antibody synthesis, Immunology, Agglutination assay, Primary immune response, *Immune suppression, Tissue analysis.

Antibody synthesis, in response to vaccination with a o.1-ml (1.8 x 10 to the 8th power cells/ml) intraperitoneally injected, heat-killed strain of Flexibacter columnaris, was employed to investigate the effect of tritium irradiation (0, 0.04, 0.4, 4.0, 40 rads total dose for 20 days during embryogenesis) on development of the primary immune response in 5-mo rainbow trout, Salmo gairdneri, reared under essentially pathogen-free conditions. Specific agglutinins to F. columnaris, determined 1-wk prevaccination, and 3, 5, 7, 9, and 11 wk postvaccination increased rapidly in both control and irradiated fish following vaccination. Agglutinin levels in irradiated fish were suppressed to 50% of control levels at 40 rads during the 9th wk, and 50% of control levels at 4.0 rads during the 11th wk. electrophoretic separation of serum proteins of both control and irradiated-vaccinated fish demonstrated four major protein fractions. Densitometric analyes demonstrated that fraction IV increased significantly in percent of total protein following antigenic stimulation, suggesting that fraction IV represents the specific humoral antibody to F. columnaris. The relative percent of total protein contained in fraction IV was significantly reduced in irradiated-vaccinated fish. (Katz)
W77-12194

THERMOPREFERENCE BEHAVIOR OF BLUEGILL (LEPOMIS MACROCHIRUS) SUBJECTED TO RESTRICTIONS IN AVAILABLE TEMPERATURE RANGE,
Wisconsin Univ., Madison. Lab. of Limnology.
T. L. Beitinger.
Copeia, No 3, p 536-541, 1977. 2 tab, 27 ref.

Descriptors: *Juvenile fish, *Water temperature, *Fish behavior, *Fish physiology, *Temperature, *Teleosts, Freshwater fish, Thermal stress, Environmental effects, Thermal properties, Water quality, Water properties, Laboratory tests, Warm water fish, *Sunfishes.
Identifiers: *Thermopreference(Fish).

Juvenile bluegill (Lepomis macrochirus) acclimated to 25C occupied a temperature range of 29.5 to 33.1C in laboratory preference studies. The midpoint of this range, 31.2C, is considered an estimate of the final temperature preferendum for this species. Experiments were designed to determine (1) the behavioral response of bluegill to situations where available temperatures were either (a) greater or (b) less than their preferendum; and (2) whether a constant temperature approximately either 1C above or below the limis of the occupied range would influence thermoselection behavior by bluegill. When the temperature preferendum was unavailable, bluegill spent more than 92% of their time at the temperature nearest the preferendum. The availability of constant non-preferred temperatures appeared to have little influence on thermoselection behavior; median precent time spent at the two non-preferred temperatures, 28.0 and 34.0C, were 9.1% and 1.3%, respectively. In addition, a separate experiment demonstrated that of the two limits of the preferred range, the lower limit is most labile. These findings are related to the thermal ecology of the bluegill. (Katz)
W77-12195

VERTICAL GRADIENTS IN ARTIFICIAL SUBSTRATE-ASSOCIATED PROTOZOAN COMMUNITY STRUCTURE IN A STRATIFIED FRESHWATER LAKE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Biology.
R. C. Jones, J. Cairns, Jr., and W. H. Yongue, Jr.
The Journal of the Elisha Mitchell Scientific Society, Vol 92, No 1, p 1-8, 1976. 2 fig, 7 tab, 5 ref.

Descriptors: *Protozoa, *Speciation, *Gradients(Stream), *Stratification, *Epilimnion, *Hypolimnion, Invertebrates, Aquatic life, Methodology, Laboratory tests, Populations, Growth rates, Productivity, Gradation, Profiles, Lakes, Density stratification.
Identifiers: *Vertical gradients, Artificial substrates.

Vertical gradients in substrate-associated protozoan community structure in a stratified freshwater lake were investigated using polyurethane foam substrates. Samples were collected at depths of 0.2 m, 6 m, 10 m, 15 m, and 20 m at 9 days, 16 days, 23 days, 30 days, and 37 days after substrate placement in the lake. Protozoan species lists were made for each sample using standard keys. Physical chemical data were collected concurrently. On the basis of numbers of species and kinds of species two similar groups were evident: epilimnion (0.2 m, 6 m, 10 m) and hypolimnion (15 m and 20 m). Although initial rates of species number increase through colonization were similar at all depths, colonization continued much longer in the epilimnion, resulting in a significantly greater number of species on epilimnion substrates at MacArthur-Wilson equilibrium. Per cent overlap of kinds of 'residents' species was high within a substrate group and low between groups. (Katz)
W77-12196

DETERMINATION OF ORGANOCHLORINE PESTICIDES IN THE TISSUE OF THE BLACK MULLET (MUGIL CEPHALUS) AND THE SILVER MULLET (MUGIL CUREMA),
Miami Univ., Coral Gables, Fla. Research and Teaching Center of Toxicology.
For primary bibliographic entry see Field 5B.
W77-12197

THE EFFECTS OF WASTEWATER APPLICATION ON THE GROWTH AND CHEMICAL COMPOSITION OF FORAGES,
Cold Regions Research and Engineering Lab. Hanover, N.H.
For primary bibliographic entry see Field 5E.
W77-12198

THE EFFECTS OF DDT, DDE AND THEIR SULFONATED DERIVATIVES ON EGGSHELL FORMATION IN THE MALLARD DUCK,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Lab.
G. J. Kolaja.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 6, p 697-701, 1977. 2 fig, 9 ref.

Descriptors: *Ducks(Wild), *Mallard duck, *Chlorinated hydrocarbon pesticides, *DDR, *DDT, Organic compounds, *Toxicity, *Sulfonates, Path of pollutants, Environmental effects, Halogenated pesticides, Size, Reproduction, Animal physiology, Bioassay.
Identifiers: *Anas platyrhynchos, Eggshell formation, *Duck eggs, Bioaccumulation, Tissue analysis, Sulfonated derivatives.

While DDT and DDE fed to mallard ducks (Anas platyrhynchos) at levels of 10 ppm and 50 ppm caused significant alterations in eggshell measurements, such as thickness, weight, and in R-values, their sulfonated derivatives did not show these characteristics. While the sulfonated compounds caused a reduction of thickness, it was not as severe as that caused by DDT or DDE and was a transitory effect. The sulfonated products of DDT and DDE were show to be less toxic to birds during egg production than the parent compounds. (Katz)
W77-12200

COMPARATIVE SENSITIVITY OF EGGS, LARVAE, AND ADULTS OF THE ESTUARINE TELEOSTS, FUNDULUS HETEROCLITUS AND MENIDIA MENIDIA TO CADMIUM,
Environmental Research Lab., Gulf Breeze, Fla.; and Environmental Research Lab., Johns Island, S.C. Bears Bluff Field Station.
D. P. Middaugh, and J. M. Dean.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 6, p 645-652, 1977. 4 tab, 13 ref.

Descriptors: *Toxicity, *Metals, *Cadmium, Estuaries, *Salinity, Life history studies, Fish, Larvae, Growth stages, Fish eggs, Mature growth stage, Environmental effects, Resistance, Juvenile fish, Teleosts.
Identifiers: *Fundulus heteroclitus, *Menidia menidia, Mummichog, Atlantic Silverside.

Cadmium sensitivity of the mummichogs, Fundulus heteroclitus, and the Atlantic Silverside, Menidia menidia, were measured at specific stages of their life histories. Results indicated little cadmium sensitivity with developing eggs of both species. Larvae of both species showed more sensitivity to cadmium toxicity than the eggs or adults. Adult Fundulus showed more sensitivity at higher salinity regimes, while Menidia indicated only slight differences in response at varied salinities. (Katz)
W77-12201

INTERACTIVE EFFECT OF CHROMIUM COMPOUNDS AND A FUNGAL PARASITE ON CARP EGGS,
Oak Ridge National Lab., Tenn.
S. Draggan.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 6, p 693-699, 1977. 2 fig, 1 tab, 9 ref.

Descriptors: *Fish eggs, *Carp, *Toxicity, *Chromium, *Fish diseases, *Pathogenic fungi, *Fish parasites, *Fungi, Freshwater fish, Metals, Mortality, Growth rates, Environmental effects, Animal pathology, Fish management, Inhibition.
Identifiers: *Saprolegniales, Hatchability, Hexavalent chromium, Trivalent chromium.

A fungal parasite (Saprolegniales) of carp eggs was exposed to hexavalent and trivalent chromium

compounds at concentrations identical to those used in a study of the effects of the same compounds on carp egg hatchability. Comparison of data from both experiments revealed that increased egg mortality and increased fungal growth were coupled at low concentrations of the compounds. A mechanism for the interaction of a chemical stress and a biological stress on carp egg survival in natural systems is presented. (Katz)
W77-12202

DOES LOW ENVIRONMENTAL PH INFLUENCE HEPATIC GROWTH IN FISH,
Oslo Univ. (Norway). Inst. of Zoology.
O. J. Jacobsen.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 6, p 667-669, 1977. 1 tab, 7 ref.

Descriptors: Fish physiology, *Salmonids, *Trout, *Brown trout, *Hydrogen ion concentration, Water quality, Water properties, Environmental effects, Growth rates, Water chemistry, Laboratory tests, Bioassay.
Identifiers: Fish lives, *Hepatic growth, Tissue analysis, Environmental pH.

The effects of chronically reduced pH on brown trout (Salmo trutta) liver were investigated. Results indicated slower hepatic growth in fish held at lower pH. Suggestions for further study were discussed. (Katz)
W77-12203

THE TOXICITY OF ENDRIN AND THE EFFECT OF PRETREATMENT OF PHENOBARBITAL AND HEXOBARBITAL ON MORTALITY IN FOUR FRESH WATER FISHES,
Marathwada Univ., Aurangabad (India). Dept. of Zoology.
M. S. Kachole, S. S. Pawar, and A. G. Mahajan.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 6, p 768-770, 1977. 2 tab, 3 ref.

Descriptors: Freshwater fish, *Inhibitors, *Toxicity, *Organic compounds, *Mortality, *Endrin, Resistance, Chlorinated hydrocarbon pesticides, Halogenated pesticides, Metabolism, Path of pollutants, Biochemistry, Enzymes, Fish physiology, Mode of action.
Identifiers: *Phenobarbital, *Hexobarbital, Liver.

Results suggested a protective effect of 2 classic inducers of hepatic drug metabolism, phenobarbital and hexobarbital, on the endrin toxicity in 4 species of freshwater fish. The observed differences in the magnitude of protection was attributed to species variation. Phenobarbital and hexobarbital in the liver caused induction of hepatic mixed function oxidase system. It was suggested that pretreatment of the 2 compounds in fishes could develop some capacity to tolerate endrin in the CNS level. (Katz)
W77-12204

EFFECTS OF RESIDUES OF THE POLYCHLORINATED BIPHENYL AROCLOR 1254 ON THE SENSITIVITY OF RAINBOW TROUT TO SELECTED ENVIRONMENTAL CONTAMINANTS,
Fish and Wildlife Service, La Crosse, Wis. Fish Control Lab.; and Fish and Wild Life Service, La Crosse, Wis. Fish Pesticide Research Unit.
T. D. Bills, L. L. Marking, and L. E. Olsen.
The Progressive Fish-Culturist, Vol 39, No 3, p 150, 1977. 5 ref.

Descriptors: *Toxicity, *Salmonids, *Aroclors, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, Metals, *Rainbow trout, Nitrates, Nitrites, *Chromium, Lethal limit, Metabolism.
Identifiers: Bioaccumulation, Aroclor 1254, *Cyanide.

The effects of the PCB Aroclor 1254 residues on the toxicity of six environmental contaminants (cyanide, chromium, nitrate nitrogen, nitrite nitrogen, chlorine and mercury) to rainbow trout (Salmo gairdneri) were tested. The toxicity of cyanide was increased by high and low concentrations of the PCB; the toxicity of chromium was increased only by the high concentration. The toxicities of the other 4 compounds were unaffected by either Aroclor concentration. (Katz)
W77-12205

SOME FACTORS EFFECTING ALGAL DENSITIES IN A EUTROPHIC FARMLAND STREAM,
Bath Univ. (England). School of Biological Sciences.
J. W. Moore.
Oecologia, Vol 29, p 257-267, 1977. 5 fig, 2 tab, 26 ref.

Descriptors: *Algae, Environmental effects, Populations, Productivity, *Growth rates, *Eutrophication, *Primary productivity, *Sessile algae, *Protozoa, Physicochemical properties, Hydrogen ion concentration, Streamflow, Water temperature, Light intensity, Water quality, Water properties, Streams, Nitrogen compounds, Sampling, Phosphorous compounds, Silicates, Inorganic compounds.
Identifiers: Farmland streams, *Epipelon, *Epilithon, *Cladophora glomerata, Fromtonia acuminata.

Population dynamics of attached algae in a eutrophic farmland stream were correlated through multiple regression analyses with changes in 7 physico-chemical parameters (temperature, light, water velocity, pH, NO3-N, P2O5-P, SiO2-Si). Samples were taken every 2 weeks for 25 consecutive months between June 1973 and June 1975. The relative significance of the 7 parameters in controlling densities varied widely depending on species. Overall light was most important, accounting for 28 and 17% of density changes in the epipelon and epilithon respectively. While winter flooding caused a sharp reduction in the density of these 2 communities, the concentration of P2O5-P and NO3-N and pH usually had little effect on numbers. The 7 parameters did not exert major control over the epiphyton, normally accounting for less than 30% of densities variation. Grazing by the protozoa Frontonia acuminata may have significantly reduced the density of epipelon for 2 months during the spring but otherwise was of no importance to any community. (Katz)
W77-12209

THERMAL EFFECTS OF POWER PLANT ENTRAINMENT ON SURVIVAL OF LARVAL FISHES: A LABORATORY ASSESSMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel, C. F. Smith, and T. S. Y. Koo.
Chesapeake Science, Vol 18, No 3, p 290-298, 1977. 2 fig, 5 tab, 24 ref.

Descriptors: *Larvae, *Larval growth stage, *Toxicity, *Heated water, *Thermal water, *powerplants, Heat resistance, *Water temperature, *Herrings, *Striped bass, *Thermal stress, Water pollution sources, Sea basses, Mortality, Environmental effects, Laboratory tests.
Identifiers: *Shad, *American shad, *Blueback herring.

Blueback herring (Alosa aestivalis), American shad (Alosa sapidissima), and striped bass (Morone saxatilis) larvae from the Chesapeake Bay region were subjected in the laboratory to time-excess temperature histories typical of those experienced by organisms entrained by power plants with a variety of design and operating criteria. The maximum excess temperature ranged from 7 to 20 degrees above the base temperature (the average surface water temperature on the spawning grounds); the time of exposure to a maximum excess temperature from 4 to 60 minutes; and the period of cooling to the final temperature from 60 to 300 minutes. An excess temperature of 20 degrees resulted in virtually total mortality of larvae of all three species. Striped bass larvae were the most tolerant of the three species and could withstand excess temperatures of up to 10 degrees with no significant increase in mortality. The response patterns of the other two species were more complicated. (Katz)
W77-12210

THE EFFECT OF PH ON THE POPULATION GROWTH OF THREE SPECIES OF DUCKWEED: SPIRODELA OLIGORRHIZA, LEMNA MINOR AND WOLLFIA ARRHIZA,
Canterbury Univ., Christchurch (New Zealand). Dept. of Zoology.
C. L. McLay.
Freshwater Biology, Vol 6, No 2, p 125-136, 1976. 9 fig, 4 tab, 10 ref.

Descriptors: *Growth rates, Population, *Hydrogen ion concentration, *Biomass, *Aquatic plants, *Mathematical studies, Water quality, Environmental effects, Water properties, Laboratory tests, Algae, Fresh water.
Identifiers: *Duckweed.

Growth was most successful in media with regulated pH where sustained logarithmic population increases were achieved. S. oligorhiza and L. minor rates were symmetrical about an almost neutral, optimal pH, declining rapidly away from the optimum. W. arrhiza had an optimum at pH 5 and growth declined with increasing pH. All 3 species had optima at, or below, the neutral point. Estimated lower limits, optimum and upper limits for each species were: W. arrhiza, pH 4-5.0-10, L. minor, pH 4-6.2-10, S. oligorrhiza, pH 3-7.0-10. Growth rate along a pH gradient was best described by polynomial equations. Rates of population growth were similar for all species. In decreasing order they were: Wolffia, Lemna, Spirodela. However, in biomass units Lemna grew more than 6 and Spirodela 17 times faster than Wolffia. (Katz)
W77-12211

VERGLEICHENDE PRUFUNGEN DER FISCHTOXIZITATEN AN ELRITZEN FORELLEN UND GOLDORFEN (COMPARATIVE TESTS ON TOXICITY TO FISH USING MINNOWS, TROUT, AND GOLDEN ORFE), (IN GERMAN),
Farbenfabriken Bayer A.G., Leverkusen (West Germany).
For primary bibliographic entry see Field 5A.
W77-12212

POLYCHLORINATED BIPHENYL COMPOUNDS (PCB'S) AND FISHERY RESOURCES,
Fish and Wildlife Service, Washington, D.C. Office of Biological Services.
C. R. Walker.
Fisheries, Vol 1, No 4, p 19-25, 1976. 4 fig, 19 ref.

Descriptors: *Toxicity, *Polychlorinated biphenyls, *Path of pollutants, *Ecosystems, *Toxins, Food chain, Freshwater fish, Aquatic life, Mode of action, Environmental effects, Population, Growth rates, Behavior, Aroclors, Water pollution effects.
Identifiers: Bioaccumulation.

PCB's were concluded to be highly persistant environmental contaminants that bioaccumulate in food chains and produce direct and chronic affects, as well as have a subtle effect on growth, reproduction, behavior, and health of fish, birds, and mammals. Freshwater fish were found to be particularly susceptible to chronic effects because PCB residues were concentrated by fish at high levels known to elicit serious toxicological effects. Fish-eating birds and mammals were also found to

have hazardous concentrations of residues. However, the actual mode of action and ecological effects were considered poorly understood, as was the long-term impact of PCB's on animal populations. (Klein)
W77-12213

ACCUMULATION AND ELIMINATION OF ALPHA-HEXACHLOROCYCLOHEXANE (ALPHA-HCH) BY THE MARINE ALGAE CHXLAMYDOMONAS AND DUNALIELLA,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Toxicology.
J. H. Canton, G. J. Van Esch, P. A. Greve, and A. B. A. M. Van Hellemond.
Water Research, Vol 11, p 11-115, 1977. 5 fig, 5 tab, 3 ref.

Descriptors: *Organic compounds, *Algae, *Absorption, *Chlamydomonas, *Chlorophyta, Path of pollutants, Mode of action, Plant physiology, Cytological studies, Analytical techniques, Metabolism.
Identifiers: *Alpha-hexachlorocyclohexane, HCH, Bioaccumulation, Tissue analysis, Dunaliella.

Chlamydomenas rapidly accumulated HCH from aqueous solutions; elimination occurred within 30 min. HCH was not found to be acutely toxic to Chlamydomonas in concentrations up to the solubility limit. The accumulated HCH was found primarily in the cell content, corresponding with the low fat content of the cell wall: the non-lipid fraction accumulated 11-14% of the total amount of HCH only. Accumulation of HCH proved to be correlated with the lipid content of the cell, as illustrated by accumulation experiments with algae with different fat content. The concentration factor on lipid basis was 12000-13000. No difference was found in accumulation behavior between living or dead algae cell. (Klein)
W77-12214

MODEL KUMULACJI 137CS U KARPIA (CYPRINUS CARPIO L.) A MODEL OF THE CUMULATION OF 137CS IN THE CARP CYPRINUS CARPIO L.), (IN POLISH),
Instytut Ksztaltowania Srodowiska, Katowice (Poland).
J. Kwapulinski, A. Buszman, and G. Kwapulinska.
Acta Hydrobiologica, Vol 18, No 2, p 183-192, 1976. 4 tab, 20 ref.

Descriptors: *Metals, *Carp, *Cesium, *Growth stages, Freshwater fish, Metabolism, Fallout, Path of pollutants, Alkali metals, Mathematical studies, Water quality, Growth rates, Sediments, Radioactivity.
Identifiers: Bioaccumulation, Tissue analysis.

In the work a model of 137Cs cumulation in the stages of development of the carp was presented. The model included the influence of body weight and weight increase on the concentration of 137Cs in them. Moreover, an equation was given illustrating the influence of the activity of bottom sediments and global fall-out. The model was checked using the results of 137Cs determinations in the years 1965-1970. (Klein)
W77-12215

BENTHIC MACROFAUNAL DYNAMICS, PRODUCTION, AND DISPERSION IN AN OXYGEN-DEFICIENT ESTUARY OF WEST SWEDEN,
Swedish Water and Air Pollution Research Lab., Gothenberg.
R. Rosenberg.
Journal of Experimental Marine Biology and Ecology, Vol 26, p 107-133, 1977. 14 fig, 3 tab, 53 ref.

Descriptors: *Salinity, *Estuaries, *Oxygen, Population, *Biomass, *Speciation, Diversity, Dispersion, Eutrophication, Productivity, Oxygen requirements, Benthic fauna, Aquatic life, Water quality.
Identifiers: *Anoxic water, Fjord, Halocline, Sweden.

The salinity above the halocline (13-15 m) in the Byfjord estuary was 23-30%. Below the halocline the oxygen concentration diminished abruptly and below 15-20 m the water was anoxic. The benthic macrofaunal communities were studied during 1971-1973 from 5 m down to the anoxic and afaunal bottoms. Number of species, abundance, and biomass were estimated in different strata in the sediments (0-5, 5-10 cm) and the seasonal variation was studied. The benthic faunal structure at different localities was compared by means of a percentage similarity index and a number of diversity indices. Dispersion was assessed by the variance/mean ratio for different block sizes and the production over one year was estimated. (Klein)
W77-12216

EFFECTS OF VARIOUS CLASSES OF HERBICIDES ON FOUR SPECIES OF ALGAE,
Langston Univ., Okla.
K. Hawxby, B. Tubea, J. Ownby, and E. Basler.
Pesticide Biochemistry and Physiology, Vol 7, p 203-208, 1977. 5 tab, 16 ref.

Descriptors: *Herbicides, *Toxicity, *Mortality, *Algae, *Productivity, *Growth rates, *Organic compounds, Inhibition, Photosynthesis, Metabolism, 2,4-D, Chlorinated hydrocarbon pesticides, Cyanophyta, Chlorophyta, Environmental effects, Chlorella, Anabaena.
Identifiers: Terbuthylazine, Dinoseb, Profluralin, Prometryne, Alachlor.

Chlorella pyrenoidosa, Chlorococcum sp., Lyngbya sp., and Anabaena variabilis were cultured in Bold's basal medium. They were treated with 0.1, 1.0, and 10 microM concentrations of alachlor, terbuthylazine, dinoseb, profluralin, prometryne, and 2,4-D. Growth of all algal species tested was markedly reduced by the triazines. Alachlor, dinoseb, and fluometuron inhibited growth of some algae at higher concentrations while 2,4-D and profluralin did not inhibit growth at the concentrations tested. Photosynthesis was greatly inhibited by the triazines, even at the 0.1 microM concentration. Fluometuron was very toxic to the blue-green algae but had less effect on the green algae tested. Lyngbya was most susceptible to photosynthesis reduction by the herbicides. The concentrations of herbicides tested had little effect on respiration of the algae species. It appeared that effects on algal growth were due primarily to inhibition of photosynthesis rather than to other metabolic processes. (Klein)
W77-12217

EFFECTS OF WATER-SOLUBLE COMPONENTS OF PETROLEUM OILS AND AROMATIC HYDROCARBONS ON BARNACLE LARVAE,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
W. H. Donahue, R. T. Wang, M. Welch, and J. A. Nicol.
Environmental Pollution, Vol 13, p 187-202, 1977. 7 fig, 4 tab, 17 ref.

Descriptors: *Organic compounds, Oil, Aquatic life, *Toxicity, *Invertebrates, *Larvae, *Fuels, *Oil pollution, *Aromatic compounds, Mortality, Animal physiology, Animal behavior, Chemistry, Environmental effects, *Oil wastes, Embryonic growth stage, Metabolism, Analytical techniques.
Identifiers: Water soluble fractions(Oil), *Barnacles, Tissue analysis, Crankcase oil, Diesel oil, Crude oil.

The effects of water-soluble fractions (WSF) of petroleum oils and of solutions of aromatics on embryos and nauplii of barnacles (Chthamalus fragilis and Balanus amphitrite niveus) were investigated. The oils tested were S. Louisiana, Alaska, Kuwait, Venezuela crudes, Diesel fuel, Bunker C, No. 2 fuel and crankcase oils. Eighteen aromatic hydrocarbons occurring in petroleum oils were also tested. Observations were made on development and hatching of embryos, and the activity, phototaxis and survival of larvae. Acute experiments (1 h duration) were carried out in glass tubes illuminated above, and larvae remaining on the bottom were separated from those actively swimming. Concentrations at which half the larvae occurred in the bottom fraction were determined. Oils were toxic in the series used: crankcase > No. 2 fuel oil, > Bunker C > Diesel > Venezuela > Kuwait > Alaska > S. Louisiana (in terms of percentages of WSF). Relative toxicities of the aromatics (in terms of percentages of saturated solutions) are given. Embryonic development and larval activity were adversely affected by No. 2 fuel oil at a concentration of 3 ppm and larval activity by naphthalene at the same level. (Katz)
W77-12218

IMPACT OF AN URBAN METHOXYCHLOR SPRAYING PROGRAM ON THE ROUGE RIVER, MICHIGAN,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5B.
W77-12220

ACUTE TOXICITY OF LIGNOSULPHONATES ON RAINBOW TROUT (SALMO GAIRDNERI),
National Veterinary Inst., Oslo (Norway). Fish Disease Lab.
S. O. Roald.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 6, p. 702-706, 1977. 1 fig, 1 tab, 12 ref.

Descriptors: *Mortality, Fish physiology, *Fish behavior, *Toxicity, *Salmonids, *Rainbow trout, *Sulphonates, *Sulfite liquors, *Pulp wastes, Lethal limit, Industrial wastes, Water quality, Trout, Effluents, Sulfur compounds, Organic compounds, Bioassay.
Identifiers: *Lignosulphonates, Bioaccumulation, Spent sulfite liquor.

The 48-hr LC50 value for lignosulphonates for rainbow trout was calculated to be 7,300 ppm. On exposure to 2,500 ppm the period of time to reach 50% mortality was 275 hours. The fish kept at 2,500 ppm or greater showed definite signs of illness before dying. The first effects of a loss of reaction to sudden movements and swimming behavior close to the water surface was followed by rapid and irregular breathing. Death was preceded by loss of coordination and the fish lying on their sides before finally dying. the results indicated that lignosulphonates may be an important factor in the effluent toxicity of sulphite spent liquor (SSL) found in pulpmill wastes responsible for fish mortality. (Klein)
W77-12222

MERCURY LEVELS IN FRESHWATER FISH OF THE STATE OF SOUTH CAROLINA,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
For primary bibliographic entry see Field 5A.
W77-12223

FATE OF POLYCHLORINATED BIPHENYL (AROCLOR 1242) IN AN EXPERIMENTAL STUDY AND ITS SIGNIFICANCE TO THE NATURAL ENVIRONMENT,
Australian National Univ., Canberra. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W77-12224

THE EFFECTS OF THE WATER SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE SURVIVAL AND BEHAVIOR OF COASTAL AND OCEANIC ZOOPLANKTON,
Texas Univ. at Austin, Port Aransas. Marine Science Lab.
W. Y. Lee, and J. A. C. Nicol.
Environmental Pollution, Vol. 12, p. 279-292, 1977. 5 fig, 2 tab, 24 ref.

Descriptors: *Fuels, Oil, *Zooplankton, Chemistry, Population, *Productivity, *Mortality, *Toxicity, *Oil wastes, Toxins, Resistance, Aquatic life, Plankton, *Oil pollution, Water pollution sources, Lethal limit, Animal behaviour.
Identifiers: Water soluble fractions(Oil), No. 2 fuel oil, Survival rates, Coastal zooplankton, Petroleum hydrocarbons.

Acute effects of water-soluble fractions (WSF) of No. 2 fuel oil on both coastal and oceanic zooplankton were studied and their LC50 for various exposure time (1 to 72 h) compared. Coastal zooplankton seemed to be more resistant to the WSF than oceanic zooplankton. This difference was probably caused mainly by the dissimilar species composition of the two zooplankton populations under investigation. The evidence from this study indicates that, on a species or taxon basis, there are some species in coastal waters more vulnerable to oils than among oceanic zooplankton and it is strongly recommended that further studies of the tolerance of both populations to various petroleum hydrocarbons be carried out at the same time. A vital staining method was used to distinguish the dead from the immobile forms. Expected variations both in the curves of mortality compared with time and in the curves of mortality compared with concentration of oil are explained and a possible method to decrease variability is suggested. Change of behaviour of coastal zooplankton due to WSF of No. 2 fuel oil was also observed during the first hour of exposure. (Katz)
W77-12227

EFFECTS OF HIGH STABILITY IRON-COMPLEXES ON THE KINETICS OF IRON ACCUMULATION AND EXCRETION IN MYTILUS EDULIS (L.),
Institute of Marine Biochemistry, Aberdeen (Scotland).
For primary bibliographic entry see Field 5B.
W77-12228

RESIDUES OF CHLORINATED HYDROCARBONS IN NORTH SEA ANIMALS IN RELATION TO BIOLOGICAL PARAMETERS,
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5B.
W77-12229

DISPOSITION OF DIELDRIN IN FOUR COMPONENTS OF TWO ARTIFICIAL AQUATIC SYSTEMS AND A FARM POOL,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 5B.
W77-12230

THE EFFECTS OF DIFFERENT ALKALI SALTS ON GROWTH AND MINERAL NUTRIENT OF LEMNA MINOR L. (EFFECT DE DIVERS SELS ALCALINS SUR LA CROISSANCE AT AL NUTRITION MINERALE DE LEMNA MINOR L.),
Dijon Univ. (France). Labortoire de Physiologie Vegetale.
R. Strauss.
Internationale Revue Gesamten Hydrobiologie, Vol 61, No 5, p 673-676, 1976. 3 tab, 7 ref.

Descriptors: *Salts, *Growth rates, *Productivity, *Sodium compounds, *Chlorides, Plant physiology, Aquatic plants, Environmental effects, Nutrients, Nutrient requirements, Inorganic compounds, Potassium.
Identifiers: *Lemna minor, Sodium chloride, Lithium chloride.

Lemna minor was grown in aseptic culture solutions. With sodium chloride or lithium chloride in the solution, the plant increased in yield. Tolerance of Lemna minor to relatively high level of sodium explains the presence of this plant in brackish waters. A low quantity of potassium was required for optimal growth. Sodium was added to nutrient solutions as chloride or sulphate. At equivalent levels the sodium content of the plant was somewhat higher under sulphate salinity. (Katz)
W77-12231

GROWTH OF SPIRODELA POLYRHIZA IN STATIC SEWAGE EFFLUENT,
Agricultural Research Center, Fort Lauderdale, Fla.
D. L. Sutton, and W. H. Ornes.
Aquatic Botany, Vol 3, p 231-237, 1977. 1 fig, 2 tab, 17 ref.

Descriptors: *Productivity, *Growth rates, Aquatic plants, *Sewage effluents, *Plant growth, *Aquatic weeds, Plant physiology, Metabolism, Wastes, Water quality, Water pollution, Water pollution sources, *Potassium, *Nitrogen, Biochemistry, Energy, Nutrients.
Identifiers: Spirodela polyrhiza, *Giant duckweed, Tissue analysis, Bioaccumulation, Secondary sewage.

Yield of the giant duckweed Spirodela polyrhiza Shleid. Grown in secondarily treated sewage effluent held under static conditions was highest for the 7th-week harvest during a 12-week growth period. Concentrations of phosphorus in plant tissue were closely associated with orthophosphate phosphorus (P) in the effluent. Potassium, nitrogen (expressed as crude protein), and caloric contents of the plant tissue were higher at the beginning of the growth period than at the end. (Katz)
W77-12232

FIELD STUDIES OF SHELL REGROWTH AS A BIOINDICATOR OF EASTERN OYSTER (CRASSOSTREA VIRGINICA GMELIN) RESPONSE TO 2,4-D BEE IN MARYLAND TIDEWATERS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5A.
W77-12233

ORGANOCHLORINE POISONING OF RING-BILLED GULLS IN SOUTHERN ONTARIO,
Ontario Ministry of Natural Resources, Maple. Fish and Wildlife Research Branch.
L. Sileo, L. Karstad, R. Frank, M. V. Holdrinet, and E. Addison.
Journal of Wildlife Diseases, Vol 13, p 313-322, 1977. 3 tab, 43 ref.

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *Dieldrin, *DDE, *Gulls, Path of pollutants, Mortality, Toxicity, Animal physiology, Analytical techniques, Water birds.
Identifiers: *Ring-billed gulls, Bioaccumulation, Tissue analysis.

Clinical, necropsy, bacteriologic, parasitologic, histopathologic, toxicologic and animal inoculation studies suggested that organochlorine (PCB, dieldrin and DNE) poisoning was an important factor in causing deaths of free-flying ring-billed gulls (Larus delawarensis) in souther Ontario in 1969 and 1973. The brains of gulls dying with clinical signs of nerologic involvement, and dead gulls with not other apparent cause of death, contained organochlorine residues of significantly greater levels than those found in healthy gulls shot for comparison. (Katz)
W77-12234

BEHAVIOURAL, HAEMATOLOGICAL AND HISTOLOGICAL STUDIES ON ACUTE TOXICITY OF BIS (TRI-N-BUTYLTIN) OXIDE ON SALMO GAIRDNERI RICHARDSON AND TILAPIA RENDALLI BOULENGER,
Geneva Univ. (Switzerland). Department de Biologie Animale.
Y.-P. Chliamovitch, and C. Kuhn.
Journal of Fish Biology, Vol 10, No. 5, p 575-586, 1977. 3 fig, 4 tab, 1 plate, 3/ ref.

Descriptors: *Salmonids, Trout, *Rainbow trout, *Toxicity, Organic compounds, *Pesticides, Fish physiology, *Fish behavior, *Path of pollutants, Metabolism, Respiration, Environmental effects, Mode of action, Cytological studies, Mathematical studies, Analytical techniques.
Identifiers: Bioaccumulation, Histology, Tissue analysis, *Bis(Tri-n-butyltin), Oxide Tin, Organic tin compound.

In acute toxicity tests based on the loss of positive rheotaxis, the relationship between exposure time and bis (tri-n-butyltin) oxide concentration was determined for Salmo gairdneri and Tilapia rendalli. The 24-h EC50 is 30.8 microg/1 for trout and 53.2 microg/1 for T. rendalli. A histopathological study on S. gairdneri shows concentrations from 5.85 to 0.0117 mg TBTO/1 resulted in damage to the gill epithelium. At low concentrations a degeneration of the cornea and damage to the epithelial cells of bile ducts were also observed. Prior to a loss of positive rheotaxis and with concentrations from 0.023 to 1.17 mg/1, the packed cell volume, the haemoglobin concentration and erythrocyte count increased. Determination of the mean cell volume showed swelling took place at 1.17 mg/1 but shrinkage was observed at 0.053 mg/1. These results indicate that TBTO interfered with the process of respiration. A 'safe level' (0.1 microg/1) is proposed for schistosomiasis control. (Katz)
W77-12235

MESENCHYMAL TUMORS OF SOME ESTUARINE FISHES OF THE NORTHERN GULF OF MEXICO. I. SUBCUTANEOUS TUMORS, PROBABLY FIBROSARCOMAS, IN THE STRIPED MULLET, MUGIL CEPHALUS,
Air Force Medical Center Keesler, Keesler AFB, Miss.
R. H. Edwards, and R. M. Overstreet.
Bulletin of Marine Science, Vol. 26, No. 1, p 33-40, 1976. 16 fig, 13 ref.

Descriptors: *Fish physiology, *Mullets, *Estuaries, *Gulf of Mexico, *Marine fish, *Pathology, Path of pollutants, Environmental effects, Toxicity, Water quality, *Water pollution effects, Laboratory tests, Analytical techniques.
Identifiers: Tissue analysis, *Striped mullet, Tumors, *Mesenchymal tumors.

Fibrous tumors occurring in the subcutaneous tissues of five striped mullet taken from Mississippi Sound were reported. These nonpedunculated tumors were associated with ulceration of the overlying integument. Affected mullet exhibited 1 to 10 tumors on most surface-areas of the body, excluding the fins. Consisting primarily of fibroblast-derivatives, these well- to poorly-differentiated tumors are considered pathologically malignant, i.e., fibrosarcomas. Invasion into and nearly through the fascia overlying the muscle, focal necrosis, and cellular atypia support this interpretation. Metastases were not observed. Thus, these tumors represent benign fibromatoses or fibromas. A possible relationship between these neoplasms in the mullet and increasing pollution in Mississippi Sound were suggested. (Katz)
W77-12236

EFFECT OF FERRIC HYDROXIDE SUSPENSION ON BLOOD CHEMISTRY IN THE COMMON SHINER, NOTROPUS CORNUTUS,
Grove City Coll., Pa. Dept. of Biology.
F. J. Brenner, S. Corbett, and R. Shertzer.
Transactions of the American Fisheries Society, Vol. 105, No. 3, p 450-455, 1976. 4 fig, 35 ref.

Descriptors: *Shiners, Freshwater fish, *Fish physiology, *Iron compounds, Ions, Iron, Proteins, Organic compounds, Biochemistry, Metabolism, Laboratory tests, Water quality, Environmental effects, Carbohydrates, Metals, Potassium, Sodium.
Identifiers: *Common shiner, *Ferric hydroxide, Blood chemistry, Glucose, Hematology, Serum proteins, Blood sugar.

Common shiners, Notropus cornutus, were exposed to 3 ppm ferric hydroxide for periods from two to eight weeks. Ferric hydroxide resulted in initial changes in serum protein, glucose, Na and K ions, but these changes did not adversely affect the internal dynamics of the fish. (Katz)
W77-12237

MERCURY IN THE SESTON OF THE SAN FRANCISCO BAY ESTUARY,
Moss Landing Marine Labs., Calif.
A. R. Flegal.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 6, p 733-738, 1977. 1 fig, 3 tab, 5 ref.

Descriptors: Metals, *Mercury, *Seston, *Phytoplankton, *Zooplankton, Estuaries, Detritus, Path of pollutants, Distribution, Sediments, Sampling, Biota, Laboratory tests, Size, Organic matter, Estuaries, Water pollution effects, California.
Identifiers: *San Francisco Bay, Bioaccumulation.

The macro-seston (>20 micro m) of the San Francisco Bay system contained relatively high concentrations of mercury, compared with other estuaries. These levels varied temporally and spatially, as well as with the size fraction of the seston and its organic content. They appeared to be higher in the phytoplankton and/or organic detritus than in the zooplankton. (Katz)
W77-12238

TOXICITY OF 2,3,7,8,-TETRACHLORODIBENZO-P-DIOXIN IN LARVAL AND ADULT FORMS OF RANA CATESBEIANA,
Vanderbilt Univ., Nashville, Tenn. Dept. of Biochemistry.
P. W. Beatty, M. A. Holscher, and R. A. Neal.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 5, p 578-581, 1976. 1 tab, 5 ref.

Descriptors: *Toxicity, *Chlorinated hydrocarbon pesticides, *Organic compounds, *Mortality, *Path of pollutants, *Frogs, *Amphibians, Larvae, Mature growth stage, Growth stages, Animal physiology, Metabolism, Biochemistry, Analytical techniques.
Identifiers: *American bullfrog, Rana catesbeiana, Bioaccumulation, Tissue analysis, Tetrachlorodibenzo-p-dioxin, Larval frogs, TCDD.

Varying doses of TCDD ranging from 25 to 1000 microg/kg were administered to the larval and adult forms of the American bullfrog. Doses of TCDD as high as 1 mg/kg failed to have any significant effect upon survival or completion of metamorphosis in tadpole and doses of up to 500 microg/kg had no effect on survival of adult frogs. Histopathological examination of various tissues from the metamorphosed tadpoles and adult frogs failed to show any abnormalities. (Klein)
W77-12239

DISTRIBUTION OF N-PARRAFINS IN SELECTED MARINE BENTHIC ORGANISMS,
Texas A and M Univ., College Station. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-12241

CONTRIBUTIONS TO ECOLOGICAL CHEMISTRY CXV METABOLISM OF 2,5,4,-TRICHLOROBIPHENYL-14C AND 2,4,6,2,4,-PENTACHLOROBIPHENYL-14C IN THE MARSH PLANT VERONICA BECCABUNGA,
Gesellschaft fuer Strahlen-und Unweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Okologische Chemie.
P. Moza, L. Kilzer, I. Weisgerber, and W. Klein.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 4, p 454-463, 1976. 2 fig, 3 tab, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Organic compounds, *Plant tissues, *Chlorine, *Marsh plants, Chemistry, Chemical reactions, Metabolism, Adsorption, Plant physiology, Analytical techniques, Water pollution effects.
Identifiers: *Veronica beccabunga, Tissue analysis, Trichlorobiphenyl, Pentachlorobiphenyl.

Under the experimental conditions used, 2,4,6,2,4,-pentachlorobiphenyl was more persistent than 2,5,4,-trichlorobiphenyl. 2,5,4,-Trichlorobiphenyl was metabolized to at least two monohydroxy derivatives which occurred in free form as well as conjugated in the plant tissues. (Klein)
W77-12243

SOME CHANGES IN POND CHEMISTRY AND PHOTOSYNTHETIC ACTIVITY FOLLOWING TREATMENT WITH INCREASING CONCENTRATIONS OF CHLORPYRIFOS,
York Univ., Downsview (Ontario). Dept. of Biology.
J. E. Butcher, M. G. Boyer, and C. D. Fowle.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 6 p 752-758, 1977. 4 fig, 11 ref.

Descriptors: *Organophosphorus compounds, *Organophosphorus pesticides, *Algae, *Productivity, *Growth rates, *Photosynthesis, Phosphorus compounds, Organic compounds, Ponds, Water pollution sources, Zooplankton, Mortality, Environmental effects, Primary productivity, Nutrients, Eutrophication.
Identifiers: *Chlorpyrifos, Photosynthetic activity.

The organophosphorus pesticide chlorpyrifos brought about an enhancement of algal growth. The virtual complete elimination of zooplankton by 48 hours followed by the development of algal blooms supported the concept of reduced grazing pressure as an explanation for the initiation of blooms by the pesticide. Evidence also supported a partial role for other factors. The correlation between the size and persistence of the algal blooms and the concentration of the pesticide led to a suggestion that a required element such as phosphorus may be a major factor in the total magnitude of the response and in the variation in species. (Klein)
W77-12244

THE INFLUENCE OF LARVAL LAMPRICIDE (TFM: 3-TRIFLUORMETHYL-4-NITROPHENOL) ON GROWTH AND PRODUCTION OF TWO SPECIES OF AQUATIC MACROPHYTES, ELODEA CANADENSIS (MICHX.) PLANCHON AND MYRIOPHYLLUM SPICATUM L.,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. W. Maki, and H. E. Johnson.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 1, p 57-65, 1977. 2 fig, 3 tab, 9 ref.

Descriptors: *Pesticides, *Growth rates, *Toxicity, *Aquatic plants, *Organic compounds, Plant physiology, Halogenated pesticides, Phenols, Mortality, Productivity, Plant growth, Resistance, Piscicide.
Identifiers: *Larval lampricide, *TFM, *Aquatic macrophytes, Elodea canadensis, Myriophyllum spicatum.

TFM inhibited the growth and production of vegetative shoots of Elodea canadensis in concentrations greater than 5.0 mg/l. Myriophyllum spicatum was more susceptible to the toxicant. TFM appeared to affect both species similarly. Within 48-72 hr following exposure the plants from the higher TFM concentrations became cyanotic and lost turgor. Leaves of the affected plants began to slough off and the entire plant rapidly deteriorated during the 2nd week of the growth period. With increasing TFM concentrations and exposure periods progressively more severe effects were observed. (Katz)
W77-12245

POLYCHLORINATED BIPHENYL INHIBITION OF MARINE PHYTOPLANKTON PHOTOSYNTHESIS IN THE NORTHERN ADRIATIC SEA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
L. W. Harding, Jr.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 5, p 559-566, 1976. 1 fig, 3 tab, 32 ref.

Descriptors: *Polychlorinated biphenyls, *Inhibition, *Toxicity, *Photosynthesis, *Phytoplankton, Organic compounds, Environmental effects, Biological communities, Productivity, Water quality, Aroclor, Water pollution effects.
Identifiers: *Adriatic Sea.

An evaluation of PCB-induced photosynthetic inhibition of natural phytoplankton assemblage was described. Phytoplankton communities from different temporal regimes exhibited distinct photosynthetic responses to PCB addition. There existed substantial horizontal gradients with regard to nutrient material of biotic and abiotic origin and presumably contamination. For these reasons determinations of polychlorinated biphenyl concentrations necessary to elicit photosynthetic inhibition were difficult. (Klein)
W77-12246

EFFECTS OF OUTBOARD MARINE ENGINE EXHAUST ON THE AQUATIC ENVIRONMENT,
Environmental Control Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W77-12248

THE INFLUENCE OF CATIONS ON CHLORINE TOXICITY,
Florida Inst. of Tech., Melbourne. Dept. of Biological Sciences.
G. M. Cohen.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 2, p 131-137, 1977. 5 fig, 2 tab, 16 ref.

Descriptors: *Toxicity, *Chlorine, *Ions, *Cations, Ion exchange, Ion transport, Cation adsorption, Fish, Analytical techniques, Fish physiology, Mode of action, Metabolism, Resistance, Respiration, Mortality.
Identifiers: *Mosquito fish, Tissue analysis.

Results demonstrated that cations markedly modified chlorine toxicity to the mosquito fish

Gambusia affinis. 25% sea water and 0.125% NaCl most effectively reduced toxicity to 0.5 ppm chlorine over controls, in comparison to tap or other waters. When chlorine concentrations were raised, mortalities increased in all waters. Physiological explanations for chlorine resistance were discussed. (Klein)
W77-12249

5D. Waste Treatment Processes

CHARACTERISTICS OF POULTRY PROCESSING EFFLUENT,
Rockingham Poultry Market Coop., Inc., Broadway, Va.
For primary bibliographic entry see Field 5B.
W77-11531

DECONTAMINATING LAKE SUPERIOR OF ASBESTOS FIBERS,
Army Mobility and Equipment Research and Development Center, Fort Belvoir, Va.
R. P. Schmitt, D. C. Lindsten, and T. F. Shannon.
Environmental Science and Technology, Vol 11, No 5, May 1977, p 462-465. 2 tab, 4 fig.

Descriptors: *Water pollution, Industrial wastes, Asbestos, Lake Superior, *Water pollution treatment, Coagulation, Disinfection, Filtration, *Waste water treatment, Water treatment.

A U.S. Army Water Purification Equipment Unit was used in the study. The equipment consists of a conical shaped solids contact clarifier and a pressure diatomite filter. The basic processes involved are coagulation, disinfection, and filtration. Nine different variations of operations were used on Lake Superior water with best results being obtained with the following procedure: (1) coagulation, 2 ppm cationic polyelectrolyte; (2) filtration, precoat, 0.4 lbs celite 535, body feed, 28 ppm Hyflo. The results indicated that charge neutralization, bridging and filtration are the logical approach to the asbestos decontamination of Lake Superior. (Chilton-ORNL)
W77-11539

MAKING WASTE WATER PURER STILL,
Department of the Environment, Stevenage (England).
A. L. Downing.
Public Health, Vol. 76, No. 12, p 372-374, December 1976.

Descriptors: *Sewage treatment, Tertiary treatment, Effluents, Water reuse, Nutrient removal, Activated carbon, Adsorption, Sludge, Water quality standards, *Waste water treatment.
Identifiers: South Africa, United Kingdom.

Effluent quality can be thought of in terms of five broad categories:- (1) Effluent which would not generally produce serious evidence of pollution in a river unless present in high concentration, but which would contain too many impurities to be permissible in a river used as a source of water for drinking (and in some circumstances could cause unwelcome growths of algae). (2) Effluent tolerable if well diluted in rivers used as a source of water for public supply. (3) Effluent of similar characteristics except that, in addition, its content of nutrients capable of promoting excessive growths of algae would be much reduced. (4) Effluent hardly distinguishable from tap water in appearance and of a sufficiently high standard to be used directly as a source of water for all but the most taxing industrial uses. (5) Effluent (reclaimed water) of potable quality. It is feasible to produce potable water from sewage effluent by giving further treatment to effluent of the second category. The following treatment processes are discussed:- Micro-straining followed by ozonation; chemical coagulation and sand filtration, separation of detergents by foaming, chemical coagulation, sand filtration and chlorination; reverse osmosis; activated carbon/adsorption and incineration; lime flocculation; and oxidizing of impurities at high temperature and pressure. (So African Water Info Center)
W77-11548

POSSIBILITIES OF WASTE RECYCLING IN SOUTH AFRICA - CHOICES AND CONFLICTS,
Johannesburg City Health Services (South Africa).
V. Bolitho.
Municipal Administration and Engineering, Vol 42, No 485, p 49-55, 1976. 1 tab.

Descriptors: *Recycling, *Municipal wastes, *Solid wastes, Rubber wastes, Waste disposal, Incineration, Pyrolysis, Hydrolysis, Costs, Landfill, Planning, Transportation, Economics, Administration, Pulp wastes, *Water reuse.
Identifiers: *South Africa, Johannesburg, Witwatersrand.

The author discusses possible recycling routes for solid urban wastes. The composition and assumed value of the components of urban refuse are tabulated. Direct recovery of materials and the recovery of heat energy from refuse are discussed in detail. (See also W77-11552) (So African Water Info Center).
W77-11551

POSSIBILITIES OF WASTE RECYCLING IN SOUTH AFRICA - II,
Johannesburg City Health Services (South Africa).
V. Bolitho.
Municipal Administration and Engineering, Vol 42, No 486, p 15-24, 1976. 2 tab.

Descriptors: *Recycling, *Municipal wastes, *Solid wastes, Rubber wastes, Waste disposal, Incineration, Pyrolysis, Hydrolysis, Costs, Landfill, Planning, Transportation, Economics, Administration, *Water reuse, Pulp wastes.
Identifiers: *South Africa, Johannesburg, Witwatersrand.

The conclusion of a previous article under the same title. Mechanised recovery processes, markets for recovered solid waste components, and special problems concerning polythene and rubber are discussed, as well as pyrolysis, cellulose upgrading, hydrolysis, landfill, and the alternative strategy of limiting the quantity of waste. The author investigates newsprint, packaging, resources, heat recovery, urban planning and transportation, the energy requirements of materials recovery, and regional administration of recycling. He concludes that the most economic recycling procedure in South Africa in the immediate future is the creation of recreation areas and the reclamation of derelict land. (See also W77-11551) (So African Water Info Center).
W77-11552

PLASTIC PIPES IN SEWERAGE AND DRAINAGE,
For primary bibliographic entry see Field 8G.
W77-11554

BALL CLEANING OF SEWER PIPES,
National Building Research Inst., Pretoria (South Africa).
For primary bibliographic entry see Field 8G.
W77-11566

STUDIES ON DISINFECTION AND CHEMICAL OXIDATION WITH OZONE AND CHLORINE IN WATER RECLAMATION,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5F.
W77-11572

HEALTH ASPECTS OF POTABLE WATER SUPPLIES,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5F.
W77-11573

EFFECTIVE PHOSPHORUS REMOVAL FROM SEWAGE BY BIOLOGICAL MEANS,
National Inst. for Water Research, Pretoria (South Africa).
A. R. McLaren, and R. J. Wood.
Water SA., Vol. 2, No. 1, p 47-50, 1976. 1 tab, 5 fig, 5 ref.

Descriptors: *Phosphorus, Sewage treatment, Biological treatment, Anaerobic treatment, Activated sludge, Nitrification, Denitrification, Waste water treatment.
Identifiers: South Africa.

The effect of including an anaerobic stage on phosphorus removal in nitrifying-denitrifying activated sludge units was investigated. On laboratory as well as pilot-plant scale almost complete elimination of phosphorus was achieved when the sludge was passed through an anaerobic stage in which phosphorus release was effected. The mechanism of phosphorus removal was investigated in batch reactors. (So African Water Info Center)
W77-11574

REMOVAL OF MICROCYSTIS TOXINS IN WATER PURIFICATION PROCESSES,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W77-11576

A GUIDE FOR THE DESIGN OF DISSOLVED-AIR (PRESSURE) FLOTATION SYSTEMS FOR ACTIVATED SLUDGE PROCESSES,
Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering.
J. Bratby, and G. vR. Marais.
Water SA., Vol. 2, No. 2 p 87-100, 1976. 20 fig, 8 ref.

Descriptors: *Design criteria, Flotation, Activated sludge, Sedimentation, Suspended solids, Sludge thickening, Sludge, Settling basins, Pilot plants, *Waste water treatment.
Identifiers: South Africa.

The relative merits of dissolved-air (pressure) flotation and sedimentation applied to activated sludge mixed liquor are discussed. In thickening waste sludge by flotation, it is advantageous to withdraw sludge from the reactor rather than from, say, the under-flow from a sedimentation basin. Design criteria for dissolved-air (pressure) flotation systems applied to activated sludge are presented based on investigations at pilot-scale level. To illustrate usage of the design data, two design examples are presented in detail: the first is applicable to instances where only clarification of the whole mixed liquor flow is required (that is, flotation taking the place of secondary sedimentation). The second example is applicable to instances where thickening (and, necessarily, clarification) of the waste sludge from the system is required. (So African Water Info Center)
W77-11581

TRADITIONAL METHODS OF WATER PURIFICATION IN THE RIVERAIN SUDAN IN RELATION TO GEOGRAPHIC AND SOCIOECONOMIC CONDITIONS,
S. A. A. Jahn.
Erdkunde (Germany), Vol 31, No 2, p 120-130, June 1977. 1 fig, 2 tab, 30 ref.

Descriptors: *Water purification, *Suspended solids, *Filtration, *Water quality, Africa, Sediment load, Sediments, Sedimentation, Rivers, Floods, Water pollution, Coagulation, Clays, Flocculation, Soils, Polymers, Waste water treatment.
Identifiers: Sudan, Nile River.

The suspended solids in the waters of the Blue Nile, the River Nile and their tributaries show a great annual increase during the flood season. The traditional methods of water purification practiced during the flood season of the Nile in rural areas of the riverain Sudan are discussed. The most important traditional method of water purification in the area is the use of natural coagulants added in suspension or as an extract to the turbid water of the water jars in order to achieve floc formation. Every household is able to improve the quality of its water by this means. The arabic word 'Rauwaq' means clarifier. It is not a name for a specific substance, but a general term for any type of material empirically found to coagulate turbid water. People in the riverain Sudan use the term mainly for clay soil which has these properties. The legendary origins of this method of water purification are discussed in detail. Water purification with plants is also described. The social aspects of traditional water purification are evaluated and the economic aspects of Nile water consumption during the flood season are treated. (Jamail-Arizona)
W77-11620

SUSPENDED SOLIDS MEASUREMENT GIVES IMPROVED CONTROL,
Instruments (H. F.) Ltd., Bolton (Ontario).
A. S. Posgate.
Water and Wastes Engineering, p 31-36, March 1977. 5 fig.

Descriptors: *Suspended solids, *Treatment facilities, *Measurement, *Instrumentation, *Monitoring, *Waste water treatment, Economic efficiency, Industrial plants, Gravimetric analysis, Industrial water, Slurries, Polymers, Effluents, Costs, Turbidity.
Identifiers: *Turbidimeters.

Turbidimeters adapted for monitoring and control at water and wastewater plants can reduce costs by pacing chemical input to actual demand. A simple method is presented for combining the standard gravimetric analysis with linear instruments to provide direct measurement of suspended solids in ppm. The method can be applied at water plants, industrial waste plants, and at sewage treatment plants with a reasonably stable influent. Suspensions that can be directly monitored are discussed. Possible sewage plant applications include monitoring the activated sludge concentration and controlling the flowrate for return to the primary stage; proportioning the input of polymers in waste sludge de-watering systems; and use in advanced tertiary waste treatment systems. In water treatment plants, it is most economical to proportion the chemical input to variations in raw water suspended solids concentration. Linearity and immediate response are the most important factors in selecting a monitoring system for industrial use. Cost reductions at sewage plants and water treatment plants are outlined. (Jahns-Arizona)
W77-11624

CHEMICAL TECHNOLOGY AND ECONOMICS IN ENVIRONMENTAL PERSPECTIVES: TASK II. REMOVAL OF BORON FROM WASTEWATER,
Midwest Research Inst., Kansas City, Mo.
T. W. Lapp, and G. R. Cooper.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 919, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-560/1-76-007, June 1976. 27 p, 7 tab, 37 ref.

Descriptors: *Boron, *Public health, *Water pollution control, *Sewage treatment, *Trace elements, *Waste water treatment, Industrial wastes, Municipal wastes, Chemical oxygen demand, Activated sludge, Salts, Ion exchange, Separation techniques, Chemical precipitation.

Objectives of this study on the removal of boron from waste water were to assess public concern over the presence of boron in effluents, examine current practices and literature on boron removal, and determine the role that boron plays in the activated sludge process. Surveys determined that no sewage treatment facilities and very few boron-producing or -consuming industries were attempting to remove boron from their wastes. A literature survey on the effects of boron on sewage treatment processes indicated that in large quantities (greater than 10 ppm) boron may inhibit biological processes and COD removal, but the effect was largely dependent on individual circumstances. Three methods of boron removal are discussed, including the use of ion exchange resins, lime precipitation, and liquid-liquid extractions. (Schulz-FIRL)
W77-11666

MCALPINE WIN EFFLUENT TREATMENT WORKS CONTRACTS.
Water Services, Vol 81, No 976, p 367-368, June, 1977.

Descriptors: *Treatment facilities, *Suspended solids, *Hydrogen ion concentration, *Pumping plants, *Waste water treatment, Waste treatment, Municipal wastes.
Identifiers: Huddersfield(UK), Lancashire(UK).

Two contracts for the construction of waste water treatment facilities have been awarded to Sir Alfred McAlpine and Son Ltd., England. A new effluent pre-treatment plant including a replacement pumping station will be constructed for ICI Ltd., Organics Division, at its Dalton works in Huddersfield. This plant is designed to comply with the Yorkshire Water Authority's requirements on pH and suspended solids levels in discharged effluent. The second contract was awarded by Ward Blenkinsop and Company Ltd. for the construction of treatment facilities which will include a twin 50 mm outfall sewer, pumping station, tanks, control house, lagoons, pipes, and roads. (Schulz-FIRL)
W77-11667

ENHANCEMENT OF HIGH-RATE DISINFECTION BY SEQUENTIAL ADDITION OF CHLORINE AND CHLORINE DIOXIDE,
O'Brien and Gere Engineers, Inc., Syracuse, N.Y.
E. C. Tifft, P. E. Moffa, S. L. Richardson, and R. I. Field.
Journal Water Pollution Control Federation, Vol 49, No 7, p 1652-1658, July, 1977. 2 fig, 9 tab, 10 ref.

Descriptors: *Disinfection, *Chlorination, *Combined sewers, *Overflow, Storm water, Bactericides, *Waste water treatment, Water Pollution Control Federation, Model studies.
Identifiers: *Chlorine dioxide.

Combined waste water overflows due to use of interceptor sewer systems for both normal waste waters and storm water runoff are a major source of microbial contamination of surface waters. Several methods for the high-rate point source treatment of microbial contamination have been investigated. As the cost, availability, and possible carcinogenicity of chlorine may restrict future disinfection by chlorine alone, the use of C102 in combination with C12 has been considered. In laboratory studies to determine the approximate dosages of C12 and C102 necessary to adequately reduce the microbial count, C12 and C102 were applied individually and sequentially during single- and two-stage studies on a simulated combined waste overflow. The treatment method included fine-mesh screening prior to disinfection. Two full-scale facilities were used to verify findings. Studies concluded that C102 at 12 mg/liter had the same bacterial and viral killing capacities as C12 at 25 mg/liter in two minutes contact time. In a two-stage addition treatment, C12 at 8 mg/liter followed by C102 at 2 mg/liter also accomplished the same disinfection as C12 at 25 mg/liter. Although the effects of the chlorite ion as a byproduct of disinfection with C102 are not known, it is suggested that the use of C102 in conjunction with C12 to enhance disinfection may significantly reduce treatment costs. (Schulz-FIRL)
W77-11668

PLANNING FOR URBAN STORMWATER CONTROL,
Fell, Brusso, Bruton, and Knowles, Inc., Tulsa, Okla.
For primary bibliographic entry see Field 5G.
W77-11669

THE INVESTIGATION OF SEWER NETWORKS BY COMPUTER,
London Borough of Hammersmith (England). Directorate of Engineering.
For primary bibliographic entry see Field 5G.
W77-11670

MUNICIPAL WASTEWATER TREATMENT PLANT SLUDGE AND LIQUID SIDESTREAMS,
Camp, Dresser, McKee, Inc., Boston, Mass.
A. A. Kalinske.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 769, Price codes: A06 in paper copy, A01 in microfiche. Report EPA 430/9-76-007, June 1976. 123 p, 3 fig, 4 tab, 204 ref, 1 append.

Descriptors: *Sludge treatment, *Dewatering, *Sludge digestion, *Filtration, *Incineration, Reviews, Separation techniques, Sewage treatment, Tertiary treatment, *Waste water treatment.

A general review of municipal waste water treatment plant sludge and liquid sidestreams is presented. Sludge characteristics are discussed for primary treatment, secondary treatment with trickling filters or activated sludge treatment, chemical treatment, and septic tanks. Various physical, biological, and chemical methods of sludge stabilization are described. Sludge thickening by gravity thickening, pressurized-air flotation, and centrifugation is discussed. Supernatants from biological digesters are considered with respect to aerobic and anaerobic digestion, treatment methods, and elutriation. Chemical conditioning, thermal treatment, and freezing are examined for sludge conditioning. Sludge dewatering and sidestreams produced by sand beds, vacuum filtration, centrifugation, filter presses, and screens are discussed. Various methods of sludge disposal considered include incineration, wet air (high-pressure) oxidation of liquid sludge, land application, landfill disposal, ocean and surface water disposal, deep well or underground injection, pyrolysis, and composting. Sludge reclamation and tertiary treatment methods are considered. (Schulz-FIRL)
W77-11671

DISINFECTION OF WASTEWATER, TASK FORCE REPORT.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 449, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-430/9-75-012, March, 1976. 59 p, 1 fig, 14 tab, 24 ref, 4 append.

Descriptors: *Chlorination, *Ozone, *Bromides, *Ultraviolet radiation, *Disinfection, Halogens, Chlorides, Chemical reactions, Toxicity, Public

health, *Waste water treatment, Costs, Aquatic life, Fish, Effluents.

A task force survey of various aspects of waste water disinfection is presented. Major topics discussed include possible toxic effects of chlorination on aquatic life and humans, public health considerations, and disinfection methods. Recognition of the potential danger of the formation of halogenated organic compounds as a result of chlorination has prefaced an investigation into alternative disinfectants such as ozone, bromine chloride, and ultraviolet light. Dechlorination with sulfur dioxide and activated carbon is examined. Task force recommendations include disinfection of waste water wherever required to maintain public safety, further investigation of alternate disinfectants, modification of present disinfection standards for more flexibility, and close monitoring of residual chlorine levels in receiving waters. (Schulz-FIRL)
W77-11672

NITRIFICATION AND HEAVY METAL REMOVAL IN THE ACTIVATED SLUDGE TREATMENT PROCESS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
P. A. Richards.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-031 748, Price codes: A09 in paper copy, A01 in microfiche. Report AD/A-031 748, August 1976. 172 p, 23 fig, 22 tab, 101 ref.

Descriptors: *Heavy metals, *Silver, *Chromium, *Activated sludge, *Nitrification, *Sludge treatment, Physicochemical properties, Chemical reactions, Separation techniques, Model studies, *Waste water treatment, Sewage treatment, Effluents.

The purpose of this dotoral dissertation was to examine heavy metal concentrations in municipal sewage with respect to nitrification and various points within an activated sludge waste treatment system. A laboratory-scale, continuous flow, completely mixed activated sludge system was used to examine removal of silver and chromium from synthetically produced waste. Heavy metal removal was observed to be positively related to sludge production rate, sludge metal concentration, and sludge wasting rate of metal-rich sludge. Metal removal was negatively related to system metal loading rate and wasting rate of metal-poor sludge. (Schulz-FIRL)
W77-11673

ANAEROBIC DIGESTION OF SOLID WASTE AND SEWAGE SLUDGE TO METHANE,
Environmental Protection Agency, Cincinnati, Ohio. Office of Solid Waste Management Programs.
S. J. Hitte.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 091, Price codes: A02 in paper copy, A01 in microfiche. Report EPA/530/SW-159, July 1975. 13 p, 2 fig, 1 tab, 9 ref.

Descriptors: *Anaerobic digestion, *Methane, *Energy conversion, *Biological treatment, *Sludge digestion, Resources, Sludge treatment, Sewage treatment, Costs, Environmental effects, *Waste water treatment.
Identifiers: Methane production.

Controlled anaerobic digestion as a means of processing organic wastes and producing methane was examined in light of the energy shortage. Comparisons with other biological processes, current research in anaerobic digestion, and cost analyses were presented. Methane production estimates and possible uses of sludge-generated methane were considered. Resource recovery concepts related to waste treatment were discussed, including use of shredding waste as a supplemental fuel, pyrolysis, waterwall incineration, hydrogasification, and methane production. A description of biological processes associated with anaerobic digestion was presented. Parameters controlling methane production, such as temperature, anaerobiosis, pH, nutrients, and toxicity, were listed. Projected costs, advantages, and disadvantages are examined for a 1,000 ton per day bioconversion plant. (Schulz-FIRL)
W77-11674

POTENTIAL VALUE OF TREATMENT OF URBAN STORMWATER,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-11675

WATER-QUALITY EFFECTS FROM URBAN RUNOFF,
Woodward-Clyde Consultants, San Francisco, Calif.
For primary bibliographic entry see Field 5C.
W77-11676

WATER TREATMENT USING OXIDISED SLUDGE.
Australian Patent 479,408. Issued January 13, 1977. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol 46, No 50, p 4873, January, 1977.

Descriptors: *Patents, *Oxidation, *Coagulation, *Aluminum, Water purification, Sludge, Hydrogen ion concentration, Chemicals, *Waste water treatment.
Identifiers: Wet air oxidation.

A patent was issued for a waste and water treatment process utilizing oxidized sludge. The process involves coagulation and separation using aluminum compounds. The resultant sludge is subjected to wet air oxidation. The sludge pH is adjusted so that the aqueous mixture resulting from the oxidation treatment will have a pH below 1.5 or above 9.0. This aqueous mixture can be directly re-used for water treatment if its pH is below 1.5 or above 10.5. For pH levels between 1.5 and 10.5, the mixture can be used after the removal of the aluminum compounds by adding acid or alkali. (Collins-FIRL)
W77-11677

BIOLOGICAL EFFLUENT TREATMENT PLANT - WITH THREE TANKS ARRANGED FOR REVERSIBLE FLOW,
J. R. Kaelin.
German Patent DS 2459-634. Issued April 21, 1977. Derwent German Patents Abstracts, Vol Y, No 17, p D4, June, 1977.

Descriptors: *Patents, *Biological treatment, *Aeration, *Treatment facilities, Activated sludge, Oxygen, Flow, Water purification, Waste treatment, *Waste water treatment.

A patent was issued for a biological effluent treatment plant. The plant consisted of three connected tanks. After the activated sludge concentration in the first tank is reduced to a pre-determined level, the flow is reversed. This allowed the second and third tanks to act as an activated tank. The first tank became a downstream post-clarification tank. Pure oxygen or an oxygen mixture was introduced into the aeration tank by a centrifugal pump impeller below the waste water surface. A flow rate of 30 cm/second was created above the floor of the activated tank. No mechanical sludge removal was necessary for prevention of clogging. (Collins-FIRL)
W77-11678

SMALL-SCALE PLANT FOR MECHANICALLY/BIOLOGICALLY PURIFYING WASTE WATER.
Netherlands Patent NL 152-516. Issued March 15, 1977. Derwent Netherlands Patents Abstracts, Vol Y, No 15, p D2, May, 1977.

Descriptors: *Patents, *Treatment facilities, *Biological treatment, Water purification, Mechanical equipment, Effluents, Liquid wastes, *Waste water treatment.

A patent was issued for a mechanical-biological waste water purification plant. Only one immersion-dripper body was contained in the biological stage. Its worm-like form reduced manufacturing and operating costs. This feature also allowed continuous step-wise cleaning. The biological stage also included a basin with the rotating immersion-dripper body. Separate pre- and/or post-purifying tanks may be attached to the unit. (Collins-FIRL)
W77-11679

NON-BIODEGRADABLE WASTE WATER TREATMENT - BY WET OXIDN. FOLLOWED BY BIOLOGICAL AERATION IN PRESENCE OF ACTIVE CARBON.
Belgian Patent BE 846-256. Issued March 16, 1977. Derwent Belgian Patents Abstracts, Vol Y, No 12, p D1, April, 1977.

Descriptors: *Patents, *Oxidation, Chemical oxygen demand, *Biological treatment, Biomass, Activated carbon, Sewage effluents, Aeration, Odor, Color, *Waste water treatment.
Identifiers: Wet oxidation, Non-biodegradable waste water treatment.

A patent was issued for a non-biodegradable waste water treatment. Effluents were treated by wet oxidation at 150-375 C and 150-4,000 p. s. i. g. This separated the gaseous, solid, and liquid phases and reduced COD by 30-99%. Biological oxidation followed in a tank with a suitable biomass. Powdered activated carbon was added to reduce color and odor while enhancing the oxidation process. Carbon was used up as excess biomass accumulated. The carbon and excess biomass were then moved to a second oxidation stage similar to the first. This regenerated the activated carbon and dispersed excess biomass. The expense of wet oxidation used alone was avoided. Toxic wastes can be biologically treated after wet oxidation. (Collins-FIRL)
W77-11680

MECHANICAL SEWAGE SLUDGE COMPOSTING - IN MIXER WITH RECYCLED BIOGENIC MASS CHARGING REVOLVING HEATED DRUM.
For primary bibliographic entry see Field 5E.
W77-11681

AERATION TANK FOR ACTIVATED SLUDGE TREATMENT OF WASTE WATER - IS SMALLER AND REQUIRES LESS POWER FOR A GIVEN TREATMENT CAPACITY.
Netherlands Patent NL 7610-431. Issued March 28, 1977. Derwent Netherlands Patents Abstracts, Vol Y, No 15, p D5, May, 1977.

Descriptors: *Patents, *Aeration, *Equipment, Design, Flow, Activated sludge, Liquid wastes, Treatment facilities, Sewage effluents, *Waste water treatment.
Identifiers: *Aeration tanks.

A patent was issued for an activated sludge treatment aeration tank. The tank was constructed as a horizontal, elongated rectangle. It contained offset immersed flow passages in several compartments formed by transverse partitions. Each division contained an aerating agitator. The liquid passed continuously between an inlet and an outlet at each end of the tank. Each compartment had a length/width ratio of 0.59 to 1.70, the preferred

ratio being 0.60 to 1.00. The flow passage covered 30-80% of the immersed cross-sectional area of its partition. Rotary agitators were used. This design was smaller and required less power for a given capacity than conventional units. (Collins-FIRL)
W77-11682

OXIDIZING ORGANIC REFRACTORY CPDS. IN WASTE WATER - BY CONTACT WITH OZONE CONTG. GAS AND SIMULTANEOUS UV IRRADIATION.
French Patent FR 2309-480. Issued December 31, 1976. Derwent French Patents Abstracts, Vol Y, No 9, p D5, April, 1977.

Descriptors: *Patents, *Oxidation, *Irradiation, *Organic compounds, Liquid wastes, Waste treatment, Industrial wastes, Municipal wastes, Ultraviolet radiation, Water purification, Ozone, Carbon dioxide, Carbon, Adsorption, *Waste water treatment, Gases.

A patent was issued for a process to treat organic refractory compounds of biorefractory compounds in a liquid medium. The medium was oxidized with ozone-containing gas and simultaneously subjected to ultraviolet radiation to enhance the process. The treatment was applicable to industrial and municipal water purification. The process was especially useful for wastes that could not be converted to carbon dioxide and water by secondary treatment and carbon adsorption. The combined treatment proved more effective than either individual treatment. (Collins-FIRL)
W77-11683

AQ. FERRIC CHLORIDE SOLN. FOR WATER TREATMENT--OBTD. BY NEUTRALISING AND CHLORINATING PICKLING LIQ. CONTG. FERROUS CHLORIDE.
French Patent FR 2320-911. Issued April 15, 1977.

Descriptors: *Chlorine, *Iron compounds, *Chemical reactions, *Patents, Treatment, Waste treatment, Flocculation, *Waste water treatment.
Identifiers: *Ferric chloride, *Ferrous chloride.

A patent has been issued for a process to produce FeC13 in an aqueous solution from a pickling liquid containing FeC12 and HCl. The liquid is first evaporated to a minimum FeC12 concentration of 34.25% by weight and then neutralized in a fluidized bath of iron oxide particles. Next, the mixture undergoes counter-current chlorination at 35-75 C for 73-86% chlorination and then at 40-100 C for 27-14% chlorination. The process is reported to produce a solution containing a minimum of 40% FeCl3, below 0.1% FeCl2, and below 0.1% free HCl. (Schulz-FIRL)
W77-11684

SLUDGE PURGING CONTROL FOR WASTE WATER PURIFICN. PLANT--AUTOMATICALLY PREVENTS OVERPURGE WITHOUT ENDANGERING QUALITY OF TREATED WATER.
Netherlands Patent NL 7612-303. Issued May 10, 1977. Derwent Netherlands Patents Abstracts, Vol Y, No 21, p D2, July, 1977.

Descriptors: *Sludge treatment, *Turbidity, Sampling, *Automatic control, Equipment, Instrumentation, *Patents, Physical properties, *Waste water treatment.
Identifiers: *Sludge purging control.

A patent has been issued for the automatic control of sludge purging from a sludge concentrator. Turbidity is measured at two different levels above the sludge bed. When measurements at the upper sampler reach a certain preset value, the sludge purge valve is opened and the lower sampler is activated. When turbidity at the lower level sampler drops below a preset level, the sludge purge valve is closed and the upper sampler reactivated. A constant level illuminated tank and a photoelectric cell which is attached to a galvanometer are suggested for turbidity measurements. This method is reported to minimize excess water loss and errors due to local variations in turbidity above the sludge bed. (Schulz-FIRL)
W77-11685

EFFLUENT PURIFICATION BY BIOLOGICAL ROTARY CONTACTOR--WHICH IS ROTATED BY AIR WHICH DISPLACES LIQUID FROM RADIAL POCKETS.
German Patent DS 2428-910. Issued May 18, 1977. Derwent German Patents Abstracts, Vol Y, No 21, p D3, June, 1977.

Descriptors: *Biological treatment, *Patents, *Packed beds, *Waste water treatment, *Biodegradation, *Water purification, Equipment, Treatment.

A patent for the biological treatment of waste water using a basin equipped with a circular, rotatable arrangement of biological beds has been issued. The beds are contained in pockets which are a part of a radial contact arrangement. Gases flowing out of a pipeline below the contact arrangement are caught in the pockets, causing the contact arrangement to rotate. It is suggested that pockets be placed on the radial outer side of the contact arrangement on non-adjacent circular discs which are part of the contact element arrangement. (Schulz-FIRL)
W77-11686

WASTE WATER ORGANIC RESIDUE DETOXIFICATION--BY TWO STAGE THERMAL TREATMENT AND SEPARATION AT SPECIFIED TEMP.
Soviet Patent SU-514-773. Issued September 23, 1976. Soviet Inventions Illustrated, Vol Y, No 22, p D2, July, 1977.

Descriptors: *Separation techniques, *Organic wastes, *Waste water treatment, *Heat treatment, Waste treatment, Chemical oxygen demand, *Patents.

A patent has been issued for a more economical method for the detoxification of organic wastes. Waste water containing a high concentration of organic substances is heated to 120-130C and separated into a highly concentrated precipitate and a weakly concentrated filtrate which requires no further treatment. Maintenance of proper temperature is important to insure good separability and minimum contamination of the filtrate. In a test using excess active sediment with W(p) of 97.5% and COD of 2.2 kg/cu m, the described method produced a precipitate with a COD of 4-6 kg/cu m. After heating to 180-200C, separating, and drying, the volume of the precipitate was 0.05 cu m and the filtrate volume was 0.45 cu m, with a COD of 21 kg/cu m. Energy consumption for the process was 290,000 kcal of heat. (Schulz-FIRL)
W77-11687

EFFLUENT WATERS CLEANING AUTOMATIC CONTROL--USED FOR DOMESTIC AND INDUSTRIAL WASTES AND BASED ON COLOUR MINITOR TO CONTROL COAGULANT SUPPLY.
Soviet Patent SU-514-774. Issued September 22, 1976. Soviet Inventions Illustrated, Vol Y, No 22, p D2, July, 1977.

Descriptors: *Coagulation, *Effluents, *Color, *Automatic control, *Instrumentation, *Patents, Remote control, Automation, Equipment, Waste water treatment.
Identifiers: Oxygen-based buffer meter.

A patent has been issued for a system designed to control the coagulation treatment of domestic and industrial effluents in a reaction vessel. The system is comprised of a coagulant dispenser controlled by a buffer meter and a color meter. The amount of coagulant initially added to the reaction vessel is determined by the oxygen-base buffer meter, which dispenses a dosage based on alkalinity of incoming effluents. After the treated effluent leaves the reaction vessel, its color is monitored. If the color of the effluent exceeds preset limits, a signal generated by the color meter adjusts the dosage added by the coagulant dispenser. (Schulz-FIRL)
W77-11688

LIQ. E.G. AQ. EFFLUENT TREATMENT WITH OZONE--EMPLOYING USED OZONE AND THEN FRESH OZONE, BOTH PRESSURIZED.
French Patent FR 2321-299. Issued April 22, 1977. Derwent French Patents Abstracts, Vol Y, No 21, p D6, July, 1977.

Descriptors: *Oxidation, *Ozone, *Waste water treatment, *Disinfection, *Liquid wastes, Treatment, Waste treatment, Organic compounds, Gases, *Patents.
Identifiers: *Ozonation.

A patent for the oxidation of waste water by exposure to pressurized ozone has been issued. Pressurized gas containing a proportion of residual ozone is used to pretreat the effluent stream. In the second stage of the treatment process, freshly made ozone at a concentration of at least 10 weight percent of the carrier gas and at higher pressures (0.07-2.1 kg/sq cm) than in the initial phase is added to the effluent stream. The ozone used in the second stage can be recycled for use in pretreatment of the next batch of effluent. Pretreatment is reported to increase the rate and efficiency of ozonation in the second stage. This process can be used for the disinfection of waste waters. (Schulz-FIRL)
W77-11689

BIOLOGICAL CONTROL OF WATER POLLUTION.
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
For primary bibliographic entry see Field 5G.
W77-11690

EXPERIMENTAL USE OF EMERGENT VEGETATION FOR THE BIOLOGICAL TREATMENT OF MUNICIPAL WASTEWATER IN WISCONSIN,
Wisconsin Univ., Oshkosh. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W77-11691

RENOVATION OF MUNICIPAL WASTEWATER FOR GROUNDWATER RECHARGE BY THE LIVING FILTER METHOD,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5G.
W77-11692

THE POTENTIAL OF SUBMERSED VASCULAR PLANTS FOR RECLAMATION OF WASTEWATER IN TEMPERATE ZONE PONDS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5G.
W77-11693

MACROPHYTES AND WATER PURIFICATION,
Max-Planck-Gesellschaft fuer Zuechtungsforshung, Krefeld (West Germany). Limnological Research Group.
For primary bibliographic entry see Field 5G.
W77-11694

THE PURIFICATION OF WASTEWATER WITH THE AID OF RUSH OR REED PONDS,
Federal Commission for the Ijsselmeerpolders, The Hague (Nederlands).
For primary bibliographic entry see Field 5G.
W77-11695

THERMAL CONDITIONING WITH AIR.
Water Services, Vol 81, No 976, p 341-342, 344, June, 1977. 1 fig.

Descriptors: Equipment, *Dewatering, *Heat exchangers, *Sludge treatment, *Treatment facilities, *Oxidation, Activated sludge, Sludge disposal, Incineration, Municipal wastes, Industrial wastes, Waste water treatment.

High pressure heating of sludge has been used to facilitate dewatering. The Zimpro Thermal Conditioning with Air unit, which combines aeration with the heating process, also reduces odors by oxidation and improves heat exchange. A single stream Zimpro unit being installed at Worleston, Crewe, England, will thermally condition a mixture of waterworks sludge, digested primary sludge, and surplus activated sludge at a rate of 16.4 cu m/hr. Additional provisions will include dewatering by filter presses and autothermic multiple hearth incineration with waste heat recovery. A three stream plant being supplied to the Anglian Water Authority is planned to condition a mixture of primary, surplus activated, and humus sludge. Implementation of the Zimpro unit is expected to reduce the quantity of dewatered sludge for ultimate disposal as well as aid in the processing of industrial wastes. (Schulz-FIRL)
W77-11696

AIR BLOWERS FOR SEWAGE AND WATER TREATMENT.
For primary bibliographic entry see Field 5F.
W77-11697

THE PRESSURE DRUM FILTER FOR SLUDGE DEWATERING.
Water Services, Vol 81, No 976, p 348, June, 1977.

Descriptors: Equipment, *Sludge treatment, *Dewatering, *Filters, Sludge, Flocculation, Stabilization, *Waste water treatment.
Identifiers: *Pressure drum filter, Belt filter.

Stamford, Connecticut has purchased a British designed and manufactured Wickham pressure drum filter from the Wickham Filtration Engineering Division. It is estimated that using the new belt filter for sludge dewatering instead of existing equipment will save $40,000 to $90,000 for Stamford. The stainless steel filter belt is automatically adjustable for variations in sludge thickness. Raw feed sludge and dilute electrolyte pass from an in-line mixer to a sludge-chemical contact zone to produce large undamaged flocs. Application of light pressure stabilizes sludge after it undergoes gravity filtration. Stabilized sludge is then compressed by a filter-mesh-covered pressure drum and carried out on a conveyer belt. (Schulz-FIRL)
W77-11698

BASIC UNITS MANUFACTURED FOR SLUDGE TREATMENT.
Water Services, Vol 81, No 976, p 341, June, 1977.

Descriptors: *Dewatering, *Equipment, *Sludge treatment, *Waste water treatment, *Activated sludge, Incineration, Filtration, Waste treatment.

A sludge thickening device, analogous to a picket fence, has been manufactured by Esmil/Envirotech Ltd., a British firm headquartered in Huntingdon, Cambridgeshire, England. Sludge is homogenized by a series of arms or pickets and raked to a central discharge hopper. The Eimco Dissolved Air Flotator produces thicker waste activated sludges than conventional gravity thickening and yields solids contents of 3 to 5 percent. Reported advantages of the flotator include smaller space required for operation, thick sludge production, and high oxygen content and low suspended solids in the effluent. The EimcoBelt continuous belt filter provides an alternate method for sludge dewatering at low cost for a wide variety of sludges, including raw primary, waste activated, thermally processed, and chemically/physically treated sludges. Operating at high vacuum, the filter discharges the dewatered sludge by passage of the filter cloth over a roller. Water jets applied to both sides of the filter cloth before it returns to the drum are designed to minimize blinding. Another mode of sludge treatment, the BSP furnace, is suited for the autothermic combustion of sludges with high moisture content. The multichamber zone effect, produced by a series of superimposed hearths in a refractory-lined cylinder shell, eliminates the need for pre-drying of feed and provides multi-stage process control. (Schulz-FIRL)
W77-11699

USING WETLANDS FOR WASTEWATER TREATMENT.
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1581, July, 1977.

Descriptors: *Wetlands, *Swamps, *Marshes, *Waste water treatment, *Nutrients, Cycling nutrients, Freshwater marshes, Water purification, Michigan, Florida, Water Pollution Control Federation.

The possible use of wetlands in Michigan and Florida for final treatment of municipal waste water has been considered. At a trial site in Florida, waste water is pumped into cypress ponds where nutrients are absorbed by vegetation. Costs for this method of treatment are approximately 50 percent less than for treatment by a conventional plant. At a trial site in Michigan, waste water is pumped into a peat marsh for the removal of nutrients. (Schulz-FIRL)
W77-11700

PHYSICAL-CHEMICAL TREATMENT SYSTEM FOR SEWAGE.
Water Services, Vol. 81, No. 976, p 373, June, 1977. 1 fig.

Descriptors: *Municipal wastes, *Waste water treatment, *Activated carbon, *Chlorination, *Flocculation, Design, Sewage treatment, Costs.

Systems for the physical and chemical treatment of non-industrial sewage have been adapted by Japan's Ministry of Construction. Designed, manufactured, and marketed by the Nippon Kokan KK, the systems have standard capacities of 200,000, 400,000, and 600,000 cubic meters/day. In the system, activated carbon is used to remove organic wastes before flocculation by the addition of sulfuric acid and polymer. The remaining waste water is chlorinated and passed through an upflow filter before it is discharged. At the time of discharge BOD and COD are at concentrations of less than 10 parts per million. While operating costs are slightly higher than those for a conventional activated sludge system, construction costs are about two-thirds lower. (Schulz-FIRL)
W77-11701

OXYGEN INJECTION BLOWS NEW LIFE INTO DROUGHT HIT SEWAGE TREATMENT WORKS,
D. Martin.
Process Engineering, p 11, June, 1977.

Descriptors: *Injection, *Oxygen requirements, *Dissolved oxygen analyzers, *Activated sludge, Aerobic conditions, Sludge treatment, Aerobic treatment, Sewage sludge, Waste water treatment.
Identifiers: *Oxygen injection system.

A BOC system has been used by the Wessex Water Authority in England to supplement oxygen supplies and to cope with fluctuating demands on the Bournemouth sewage treatment system. Electronic sensors in the activated sludge tank monitor dissolved oxygen levels and trigger a high-pressure oxygen injection system when levels drop below preset values. The two Vitox systems in use can provide three and four tons of oxygen per day, respectively. Oxygen is stored in vacuum-insulated vessels which are filled by road tankers as necessary. The system proved useful as an alternative to construction of new facilities during a recent water shortage, when reduced water consumption resulted in more concentrated influent entering the system. (Schulz-FIRL)
W77-11702

PALO ALTO SEES GOLDEN GLINT IN SLUDGE.
The American City and County, Vol. 92, No. 7, p 23, July, 1977.

Descriptors: *Metals, *Gold, *Silver, *Reclamation, *Sludge disposal, Electronics, Industrial wastes, Chemical wastes, Sludge treatment, Separation techniques, Costs, Heavy metals, California, Waste treatment.

Precious metals from wastes from area electronics industries have been discovered in sludge ash from the Palo Alto sewage treatment plant. Various methods to recover the estimated ounce of gold and 15 ounces of silver per ton of sludge ash were considered. Although sewage treatment does concentrate metals in sludge, small particle sizes and the lack of a smelter in the immediate vicinity inhibit the use of magnetic separation and smelting in the recovery of these metals. Options being considered include sale of the ash to an outside processor or the construction of an on-site processing facility which would be operated on a profit-sharing basis by a private contractor and the city of Palo Alto. Although costs and environmental impact of an on-site facility have not yet been assessed, the use of a mining industry-related process for cyanide extraction of metals is being considered for Palo Alto sludge by the World Resouces Company. (Schulz-FIRL)
W77-11703

PERIPHERAL MIXING TURNS SLUDGE INTO FUEL GAS.
The American City and County, Vol. 92, No. 7, p 58-59, July, 1977. 1 fig.

Descriptors: *Digestion tanks, *Sludge treatment, *Energy, *Convection, Circulation, *Mixing, Treatment facilities, Model studies, Design data, Municipal wastes, Energy conversion, Waste water treatment.
Identifiers: Peripheral mixing.

The addition of sludge around the sidewall of a digester as well as into its center is reported to have increased sludge handling capability and energy savings for Dayton, Ohio. Pilot studies of a multi-point injection system allowing for distribution of sludge to 10 points at the periphery of a digester at Dayton's sewage treatment plant suggest that the system may increase gas production in digesters by 13-25%. This is attributed to the formation of a larger active zone by peripheral mixing. The larger active zone may also be useful in dampening problematic effects caused by variations in pH, temperature, and sludge solids within digesters, leading to greater gas production and volatile solids reduction. Design suggestions include the placement of five inlet pipes at a single level around the perimeter, and the placement of a vertical pipe in the center of the digester tank to circulate warmed sludge over the scum blanket at the top of the digester. While conventional mixing methods such as mechanical mixing and gas induction require energy, peripheral sludge injection produces thermal convection currents for mixing,

with energy consumption limited to that used to inject the sludge into the digester. Gas production from the digesters at the Dayton plant is more than sufficient to adequately heat the plant's buildings and digesters. (Schulz-FIRL)
W77-11704

TWO CONTRACTS UNDERWAY TO COMPLETE SOUTH BAY AREA WATER TREATMENT PLANT.
Western Construction, p 40, 42, July, 1977.

Descriptors: *Tertiary treatment, *Activated sludge, *Nitrification, *Treatment facilities, *Filtration, Biological treatment, Ammonia, Nitrogen compounds, California, Construction, Waste water treatment.
Identifiers: Multi-media filtration.

Advanced waste treatment facilities are being constructed for the San Jose/Santa Clara Pollution Control Plant by four California firms jointly operating as the Waste Water Construction Company. Two contracts totalling $58,692,500 were awarded on January 13, 1976 for the construction of nitrification facilities and of multi-media type tertiary filter facilities. The nitrification facilities will include an activated sludge-type waste water treatment plant for the nitrification of ammonia in effluent from the existing secondary treatment facilities. A two-stage biological system will be formed by the addition of the new sludge treatment plant to the existing facilities, which will comprise the first stage used to remove organic carbon. Specialized bacteria and aerobic nitrifiers will be used for biological nitrification in the second stage of treatment by the new facilities. The tertiary filter facilities, which will be used to filter effluent from the ammonia nitrification facilities, will include gravity filters, chlorine contact basins, a filter service building, and a paint shop. Additional filtration processes will be provided for removal of BOD, suspended solids, coliform, and floatables. Federal and state funds will provide up to 87.5% of the costs of the $66,500,000 project which is scheduled for completion in August 1978. (Schulz-FIRL)
W77-11705

ADAPTATION TO NITRIFICATION OF ACTIVATED SLUDGE SYSTEMS TREATING HIGHLY NITROGENOUS WATERS,
Ghent Rijksuniversiteit (Belgium).
W. Verstraete, H. Vanstaen, and J. P. Voets.
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1604-1608, July, 1977. 4 fig, 2 tab, 8 ref.

Descriptors: *Nitrification, *Activated sludge, *Nitrogen compounds, *Farm wastes, Bacteria, *Waste water treatment, Water Pollution Control Federation, Nitrogen fixing bacteria, Model studies, Ammonification, Sludge treatment, Control, Operations, Waste treatment.
Identifiers: Nitrobacteria, Nitrification tolerance.

Nitrification processes occurring in activated sludge plants treating highly nitrogenous waste water can be unpredictable during the start-up of the plant. For this reason, an investigation was initiated to determine whether a start-up procedure could be designed on the basis of a nitrification-tolerance graph. The validity of the graph and the required time for establishing a maximum nitrifying community were then studied. Laboratory studies using various nitrogen loading rates indicate that an N-loading of about 1.2 mg/liter per day is the optimal start-up rate. Gradual auto-acidification of the mixed liquor is suggested during the adaptation phase to insure low NH3-N levels. Since nitrifying bacteria are sensitive to environmental changes, plant start-up for specific waste waters is suggested. A nitrification-tolerance graph was considered as a useful guideline for nitrification process control. (Schulz-FIRL)
W77-11706

EXTENSIONS TO GREAT BILLING STW OPENED.
Water Services, Vol. 81, No. 976, p 329-333, June, 1977. 1 fig.

Descriptors: *Biological treatment, *Activated sludge, *Treatment facilities, *Sludge treatment, Filtration, Sewage treatment, Settling basins, Municipal wastes, Waste water treatment.
Identifiers: High-rate filtration.

A two-stage filtration system using high rate filters followed by biological filters has been adapted for the Great Billing Sewage Treatment Works in Northampton, England. The works will receive sewage discharges through three gravity sewers of 1500 mm diameter and will treat 318 liters per capita per day. Processing of settled sludge is divided between the new biological filtration plant and the existing activated sludge plant built in 1953. Sludge is mechanically screen raked, and divided equally by five flumes which each control flow to a primary settling tank. Sludge is lifted by screw pumps to either the activated sludge plant or the new biological treatment plant. Sludge processed at the new plant undergoes high rate filtration which reduces the organic load by 80 percent. Screw pumps then lift the sludge to be divided equally among six biological filters, where filtration at a slower rate using smaller filtering media removes the remaining organic material. Effluent, collected in channels at the base of the filters, then flows to humus chambers where solid matter is settled out before discharge of the final effluent into the River Nene. The sludge removal system at Great Billings has been designed to offer greater flexibility for sludge routing by providing alternate methods by which sludge can be removed from primary settling tanks and fed to the storage tanks. Because treated sludge retains a significant amount of nitrogen and phosphorus, it is used as a soil conditioner for 200 hectares of farmland. (Schulz-FIRL)
W77-11707

EVALUATION OF RESIDUAL CHLORINE CONTROL SYSTEMS,
Fischer and Porter Co., Warminster, Pa.
For primary bibliographic entry see Field 5F.
W77-11708

SLUDGE PROCESSING TO OPTIMIZE DIGESTIBILITY AND ENERGY PRODUCTION,
Regional Wastewater Solids Management Program, Whittier, Calif. Laloma Project.
For primary bibliographic entry see Field 5E.
W77-11709

SLUDGE HANDLING.
For primary bibliographic entry see Field 5E.
W77-11710

THE WASTE WATER TREATMENT BERGSTRASSE - POSSIBILITIES AND SELECTION OF THE SLUDGE TREATMENT (DIE KLAERANLAGE BERGSTRASSE - MOEGLICHKEITEN UND WAHL DES SCHLAMMBEHANDLUNGS-SYSTEMS),
Gesellschaft fuer Klaeranlagen und Wasserversorgung, Mannheim (West Germany).
W. Kaufhold.
Wasserwirtschaft, Vol. 67, No. 6, p 162-168, 1977. 6 fig, 2 tab, 3 ref.

Descriptors: *Dewatering, *Sludge treatment, *Sludge digestion, *Feasibility studies, *Cost comparisons, Waste water treatment, Flocculation, Incineration, Sludge disposal, Municipal wastes, Chemical precipitation, Filtration, Biological treatment.
Identifiers: Thermal conditioning.

A centralized waste water treatment facility is being planned by the Bergstrasse Regional Water Authority in West Germany for the processing of wastes from 9 cities and 25 townships in the Hessen and Baden-Wurtemberg areas. Sludge treatment by thermal conditioning and dewatering in chambers has been chosen for use in the processing of the 20.68 tons/day of raw sewage expected to enter the facility. Other alternatives for sludge treatment which were investigated for possible use were: incineration; chemical treatment and flocculation with FeCl2 and lime or with polyelectrolytes; and anaerobic digestion. Cost estimates for construction, operation, and maintenance were prepared for the various alternatives. (Schulz-FIRL)
W77-11711

HYGIENIZATION OF SEWAGE SLUDGE BY ELECTRON IRRADIATION,
For primary bibliographic entry see Field 5E.
W77-11712

LAGOONS AND OXIDATION PONDS, (LITERATURE REVIEW),
Black and Veatch, Dallas, Tex.
W. J. O'Brien.
Journal Water Pollution Control Federation, Vol. 49, No. 6, June 1977, p 1016-1019. 53 ref.

Descriptors: *Lagoons, *Ponds, *Oxidation lagoons, *Aerated lagoons, *Sewage lagoons, Photosynthesis, Nutrients, Heavy metals, Infiltration, Microorganisms, Bacteria, Effluents, Waste water treatment, Water Pollution Control Federation, Bibliographies.

A review of literature concerning various aspects of lagoons and oxidation ponds is presented. Published proceedings of a 1975 conference on lagoons and oxidation ponds are cited. Design considerations discussed were mixing, flow patterns, aeration, and cell number. Physiocochemical parameters mentioned include pH, rates of methane fermentation and volatile acid production, nutrient strength, and concentrations of ammonia, algae, DO, and sulfide. Studies on detention time and pond depth are described. The use of plants and fish to upgrade effluent, and the use of spray irrigation of oxidation pond effluent, are discussed. Soil characteristics are considered with respect to heavy metal concentrations, infiltration rate, seismic sounding, and electrical resistivity. (Schulz-FIRL)
W77-11714

TREATMENT OF ORGANIC WASTE WATER BY TOWER TYPE PACKED BIOFILTER (JUTENTO SHIKI ROSHO HO NI OKERU KAIBUNSHIKI SHORI NO JOKA SOKUDO),
Kyushu Univ., Fukuoka (Japan). Dept. of Food Science and Technology.
K. Yoshihara, S. Udo, M. Sanbuichi, Y. Fujio, and S. Ueda.
Hakko Kogaku, Vol. 55, No. 3, p 129-133, 1977. 7 fig, 10 ref.

Descriptors: *Chemical oxygen demand, *Filters, *Biological treatment, *Organic wastes, Waste water treatment, Filtration, Laboratory tests, Flow rates.
Identifiers: *Biological filters, Tower-type biological filters.

Laboratory studies on a biological method for the treatment of organic wastes are described. Operational time, recirculation, and batch volume were considered during the examination of COD removal by a tower-type biological filter which had been filled with 400 25-mm glass spheres. Aerobic conditions and a temperature of 22 C were maintained in the 100 mm filter throughout the experiments. Results indicated that, at a given batch volume and recirculation flow rate, COD removal was directly related to operational time. COD removal was observed to increase rapidly with recirculation rate up to a rate of 111 cu m/sq m/day

and approached a maximum value at 146 cu m/sq m/day. Since these effects were attributed to the activity of the biofilm, it was suggested that recirculation flow rates be chosen for maximum use of the biological film without loss of adhesion of the film to the media. In pilot studies with batch volumes of 0.002-0.012 cu m, COD removal by the filter was observed at 3 to 4 kg COD/cu m/day for recirculation flow rates between 110 and 238 cu m/sq m/day. (Schulz-FIRL)
W77-11715

HAYLE'S LONG WAIT FOR ITS SEWAGE SCHEME IS OVER,
J. Pullin.
Surveyor, Vol. 150, No. 4439, p 10-11, July, 1977.

Descriptors: *Treatment facilities, *Sewage treatment, *Sludge disposal, *Municipal wastes, Filtration, Biological treatment, Dewatering, Settling basins, Waste water treatment.

A new sewage treatment facility in the Hayle area of West Cornwall, England is described. Construction of the new facility began in 1975, 20 years after its initial conception. The treatment facility, designed to accommodate a population of 50,000, is intended to replace existing facilities which discharged directly into the Hayle Estuary which empties into St. Ives Bay. Municipal wastes, fluctuating with the area's tourist industry, and wastes from the St. Erth Creamery will be processed. Treatment facilities include primary sedimentation, media filtration, secondary biological filters, coagulation, and dewatering by gravity filtration. A landfill is intended for sludge disposal. Plans for regionalization of sewage treatment are being considered. (Schulz-FIRL)
W77-11716

TREATMENT OF WATER AND EFFLUENT BY AIR FLOTATION.
Journal of the Institution of Engineers (India), Vol. 26, No. 9, p 30, March, 1977.

Descriptors: *Flotation, *Aeration, *Suspended solids, *Waste water treatment, Municipal wastes, Industrial wastes, Sludge treatment, Equipment, Sewage treatment, Hydraulic equipment, Flocculation.
Identifiers: Air flotation.

An air flotation process in which micro-bubbles are used to clarify waste water and remove impurities is described. A recirculating hydraulic pump is used to produce water which is saturated with air or some other gas. The system is reported to remove from 90 to 99 percent of suspended solids with low flocculant consumption. Use of the system is suggested for treatment of municipal wastes and a wide variety of industrial wastes. Other advantages of the system include low energy consumption (50 to 150 Wh/sq m), compact size, immediate start-up, resistance to corrosion and clogging, and automatic operation and installation. (Schulz-FIRL)
W77-11717

NEW DEVELOPMENT.
Effluent and Water Treatment Journal, Vol. 17, No. 6, p 275, June, 1977.

Descriptors: *Filtration, *Screens, *Equipment, *Tertiary treatment, *Water treatment, Suspended solids, Biochemical oxygen demand, Turbidity, Waste water treatment.
Identifiers: *Rotary drum microscreens.

A series of rotary drum microscreens produced by Paterson Candy International Limited is described. The microscreens are designed for sewage and water treatment and are used in the treatment of storm water overflows, final effluent polishing, BOD and turbidity removal, and algae and plankton removal. Water flows in through the open end of a horizontally rotating drum which is covered with panels of filter mesh. Filtered water flows out of the drum radially, leaving suspended solids inside the drum. The individually replaceable filter mesh panels contain a rigid polypropylene support grid at 20 mm square intervals and can be used with any commercially available media, including stainless steel mesh and polyester fabric. Continuous spray, time-sequenced and headloss monitoring are contained in backwash spray systems for filter cleaning and removal of retained solids. (Schulz-FIRL)
W77-11718

BRISBANE COUNCIL'S FIRST IN AUSTRALIA AT SEWERAGE TREATMENT PLANT.
Engineers Australia, Vol. 49, No. 16, p 26, June, 1977.

Descriptors: *Treatment facilities, *Drying, *Sludge treatment, *Aluminum alloys, *Equipment, Separation techniques, Design data, Australia, Construction materials, Waste water treatment.
Identifiers: Sludge drying, Aluminum gantries.

Aluminum gantries furnished by Highgate Engineers are being used at the Luggage Point sewage treatment plant in Brisbane, Australia. Advantages to the use of the lightweight aluminum gantries include resistance to corrosion by the abrasive atmosphere of Moreton Bay, and reduced construction requirements for the load-bearing walls. The gantries will service four 4.4 hectare sludge drying beds, removing dried sludge, distributing sludge from digestion tanks to drying beds, and placing sand media in the beds. The first stage of the Luggage Point treatment facility is designed for sewage treatment for a population of 500,000 at a cost of $30 million; the second stage will be a duplication of the first. (Schulz-FIRL)
W77-11719

GRANULAR ACTIVATED CARBON IN WATER TREATMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
J. J. McCreary, and V. L. Snoeyink.
Journal of the American Water Works Association, Vol. 69, No. 8, p 437-444, August, 1977. 6 fig, 39 ref.

Descriptors: *Activated carbon, *Adsorption, *Odor, *Water quality, *Color, Organic compounds, Organic wastes, Model studies, Pilot plants, Organic matter, Water properties, Water treatment, Municipal wastes, Industrial wastes, Chlorination.
Identifiers: Granular activated carbon.

The use of granular activated carbon filtration in water treatment is reviewed. Activated carbon treatment is normally used to reduce odor and color derived from organics which may be added to water by industrial and municipal discharges, agricultural runoff and other nonpoint sources, decaying vegetation, and reaction of water-treatment chemicals such as chlorine with organic aqueous matter. The efficiency of granular activated carbon treatment for removal of biologically derived odor and carbon chloroform extract, odors of industrial origin, sulfide odor, pesticides, hydrocarbons, and haloforms is discussed. Various carbon types are examined for relative efficiencies of total organic matter removal. The presence of organic chlorine is considered for carbon choice. Pretreatment effects on the adsorption process resulting from clarification, ozonation, chlorination, softening, and manganese removal are described. Studies on competitive adsorption are referenced for bisolute systems and for single compounds in the presence of natural organic matter. Monitoring procedures, bed design, pilot studies, and biological activity in granular activated carbon beds are examined. (Schulz-FIRL)
W77-11720

VISCOSITY EFFECTS OF SLUDGE.
For primary bibliographic entry see Field 5E.
W77-11722

HIGH RATE FILTER AT RUGBY.
Water and Waste Treatment, Vol. 20, No. 6, p 14, June, 1977.

Descriptors: *Filters, *Packed beds, *Filtration, *Sewage treatment, Biochemical oxygen demand, Effluents, Treatment facilities, Waste water treatment.
Identifiers: *High rate filters, Plastic filter media.

Rugby Water Reclamation Works in England has begun using a high rate filter manufactured by Norton Chemicals Process Products Limited, Stoke-on-Trent, in the treatment of a daily waste water flow of 15,000 cu m/d. A four-arm stainless steel trough-type distributor which is supported on a 1.2 m heavy-duty bearing is used to conduct waste water into the filter. The filter itself is 30 meters in diameter and filled with 200 cu m of plastic media. Effluent quality was increased from 33-39 mg/liter BOD and suspended solids to 19-23 mg/liter BOD and suspended solids with the use of the high rate filter. BOD of settled influent was reduced by 85% to 30 mg/liter. (Schulz-FIRL)
W77-11723

REDUCTION OF NON-IONIC DETERGENTS IN CONNECTION WITH BASIC INDICATORS OF URBAN SEWAGE CONTAMINATION (REDUKCJA DETERGENTOW NIEJONOWYCH W POWIAZANIU Z PODSTAWOWYMI WSKAZNIKAMI ZANIECZYSZCZEN SCIEKOW MIEJSKICH),
Medical Academy, Gdansk (Poland). Inst. of Hygiene.
J. Pastor-Rodziwanowska.
Gaz, Woda i Technika Sanitarna, Vol. 51, No. 1, p 21-22, January, 1977. 2 tab, 13 ref.

Descriptors: *Detergents, *Biological treatment, *Colorimetry, *Reduction, *Sewage treatment, Industrial wastes, Municipal wastes, Effluents, Suspended solids, Flow, *Waste water treatment.

The reduction of non-ionic detergents in connection with the reduction of basic sewage pollutants in a purification plant of the mechanical-biological type was evaluated. The material examined was taken from sewage samples entering and leaving the purification plant. Seventeen tests were performed over a period of three months. To determine the level of non-ionic detergent ranging from 1-25 mg/liter, a colorimetric method using phosphorotungstic acid and a barium compound was employed. The detergents were precipitated from the solution in the form of a complex compound. The precipitate was separated and dissolved in concentrated H_2SO_4. A hydrochinone solution was added, producing red coloration. Its degree of intensity was defined by the wavelength lambda-500 mm. It was found that the concentration of non-ionic detergents was reduced by a mean 31.6%. Average level of non-ionic detergents in the sewage leaving the purification plant was 3.7 mg/liter. Reduction of BOD_5 and suspended matter did not reach the intended level because the sewage flow was always higher (average 25%) than the level designed. It was concluded that a positive correlation exists between the quantity of incoming non-ionic detergents and the extent of their reduction. Reduction was adversely affected by an increased sewage flow and high level of suspended material at the entrance of the purification plant. An increased sewage flow was ascertained to have a negative effect on reduction of all components, including non-ionic detergents. (Tallert-FIRL)
W77-11724

EXPERIENCE WITH THE BACTERIOLOGICAL CONTROL OF WASTE WATER PURIFICATION (A SZENNYVIZTISZTAS BAK-

TERIOLOGIAI ELLENORZESENEK TAPASZTALATAI),
L. Nemedi.
Budapesti Kozegeszsegugy, No. 4, p 113-120, 1976. 8 tab, 14 ref.

Descriptors: *Salmonella, *Clostridium, *Coliforms, *Bacteria, *Waste water treatment, Municipal wastes.

The effects of different methods of municipal waste water treatment in bacteriological characteristics were studied. Bacteria growing at 20C on gelatin, at 37C on agar, Clostridia, coliform bacteria, Streptococcus faecalis, Pseudomonas aeruginosa, and Salmonella were determined. Waste water treatment by means of activated sludge and percolation bodies caused no considerable improvement in the bacteria counts. Settlers, oxidation ditches, and the slow sand filtration method proved to be efficient in the reduction of the bacteria counts. Regardless of the treatment method, the reduction was most marked for bacteria growing at 20 and 37C, P. aeruginosa, and smallest for Clostridium and Salmonella. Salmonella, coliform bacteria, and P. aeruginosa proved to be highly sensitive to gamma-irradiation, while Clostridium and S. facalis were resistant. (Takacs-FIRL)
W77-11725

GUIDELINES FOR THE QUICK EVALUATION OF THE SEWAGE PURIFICATION PROCESS WITH ACTIVATED SLUDGE (PRZEWODNIK DLA SZYBKIEJ OCENY PRZEBIEGU OCZYSZCZANIA SCIEKOW OSADEM CZYNNYM. CZESC. III. ORGANIZMY RZADZIEJ SPOTYKANE),
Institute for Environmental Management, Warsaw (Poland).
H. Klimowicz.
Gaz, Woda i Technika Sanitarna, Vol 51, No 3, p 73-77, March, 1977. 1 tab, 23 ref.

Descriptors: *Microorganisms, *Bioindicators, *Activated sludge, *Water purification, *Sewage, Biological treatment, Analysis, Water quality standards, Sewage treatment.
Identifiers: Microfauna.

Guidelines for the identification of microfauna as bio-indicators for the purification process with activated sludge were presented. The microorganisms infusoria, rotifers, flagellates, rhizopods, turbellaria, gastrotriacha, nematodes, oligochaeta, etc. They appeared at different stages of the purification process and varied in number. Flagellates were indicative of poor progress in an inadequately working purification plant or its low purification level designed beforehand. Some species were rarely encountered and only in small numbers. Other species turned up in large numbers in poorly running plants, but decreased numerically to the extent that the plant operation improved. Due to the fact that 1 liter of activated sludge averaged 27,909,000 flagellates, 15,379,000 rhizopods, 27,000 gastrotrichae, 129,000 nematodes, and 29,000 oligochaetae (levels considered to be low in activated sludge, but much higher than in rivers and lakes), the role of this microfauna in the sewage purification process has to be regarded as substantial. Determinations of species and numbers present in samples would be excellent bioindicators to assess the level of sewage purification. (Tallert-FIRL)
W77-11726

EFFECTS OF NITRIFICATION IN THE ACTIVATED SLUDGE PROCESS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
M. E. Degyansky, and J. H. Sherrard.
Water and Sewage Works, Vol 124, No 6, p 94-96, June, 1977. 3 fig, 6 tab, 7 ref.

Descriptors: *Nitrogen, *Nitrification, *Biological treatment, *Activated sludge, Waste water treatment, Biological oxygen demand, Oxygen, Alkalinity, Oxidation, Eutrophication, Water pollution, Water quality standards.

The removal of waste water nitrogen, or its conversion to its most oxidized form, is frequently desirable. The process of nitrification, the biologically mediated conversion of NH4+-N to NO3--N, is considered in terms of oxygen demand and depletion of alkalinity. As a model, an example situation is used in which a completely mixed activated sludge process receives waste water with a variable BOD:NH4+-N ratio and a variable mean cell residence time. The oxygen requirement for the nitrification process is demonstrated to be not the constant value previously believed, but rather a value dependent on the BOD:NH4+-N ratio and on mean cell residence time. Likewise, the alkalinity destroyed is variable. These findings must be considered in designing biological waste treatment processes. (Pfeifer-FIRL)
W77-11727

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),
Pennsylvania State Univ., University Park.
R. F. Unz.
Journal Water Pollution Control Federation, Vol 49, No 6, p 1255-1268, June, 1977. 130 ref.

Descriptors: *Microbiology, *Microbial degradation, *Activated sludge, *Viruses, *Bacteria, *Disinfection, Diseases, Environmental sanitation, Chlorination, Anaerobic digestion, Irrigation practices, Water reuse, Fertilizers, Agriculture, Metals, Nutrients, Sewage sludge, Land reclamation, Sludge disposal, Waste water disposal, Waste water treatment, Analytical techniques, *Bibliographies.

A literature review of various aspects of microbial contamination by waste water treatment practices has included a survey of possible sources, types, and removal procedures. Among the methods of disinfection described were chlorination and ultraviolet irradiation. Seasonal variations in viral content of raw waste water and reduction methods are also described. A survey of studies on the roles that nutrient levels, metal ions, and toxic conditions play in the destruction and inhibition of bacteria is presented. Aerobic and anaerobic biodegradation are considered under a wide variety of conditions. Possible implications of contamination by bacteria and viruses contained in sludge and waste water used for agricultural purposes, such as irrigation, are outlined. (Schulz-FIRL)
W77-11729

DISINFECTION, (LITERATURE REVIEW),
Georgia Inst. of Tech. Atlanta.
A. W. Hoadley, and J. P. Gould.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1067-1074, June, 1977. 65 ref.

Descriptors: *Disinfection, *Chlorination, *Ozone, *Irradiation, *Bacteria, Viruses, Municipal wastes, Sewage treatment, Sludge treatment, Waste water treatment, Microorganisms, Environmental sanitation, Water Pollution Control Federation, *Bibliographies.

A literature review on disinfection is presented. Topics covered include the chemistry of chlorination and related microbiological effects. Possible effects of harmful products formed during the process of chlorination of organic compounds are discussed. Biological factors affecting disinfection, including resistance to chlorination and to aggregation, are cited. Ozonation and irradiation of waste water effluents are described as possible alternatives to chlorination. Inactivation of viruses present in sludge by gamma irradiation, disinfection, ozonation, and heating are reported. (Schulz-FIRL)
W77-11730

BEHAVIOR OF BENZIDINE AND OTHER AROMATIC AMINES IN AEROBIC WASTEWATER TREATMENT,
Los Angeles County Sanitation District, Whittier, Calif.
For primary bibliographic entry see Field 5B.
W77-11733

METHODS FOR THE EVALUATION OF THE RESULTS OF THE SELF-CONTROL-MEASUREMENTS CARRIED OUT BY THE SEWAGE TREATMENT PLANT OPERATORS (VERFAHREN ZUR AUSWERTUNG DER BETRIEBSERGEBNISSE VON KLAERWERKEN),
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft.
For primary bibliographic entry see Field 5A.
W77-11734

VARIATIONS IN NITROGEN AND ORGANICS IN WASTEWATERS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
S. J. Randtke, and P. L. McCarty.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE4, p 539-550, August, 1977. 7 fig, 4 tab, 12 ref.

Descriptors: *Ammonia, *Nitrification, *Diurnal distribution, *Oxygen requirements, *Design data, Nitrogen compounds, Nitrates, Nitrites, Chlorination, Aeration, Municipal wastes, Sewage treatment, Treatment facilities, Organic loading, Activated sludge, Organic wastes, Waste water treatment, Model studies.

Three activated sludge plants of different size and sludge characteristics were chosen for the examination of variations in nitrogen and organics in waste water. Design data for the San Jose/Santa Clara Water Pollution Control Plant, the Palo Alto Regional Water Quality Control Plant, and the Union Sanitary District Plant No. 3 (Union City) are provided. Treatment methods employed at the three facilities include primary treatment of raw influent sewage, activated sludge aeration, final clarification, and chlorination. At each plant grab samples of raw influent sewage and primary, secondary, and chlorinated effluents were taken at 2 hour intervals. A portion of each sample was filtered and then analyzed for ammonia, soluble COD, and soluble nitrogen (SON). Composite samples prepared according to flow were also analyzed, both filtered (for ammonia, COD, SON, nitrate, nitrite, soluble total organic carbon, and BOD) and unfiltered (for organic nitrogen, COD, BOD, pH, alkalinity, and suspended solids). Results indicated peak periods of flow in the morning and evening, possibly due to increased domestic use. As ammonia and organics loadings were observed to increase concurrently, plant designs should consider accommodation of large increases in oxygen demand and sufficient aeration to insure complete nitrification. Flow equalization, partial nitrification, denitrification, and breakpoint chlorination are also considered for the removal of excess ammonia. (Schulz-FIRL)
W77-11735

MEMBRANE FILTER TECHNIQUE FOR THE QUANTIFICATION OF STRESSED FECAL COLIFORMS IN THE AQUATIC ENVIRONMENT,
Montana State Univ., Bozeman. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W77-11736

INACTIVATION OF VIRUSES DURING ANAEROBIC SLUDGE DIGESTION,
Metropolitan Sanitary District of Greater Chicago, Ill.
J. J. Bertucci, C. Lue-Hing, and S. J. Sedita.
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1642-1651, July, 1977. 7 fig, 4 tab, 14 ref.

Descriptors: *Viruses, *Epidemiology, *Anaerobic digestion, *Disinfection, *Enteric bacteria, *Sludge disposal, Sludge treatment, Microbiology, Model studies, Microorganisms, Fertilizers, Biocontrol, Sludge disposal, Activated sludge, Waste water treatment.
Identifiers: Chicago(IL).

Because enteric viruses may be present in waste water and sludge, the Metropolitan Sanitary District of Greater Chicago initiated an investigation of the inactivation of viruses during anaerobic sludge digestion for treated municipal sludge destined for use as fertilizer and for reclamation of strip mines. High concentrations of various viruses, including coliphage MS-2, poliovirus A-9, coxsackievirus B-4 and A-9, and echovirus 11, were seeded into pilot-scale anaerobic digesters. A comparison of virus survival and digestion time indicated that inactivation for the various viruses ranged from 54.4% to 97.6% after 24 hours and from 92.5% to 99.7% after 48 hours. Variations in measurements taken on different days were attributed to undefined sludge characteristics other than volatile solids reduction and pH, which were consistent. Linear regression curves for percent survival and time in the digester were calculated for each of the viruses examined, with correlation coefficients ranging from 0.74 to 0.93. The percent inactivation per day of anaerobic digestion, represented by the slope determined by the linear regression, ranged from 74.9% for echovirus 11 to 97.3% for coxsackievirus A-9. (Schulz-FIRL)
W77-11737

PROBLEMS IN IMPLEMENTING U. S. WATER QUALITY GOALS,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 5G.
W77-11739

CURRENT SLUDGE RESEARCH AT THE WRC,
For primary bibliographic entry see Field 5E.
W77-11741

WATER TREATMENT PLANT DESIGN IS COST-EFFECTIVE,
Engineering-Science, Inc., Arcadia, Calif.
D. V. MacDonald, and L. Streicher.
Public Works, Vol. 108, No. 8, p 86-89, 114, August, 1977. 6 fig, 1 tab.

Descriptors: *Design criteria, *Construction costs, *Energy, *Hydraulic engineering, *Treatment facilities, Model studies, Flocculation, Filters, Sludge disposal, Sludge treatment, Waste water treatment.

A water treatment facility planned for the city of Oceanside, California has been designed for lower than average construction costs and for lower energy and manpower requirements. Provisions for a suction-type traveling sludge collector and a special filter design have reduced construction costs by eliminating the need for below-grade pipe galleries, access tunnels, and pump pits. Designs for static mixing devices should reduce plant power requirements to 30-40% of conventional requirements. The facilities are planned to treat 16 mgd, with the plant flow scheme including flash mixing, flocculation, sedimentation, filtration, and disinfection. Design criteria are listed for chemical mixing, flocculation, settling, filters, backwash recovery, and sludge disposal basins. Hydraulic pressure from the San Diego County Water Authority's No. 2 aqueduct system is converted to turbulent energy for use in chemical mixing and flocculation, eliminating the conventional need for mechanical energy during these processes. A modified baffle arrangement, designed on the basis of computer calculations of velocity gradient, head loss, and detention time, should provide tapered-energy flocculation at reduced flow rates. Backwash water will be derived from plant effluent. Construction costs for the 16.5 mgd plant are estimated at $3.7 million, as opposed to $4.5 to $5.0 million for a plant of similar size with conventional design considerations. (Schulz-FIRL)
W77-11742

THERMAL DRYING OF SLUDGE,
Ercole Marelli S.p.A., Milan (Italy).
For primary bibliographic entry see Field 5E.
W77-11743

EVALUATION OF SETTLING BASIN PERFORMANCE,
New Haven Water Co., Conn.
E. R. Coppock, III.
Journal of the New England Water Works Association, Vol. 91, No. 2, p 143-164, June, 1977. 4 fig, 4 ref.

Descriptors: *Settling basins, *Suspended solids, *Evaluation, *Design criteria, *Flow control, Flow rates, Sedimentation rates, Flocculation, Settling velocity, *Waste water treatment, Sewage treatment, Treatment facilities.
Identifiers: Settling basin efficiency.

An evaluation of settling basin characteristics and performance is presented, with particular emphasis on an 8 mgd treatment facility in New Haven, Connecticut. Factors considered include floc characteristics, temperature and viscosity of the water, and settling basin hydraulics. Observed variations in color, turbidity, and floc distribution in settling basins at the New Haven plant brought about an investigation of the possibility of short-circuiting of flow through the basins. Flow patterns in the two basins were traced by the addition of sodium chloride to the flash-mix tank and subsequent chloride analysis for samples taken from various areas within the basins. Curves produced for chlorine concentrations as a function of travel were similar for both basins and indicated that the flow was, in fact, being short-circuited by the overlapping slab at the sludge collector return passage and by the normal course of flow through the basin. Calculation of a basin 'efficiency curve' indicated that only 12% of the total basin contents was being detained for the designed theoretical detention time. Reduction of the plant flow from 8 mgd to 4 mgd increased the fraction of flow detained to 37% of the total flow. Solutions under consideration include the use of a rubber 'membrane' at the sludge collector return passage to inhibit water flow, extension of the upper apron of the collector passageway, and the construction of baffle plates in the basin to equalize flow. (Schulz-FIRL)
W77-11744

CHLORINATION DISINFECTION STUDY AT PROPHETSTOWN SEWAGE TREATMENT PLANT.
Water and Pollution Control, Vol. 115, No. 7, p 14-15, 17, 19, July, 1977. 2 fig, 1 tab.

Descriptors: *Disinfection, *Chlorination, *Model studies, *Bactericides, Equipment, *Enteric bacteria, *Waste water treatment, Water purification, Costs, Chlorine, *Sewage treatment, Treatment.
Identifiers: Hypochlorous acid, Hypochlorite.

The Penberthy unit was designed as an alternative to the conventional diffuser method of disinfection. A pilot study was initiated to determine if the unit could lower costs for disinfection by using less chlorine while still maintaining adequate bactericidal capacities. The Penberthy unit, operating on the principle of the plug flow reactor, rapidly mixes gaseous chlorine and waste water. The formation of hypochlorous acid and hypochlorite from the breakdown of chlorine, and the thorough bacteria-chlorine contact brought about by the rapid mixing, result in high disinfection rates for the unit. Tests indicate that the Penberthy unit requires only half as much chlorine to adequately destroy enteric bacteria as the conventional method of disinfection. (Schulz-FIRL)
W77-11745

AEROBIC BIO-TREATMENT OF A HIGH-STRENGTH LEACHATE,
Northern Purification Services Ltd., North Vancouver (British Columbia).
V. C. Uloth, and D. S. Mavinic.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE4, p 647-661, August, 1977. 4 fig, 3 tab, 12 ref, 1 append.

Descriptors: *Activated sludge, *Leachate, *Landfills, *Heavy metals, *Biological treatment, Suspended solids, Aerobic treatment, Microorganisms, Design data, Model studies, Chemical oxygen demand, Biochemical oxygen demand, Sludge digestion, Organic loading, *Waste water treatment.

An aerobic biological treatment method to process high-strength leachates produced by sanitary landfills is described. The three phases of the study included: an acclimatization/metal removal study, an 'extended aeration' efficiency study, and a 'shorter detention time' efficiency study. Leachate used in the studies was generated by waste activated sludge from municipal and industrial sources. The acclimatization/metal removal study established a microbial population in the digester for use in later phases, and examined metal removal by the biological floc while monitoring total solids and BOD. The high levels of mixed liquor volatile suspended solids (MLVSS) of 8,000-16,000 ppm produced in this phase were in excess of those needed for activated sludge processes. Retention time (theta c) and food-to-microorganism (F/M) ratios were considered with respect to treatment efficiency and metal removal during the second and third phases of the study. With very high MLVSS concentrations and air and mechanical mixing, a retention time as low as 10 days was sufficient for foam control and stable digester operation. Heavy metals at high concentrations did not seem to affect the microbial digester community. High pH values (above 8.5) and high MLVSS in the digesters enhanced metal uptake by the biological floc. COD removals decreased at increasing F/M ratios, and increased with increasing solids retention times for both the mixed liquor and settled effluents. Recommended parameters for optimum treatment of a similar leachate were a retention time of at least 20 days and an F/M ratio of less than 0.15 kg BOD/kg MLVSS per day. (Schulz-FIRL)
W77-11746

WATER QUALITY MANAGEMENT—RESEARCH AND DEVELOPMENT AREAS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5G.
W77-11747

SEWAGE SLUDGE FOR AGRICULTURAL USE,
Department of Agriculture, Washington, D.C. Public Information Office.
For primary bibliographic entry see Field 5E.
W77-11748

ULTRAVIOLET LIGHT ENHANCES OZONIZATION OF ORGANICS DISSOLVED IN WASTEWATER.
Chemical Engineering, Vol. 84, No. 16, p 18, August, 1977.

Descriptors: *Ozone, *Ultraviolet radiation, *Polychlorinated biphenyls, *Organic wastes, Organic compounds, Oxidation, Chemical degradation, Waste water treatment.

The Westgate Research Corporation of Los Angeles, California has developed a system for the oxidation of organics from ozone-enriched waste water by exposure to a series of ultra-violet lamps. The method is reported to oxidize all dissolved organic chemicals to carbon dioxide, water, and other oxidation by-products. It also eliminates viruses and other microorganisms. Heavy metals are precipitated as oxides or metals. The process is reported to be more efficient than carbon adsorption and not much more costly. The treatment system will be marketed in 20,000 gal/day modules which may be combined to increase treatment capacity. (Schulz-FIRL)
W77-11749

IS THERE A POTENTIAL FOR PARASITIC DISEASE TRANSMISSION FROM LAND APPLICATION OF SEWAGE EFFLUENTS AND SLUDGES,
Pittsburgh Univ., Pa. Dept. of Life Sciences.
For primary bibliographic entry see Field 5E.
W77-11750

SALVAGING AN OLD SEWAGE PLANT CUTS TERTIARY TREATMENT COSTS.
Construction Week, Vol. 199, No. 2, p 23-24, July, 1977.

Descriptors: *Tertiary treatment, *Activated sludge, *Filtration, *Model studies, *Water quality, Suspended solids, Biochemical oxygen demand, Chlorination, Polymers, Sludge treatment, Municipal wastes, Cost comparisons, Aerated lagoons, Treatment facilities, Waste water treatment.

In upgrading its waste water treatment facilities, Dallas has added activated sludge and filtration treatment to its existing trickling filter plant. The city invested $38 million to achieve 96% removal of suspended solids and BOD instead of construction new facilities at an estimated $150 million. Pilot studies were carried out at a plant which contained an activated sludge unit, a flocculation-sedimentation unit, two filtration units, two activated carbon columns, and two chlorine contact basins. Data from this pilot plant, which was designed for flexibility to accommodate changing water quality standards, were used to evaluate design standards for the larger facility. The new plant was designed to meet standards for effluent discharged into the Trinity River of 10 ppm each for suspended solids and BOD, with provisions for more stringent future regulations. Special features in the upgraded facility include chemical control of solids in the activated sludge process and effluent filters; chlorination of activated sludge, to prevent filamentous growth during sedimentation; and the addition of polymer after aeration, to prevent concentration of solids. Annual operating costs are estimated at $7 million, a $5 million increase over previous costs for a facility without tertiary treatment. (Schulz-FIRL)
W77-11751

AUTOMATIC DISSOLVED OXYGEN CONTROL,
Flanagan and Associates, San Francisco, Calif.
M. J. Flanagan, B. D. Bracken, and J. F. Roesler.
Journal of the Environmental Engineering Division, Proceeding of ASCE, Vol. 103, No. EE4, p 707-722, August, 1977. 9 tab, 5 fig, 3 ref, 1 append.

Descriptors: *Automatic control, *Dissolved oxygen, *Activated sludge, *Aeration, *Cost comparison, Dissolved oxygen analyzers, Cost-benefit analysis, Sludge treatment, Instrumentation, Economic feasibility, Analytical techniques, Operation and maintenance, Maintenance costs, Operating costs, Energy, Waste water treatment.
Identifiers: Automatic dissolved oxygen control.

Various types of air and pure oxygen dissolution control systems for use in the activated sludge process are described and evaluated. Aspects of diffused air aeration for the production of air bubbles in mixed liquor include control of centrifugal blowers and the design and operation of diffuses air aeration control systems. Mechanical aerators of plate, updraft, downdraft, combination, and brush types may also be used in the activated sludge process. Possible systems for control of mechanical aeration include on-off aerator control, two-speed aerator control, variable speed aerator control, variable impeller depth control, and variable level control. Cost comparisons for automatic dissolved oxygen control systems and system components are presented. Design data for typical activated sludge plant aeration systems have been calculated according to plant size. Operation and maintenance costs, capital costs, and acquisition feasibility have been estimated for various plant sizes and control systems. The use of automatic dissolved oxygen control is suggested for activated sludge plants handling more than 1 mgd with unequal loading conditions, sufficient oxidation tank or aerator capacity, and unlimited aerator turndown capacities to provide consistent effluent quality and less strain on aeration equipment. (Schulz-FIRL)
W77-11752

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),
Wastewater Treatment.
For primary bibliographic entry see Field 5F.
W77-11753

RHINELANDER SOLVES I AND I PROBLEMS,
Howard, Needles, Tammen and Bergendoff, Milwaukee, Wis. Dept. of Environmental and Municipal Engineering.
R. G. Larget.
Water and Wastes Engineering, Vol. 14, No. 7, p 46, 48, 50, July, 1977. 1 fig.

Descriptors: *Sewerage, *Infiltration, *Treatment facilities, *Inflow, *Sewers, Monitoring, Data collections, Manholes, Industrial wastes, On-site data collections, Water utilization, Waste water treatment.
Identifiers: Rhinelander(WI).

In compliance with EPA regulation PL92-500 an Infiltration/Inflow Analysis, a revised environmental statement, and a facilities plan were provided before construction of a secondary treatment facility at Rhinelander, Wisconsin. The Infiltration/Inflow analysis included field monitoring of flow in the six major service areas in the system, with HNTB-designed fiberglass weir boxes equipped with interchangeable back plates for variable sewer sizes and stage flow recorders. Field study results and past records on plant operations, climatology, and water usage were used to predict average and peak flow contributions to sub-areas within each service area. Inflow was traced to three sources: 0.12 mgd added through manhole covers, 0.20 mgd from two groceries and cooling water from an industry, and 0.03 mgd from building roof drain connections. Infiltration rates were significant for one new sewer main, but not appreciable for any area. Costs for the recommended 1.9 mdg plant expansion were projected at $1.75 million. (Schulz-FIRL)
W77-11754

REMOVE ALGAE AND HIGH COSTS TOGETHER,
CH2M/Hill, Inc., Portland, Oreg.
K. V. Leininger.
Water and Wastes Engineering, Vol 14, No 7, p 32-35, July, 1977. 2 fig, 21 ref.

Descriptors: *Algae, *Suspended solids, *Ponds, *Tertiary treatment, Sewage treatment, Filtration, Aeration, Dewatering, Cost comparisons, *Waste water treatment.
Identifiers: Stabilization ponds, Sand filtration, Granular media filtration, Chemical treatment.

In response to EPA regulations on stabilization ponds and effluent quality various methods for the removal of algae, BOD, and suspended solids from effluents are discussed, with emphasis on systems handling more than 1 mgd. Methods for improving effluent quality include upgrading of existing stabilization ponds and replacement of ponds by mechanical and chemical treatment facilities. Intermittent sand filtration and the removal of algae by chemical treatment followed by granular media filtration are suggested as the two most reliable alternative methods. Two configurations for chemical treatment and filtration are presented: the replacement of ponds by a secondary treatment facility, and the addition of an initial aerated pond and chemical treatment of pond effluent to existing stabilization pond facilities. Although the second alternative may require the acquisition of additional land, its capital, operation, and maintenance costs may be 20% less than for pond replacement. Methods of sludge handling and disposal considered include air drying on sand beds, recycling of chemical-algae sludge to stabilization ponds, mechanical dewatering, and vacuum filtration. Advantages in process flexibility of stabilization ponds include fast start-up and shutdown, more hydraulic flexibility, and suspended solids removal adjustment by chemical dosages. Changes in productivity with weather conditions are suggested as possible disadvantages. (Schulz-FIRL)
W77-11755

INACTIVATION OF POLIOVIRUS IN WASTEWATER SLUDGE WITH RADIATION AND THERMORADIATION,
Sandia Labs., Albuquerque, N. Mex.
R. L. Ward.
Applied and Environmental Microbiology, Vol 33, No 5, p 1218-1219, May, 1977. 2 fig, 11 ref.

Descriptors: *Viruses, *Thermal radiation, *Irradiation, *Bioassay, Sewage treatment, Sludge disposal, Waste water treatment, Human diseases, Pathology, Waste disposal, Microbiology.
Identifiers: *Poliovirus, Virus inactivation, Thermoradiation.

Agricultural uses of treated waste water sludge may be limited by hazardous pathogens present in sludge. Experimental methods to rid sludge of bacterial pathogens, viruses, and parasites include exposure to ionizing radiation, alone and in combination with heat (thermoradiation). Since viruses can be insulated from inactivation by raw sludge and a variety of other substances, the effect of sludge on the rate of viral inactivation by radiation and thermoradiation was investigated. For these experiments the poliovirus type 1 strain CHAT was diluted 10-fold with phosphate-buffered saline (PBS) which contained appropriate amounts of raw sludge. It was established in control experiments that the D-value (the amount of radiation necessary to inactivate 90% of the virus) in PBS without sludge was 192 krads. The addition of small amounts of sludge to the PBS significantly increased the D-value. The D-value was 332 krads for sludge containing 0.78% solids and 340 krads for 2.34% solids for samples which were heated at 47C for 10 minutes. The D-value approaches a plateau at approximately 1.00% solids, suggesting that small amounts of sludge are nearly as protective of viruses as larger amounts. An investigation

into the effect of raw sludge on poliovirus inactivation showed that although raw sludge was very protective of poliovirus against heat and radiation inactivation, the effects were not additive. This suggests that thermoradiation treatment may be an effective method of virus inactivation in waste water as long as suspended solid concentrations are low. (Schulz-FIRL)
W77-11756

EFFECT OF SHAPE OF PADDLE AND CONTAINER ON FLOCCULATION PROCESS,
Visvesvarya Regional Coll. of Engineering, Nagpur (India).
A. G. Bhole, and P. Limaye.
Journal of the Institution of Engineers (India), Vol 57, Part EN 2, p 52-57, February, 1977. 11 fig, 3 tab, 4 ref.

Descriptors: *Flocculation, *Turbidity, *Design criteria, *Chemical precipitation, *Liquid wastes, Water purification, Colloids, Waste water treatment.
Identifiers: *Paddles(D-prime and C-prime shaped).

A study of the controlling factors in the process of flocculation has concluded that the container and paddle geometry, in addition to other physical and chemical factors, can affect floc formation. The purpose of this study was to examine the effect of paddle and container shape on the removal of turbidity during the flocculation process. Container shapes examined were circular, hexagonal, pentagonal, square, and triangular. The pentagonal shape created maximum size flocs for fastest settling. Paddle shape was considered while keeping the area of the paddle and the shape of the container constant. A D'-shaped paddle was considered the most efficient for removal of turbidity, with the C'-shaped paddle being the next best. All experiments were conducted on Fuller's earth at pH 7, using acetic acid, sodium hydroxide, and sodium bicarbonate. (Schulz-FIRL)
W77-11758

WASTEWATER FLOW MEASUREMENT IN SEWERS USING ULTRASOUND,
Milwaukee Sewerage Commission, Wis.
For primary bibliographic entry see Field 7B.
W77-11759

INSTRUMENTATION AND AUTOMATION EXPERIENCES IN WASTEWATER-TREATMENT FACILITIES,
Raytheon Co., Portsmouth, R. I.
A. E. Molvar, J. F. Roesler, and R. H. Babcock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 232, Price codes: A17 in paper copy, A01 in microfiche. Report EPA-600/2-76-198, October 1976. 371 p, 18 fig, 11 tab, 24 ref, 3 append.

Descriptors: *Automation, *Automatic control, *Instrumentation, *Data processing, *Waste water treatment, Surveys, Control systems, Monitoring, Waste treatment, Storm water.
Identifiers: Control loops, Sensors.

A comprehensive nationwide survey of current and potential instrumentation and automation applications in 50 waste water treatment facilities was conducted to evaluate existing and prospective water treatment practices. The survey revealed that most waste water treatment facilities employ fewer instruments and automatic control devices than similar water supply and chemical processing plants. Flow and level measuring devices comprised much of the instrumentation present in the surveyed facilities. Based on operational experiences, the following parameters were considered reliably measurable by commercially available instruments: level, flow, temperature, pressure, speed, weight, position, conductivity, rainfall, turbidity, pH, free and residual chlorine, and free flammable gases. Other sensors and measuring devices were subject to fouling and required more frequent calibration and maintenance. It was observed that although most facilities used automatic devices to control liquid level, liquid flowrate, and air flowrate, other applications of automatic control were limited. Further research into the development of more successful sensors for organic contaminants, suspended solids, storm water, phosphates, and ammonia is suggested. Research into control loops for organic load equalization, food-to-microorganism ratio, break-point chlorination, phosphate removal, and feed-forward DO control is recommended. Computer hardware and software requirements are outlined. (Schulz-FIRL)
W77-11760

SELECTED APPLICATIONS OF INSTRUMENTATION AND AUTOMATION IN WASTE-WATER-TREATMENT FACILITIES,
Raytheon Co., Portsmouth, R. I.
A. E. Molvar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 777, Price codes: A14 in paper copy, A01 in microfiche. Report EPA-600/2-76-276, December 1976. 312 p, 91 fig, 60 tab, 67 ref, 2 append.

Descriptors: *Automation, *Automatic control, *Instrumentation, *Combined sewers, *Waste treatment, Activated sludge, Cost-benefit analysis, Sewage treatment, Waste water treatment.

Automatic controls in waste treatment facilities are considered as a means of maximizing efficiency, reducing energy and labor costs, and maintaining consistent effluent quality under varialbe loading. Various applications for automatic monitoring are discussed, as well as possible sources of error. Among the dry-weather processes considered for automation are: influent pumping and pretreatment control, primary sludge pumping, aeration, biodegradation, filtration, secondary sludge pumping, disinfection, anaerobic digestion, sludge conditioning, dewatering, incineration, neutralization of acids and bases, and removal of phosphorus. Controls on wet-weather treatment processes and collection systems are considered for three hypothetical catchment areas as a means of alleviating overflow pollution in combined sewer systems. A survey of 50 treatment facilities indicated that far less automatic equipment was in use than was commercially available and reliable. Cost/benefit analyses showed that automatic control of certain processes is feasible for smaller plants (1 to 5 mgd). Processes recommended for automatic control include: prechlorination, aeration, digestion, disinfection, phosphorus removal, and pH adjustment. (Schulz-FIRL)
W77-11761

DISINFECTION EFFICIENCY AND RESIDUAL TOXICITY OF SEVERAL WASTEWATER DISINFECTANTS: VOLUME I - GRANDVILLE, MICHIGAN,
Grand Valley State Colleges, Allendale, Mich. Dept. of Biology.
R. W. Ward, R. D. Giffin, G. M. DeGraeve, and R. A. Stone.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 245, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-600/2-76-156, October 1976. 144 p, 1 fig, 50 tab, 86 ref.

Descriptors: *Disinfection, *Chlorination, *Toxicity, *Ozone, *Bromine, Aquatic life, Model studies, Environmental sanitation, Microorganisms, Environmental effects, Bioassay, Sulfides, Bactericides, Daphnia, Fish, Efficiency, Municipal wastes, Waste water treatment.
Identifiers: Bromine chloride, Ozonation, Grandville(MI).

Possible toxic effects associated with chlorination of waste water have prefaced this study on waste water disinfectants. Chlorine, bromine chloride, and ozone were examined for relative bactericidal efficiency and residual toxicity at a waste water treatment plant in Grandville, Michigan. The Grandville plant uses secondary activated sludge processes and chemical removal of phosphates to treat an average flow of 2.6 mgd of municipal wastes. A manually-controlled feed system with a continuous residual chlorine analyzer and recorder is used to chlorinate effluent. For study purposes, a portion of the settled unchlorinated effluent was divided into three streams for ozonation, bioassay, and disinfection with bromine chloride. A portion of the chlorinated stream was dechlorinated with sulfur dioxide. Total and fecal coliform densities, suspended solids, volatile solids, COD, ammonia nitrogen, phosphate, turbidity, color, and pH were monitored for the five waste water streams. Studies indicated that disinfection was more reliable with chlorination, with or without SO2 dechlorination, than with bromine chloride treatment. Disinfection with ozone injection was adequate only after filtration. Acute toxicity tests on Daphnia, fathead minnows, and several species of fish indicated that the toxic effects of chlorination could be eliminated with sulfur dioxide dechlorination. No toxic effects were observed for chlorobrominated or ozonated effluents. (Schulz-FIRL)
W77-11762

WATER RELATED UTILITIES FOR SMALL COMMUNITIES IN RURAL ALASKA,
Corvallis Environmental Research Lab., College, Alaska. Arctic Environmental Research Station.
B. Puchtler, B. Reid, and C. Christianson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 964, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/3-76-104, September 1976. 82 p, 17 fig, 5 tab, 5 ref.

Descriptors: *Treatment facilities, *Alaska, *Cold regions, *Sewage treatment, *Municipal wastes, Laundering, Domestic wastes, Potable water, Water utilization, Water reuse, Waste treatment, Incineration, Pilot plants, Model studies, Chemical degradation, Public health, Waste water treatment.
Identifiers: Central community facility concept.

The Alaska Village Demonstration Projects (AVDP) were implemented to examine practical solutions to water supply and waste disposal problems where difficult terrain, unfavorable soil conditions, and severe climate prohibit conventional treatment methods. Major objectives of AVDP were to construct and evaluate central community facilities for communities where water distribution and collection systems were unpractical. Design data for the facilities at Wainwright and Emmonak are presented. Treatment of the high quality raw water for drinking purposes included only filtration, carbon adsorption, and chlorination. Treatment systems were provided for graywater (laundry, shower and sink waste water) and blackwater (toilet waste water). Since year-round sources of liquid water were not available, graywater was treated for reuse. Graywater treatment included disinfection with a quarternary ammonium compound, upflow clarification with lime, and chlorination. One problem associated with graywater treatment was variation in plant performance caused by influent temperature fluctuations and sludge carryover from the upflow clarifier. Blackwater was carried to the central facility, chemically treated, centrifuged, and incinerated. The community centers also provided laundry and bathing facilities and potable water for the village inhabitants. The Central Community Facility concept was a viable method of providing water services to Alaskan villages when combined with a vehicular distribution and collection system. (Schulz-FIRL)
W77-11763

EFFICIENCY PROBLEMS FROM USER FEES IN MUNICIPAL WASTEWATER TREATMENT,
National Bureau of Standards, Washington, D.C. Building Economics Section.
H. E. Marshall, and R. T. Ruegg.
Water Resources Bulletin, Vol. 12, No. 5, p 903-917, October 1976. 2 tab, 8 ref.

Descriptors: *Economic efficiency, *Waste water(Pollution), *Pollution abatement, *Cost sharing, *Legislation, *Regulation, Water resources, Municipal water, Treatment facilities, Financing, Grants, Equations, Industries, Costs, Projects.
Identifiers: *User fees, Algebraic expressions, Federal costs, Cost shares, Sensitivity.

The Environmental Protection Agency administers a construction grant program to encourage abatement of wastewater pollution by sharing with municipalties the costs of wastewater treatment facilities. The enabling legislation (P.L. 92-500) specifies that EPA's cost share will be 75% of construction costs. If further requires municipalities to collect user fees from industrial users of the facilities to repay that part of the federal grant allocable to the treatment of industrial wastewater. The municipality is allowed to retain the remaining half. Retention by municipalities of these user fees lowers their effective cost shares and results in the following consequences: (1) a bias for municipalities to select certain kinds of abatement techniques regardless of whether or not they are the least-cost techniques from the national perspective; (2) a bias for municipalities to select larger-than-optimal scales of abatement facilities; (3) a hidden federal subsidy to industry; and (4) grants that favor industrial communities. This article examines the legislative and regulatory requirements for user charges, derives the algebraic expressions for calculation the real federal municipal and industrial cost shares with user fees; computes municipal cost shares for selected values of the determinant factors; evaluates efficiency and other consequences of current user fee arrangements; and concludes that efficiency distortions caused by the impacts of user fees on cost sharing could be eliminated by requiring that all user fees collected from industry against the federal cost share be returned to the U.S. Treasury. (Bell-Cornell)
W77-11783

POLLUTANT REMOVAL FROM COAL-ASH BASIN EFFLUENT,
Texas Univ. Health Science Center, Houston. School of Public Health.
For primary bibliographic entry see Field 5A.
W77-11784

USE OF IRON SALTS FOR CONTROL OF ACTIVATED SLUDGE BULKING CAUSED BY SPHAEROTILUS,
Illinois Univ. at Urbana-Champaign. Dept. of Nuclear Engineering.
J. T. Pfeffer, and Y. Chang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 321, Price codes: A05 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 127, July 1977. 87 p, 9 tab, 23 fig, 6 ref. S-059-ILL.

Descriptors: *Activated sludge, *Sewage treatment, *Waste water treatment, Salts, Iron, Sludge treatment, Bioindicators, *Iron compounds.
Identifiers: *Sludge bulking, *Sphaerotilus inhibition.

A continuing operational problem encountered in the activated sludge system is sludge bulking. While there are several causitive agents for this bulking, the filamentous bacterium Sphaerotilus is one of the more common. Control of the growth of this organism will help to eliminate sludge bulking as an operating problem in many activated sludge systems. Iron has been identified in the literature as a possible inhibitor to the growth of this bacterium. However, little is known about the mechanism of this inhibition. This study has shown that the adsorption of iron on Sphaerotilus is the major inhibitory mechanism. The layer of iron on the organism appears to block the transport of nutrients through the sheath and cell wall and hence inhibit the growth of this organism. The effectiveness of the iron compounds in this inhibition corresponds to the physical characteristics of the absorbed iron. Soluble iron complexes form a uniform layer so that the inhibitory effect is proportional to the iron absorbed. Among the soluble complexes, the ferrous forms are more effective. These forms can penetrate the sheath and deposit on or near the cell wall resulting in greater inhibition. On the other hand, the ferric complexes are deposited on or in the sheath of the organism.
W77-11789

BIOLOGICAL EVALUATION OF BEST PRACTICABLE AND BEST AVAILABLE TREATMENT CONTROL TECHNOLOGY FOR PETROLEUM REFINERY WASTEWATERS,
Oklahoma State Univ., Stillwater. Reservoir Research Center.
S. L. Burks, and J. L. Wilhm.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 281, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, (1977). 129 p, 23 fig, 28 tab, 7 ref, 2 append. OWRT B-033-OKLA(1), 14-34-0001-6110.

Descriptors: Effluents, Lagoons, *Waste water treatment, Technology, Industrial wastes, *Waste water treatment, Technology, *Oil wastes, *Biological treatment, *Sewage treatment, Invertebrates.

A biological evaluation of conventional secondary biological treatment, Best Practicable Treatment Control Technology and Best Available Technology Economically Achievable was performed to determine the effectiveness of the treatment systems for producing nontoxic effluents from petroleum refining wastewaters. On-site continuous-flow fathead minnow and benthic macroinvertebrate bioassays were used to measure the toxic effects of the test effluents. BATEA, sequential biological treatment-dual media filtration-activated carbon adsorption, improved final effluents by adsorbing slugs of chemicals which had upset the conventional biological treatment systems and thus protected the bioassay organisms from lethal doses of chemicals. A waste stabilization lagoon system produced a final effluent of comparable quality as that of BATEA as measured by changes in species diversity, number of taxa and mean density of benthic macroinvertebrates. BPTCT, sequential biological treatment-dual media filtration, did not significantly improve final effluent quality as measured by fathead minnow and benthic macroinvertebrate bioassays. The technique of using benthic macroinvertebrate colonized artificial substrate samplers as a bioassay tool was developed and successfully demonstrated in this evaluation of wastewater treatment methods used in the petroleum refining industry.
W77-11790

AN INVESTIGATION INTO ENVIRONMENTAL EFFECTS OF SEWAGE EFFLUENT REUSE AT THE KANE'OHE MARINE CORPS AIR STATION KLIPPER GOLF COURSE,
Hawaii Univ., Honolulu. Water Resources Research Center.
R. H. F. Young, and S. Y. K. Chang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 320, Price codes: A04 in paper copy, A01 in microfiche. Technical Memorandum Report No. 53, January 1977. 57 p, 19 fig, 10 tab, 32 ref, 5 append. OWRT A-064-HI(1), 14-34-0001-6012.

Descriptors: *Water reuse, *Irrigation, Reclaimed water, Groundwater, *Environmental effects, *Sewage effluents, *Golf courses, *Waste disposal, Infiltration, Water pollution effects, *Hawaii, Waste water treatment, Treatment facilities.
Identifiers: Land disposal, Kane'ohe Marine Corps Air Station, Oahu, Hawaii, Low humic latosols, Jaucas, Regosols.

An investigation of waste water reuse by spray irrigation was conducted at the Kane'ohe Marine Corps Air Station (KMCAS) Klipper Golf Course on Oahu. The study was conducted in three phases: (1) waste water characterization of the KMCAS Sewage Treatment Plant, (2) groundwater quality analysis, and (3) air quality analysis of indicator bacterial levels during spray irrigation with waste water. Waste water analyses showed that the KMCAS Sewage Treatment Plant, employing the trickling filter process with a final polishing pond, is capable of removing a high percentage of biodegradable substances and suspended solids. The effluent appears to be of good quality for agricultural irrigation use. High concentrations of sodium and chloride, due to brackish groundwater infiltration into the sewage system, were not considered to be a hazard to the salt-tolerant bermudagrass. The two predominant soils on the KMCAS Klipper Golf Course, the Ewa silty clay loam (Low Humic Latosols) and the Jaucas (Regosols), appeared to be very effective in removing nitrogen, phosphorus, and fecal coliforms from the applied effluent. The quality of the perchlorate does not present a hazard to the groundwater quality. Runoff from the golf course does not present a hazard to the adjacent surface waters. Analyses of spray irrigation fallout samples at the KMCAS Klipper Golf Course resulted in the isolation of coliform bacteria up to 91 m (300 ft) downwind of the sprinkler sources. Coliform bacteria recovery rates depended upon the initial coliform bacterial concentrations in the effluent and upon wind velocities. The presence and concentration of aerosolized coliform bacteria were not considered a public health hazard to golf course users, workers, or nearby residents.
W77-11792

LABORATORY STUDIES OF UPGRADING EFFLUENT WATER QUALITY FROM SEWAGE LAGOONS,
Montana State University, Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
R. L. Sanks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 312, Price codes: A05 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Research Report No. 84, March 1977. 77 p, 8 fig, 17 tab, 70 ref. OWRT A-089-MONT(1), 14-34-0001-6027.

Descriptors: *Sewage lagoons, *Oxidation lagoons, Algae, Water pollution, Suspended solids, Nutrients, Filtration, Coagulation, *Montana, *Water quality, *Waste water treatment.
Identifiers: Microstraining.

Water from a municipal sewage lagoon was treated in the laboratory by four processes: coagulation, rock filtration, intermittent sand filtration and rapid sand filtration. All processes were capable of producing effluent that would nearly meet (and some would exceed) the requirements of Public Law 92-500. Rapid sand filtration was impractical due to short filter runs. An extensive literature search revealed that the processes of greatest promise for effectiveness, reliability, and economy under Montana conditions appear to be: intermittent sand filtration, seasonal discharge at selected times, and integrated ponding systems with enclosed chambers or deep lagoons designed to remove algae by sedimentation. A realistic field research program is needed to evaluate the reliability and economy of these processes for upgrading Montana lagoons. (Stuart-Mont State)

W77-11793

A FUNDAMENTAL STUDY OF REMOVAL MECHANISMS OF SUSPENDED PARTICLES IN THE DEEP FILTER (III) (KYUSOKU ROKAROSO NO KYODO (III): TEIJO ROKAJI NO RIHAKU TO SONO SAYO KIKO NO KENTO),
K. Ebie.
Journal of Japan Water Works Association, No. 507, p 20-34, December, 1976. 9 fig, 2 tab, 19 ref.

Descriptors: *Suspended particles, *Flocculation, *Filtration, *Microscopy, *Filters, Colloids, Slurries, Suspension, Waste water treatment, Water treatment.

Microscopic examination of particles undergoing filtration has been used to better understand filtration theory. Experimental observation of deposit behaviors during direct filtration was made through the microscope by camera. It is suggested that two modes of floc particle breakdown occur. Minute suspended particle size breakdown occurs continuously during the filter run, while cluster breakdown of deposit thickness size occurs intermittently at a later stage. Mechanisms such as electrophoretic mobility which affect particle breakdown in filtration are discussed. (Schulz-FIRL)
W77-11829

PHYSICAL-CHEMICAL TREATMENT OF A MUNICIPAL WASTEWATER USING POWDERED CARBON: NO. II,
Envirotech Corp., Salt Lake City, Utah. Eimco BSP Div.
D. E. Burns, R. N. Wallace, and D. J. Cook.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 134, Price codes: A15 in paper copy, A01 in microfiche. Report EPA-600/2-76-235, November 1976. 328 p, 106 fig, 54 tab, 17 ref, 3 append.

Descriptors: *Activated carbon, *Chemical degradation, *Filtration, *Adsorption, Dewatering, Sewage treatment, Model studies, Diurnal distribution, Chemical oxygen demand, Suspended solids, Phosphorus, Treatment, Municipal wastes, Effluents, Water quality, Pilot plants, Waste water treatment.
Identifiers: *Physical-chemical treatment, Powdered carbon, Carbon sludge thickening, Ferric chloride, Alum, Fluidized bed furnace, Salt Lake City(UT).

Chemical coagulation-precipitation followed by powdered activated carbon adsorption and granular media filtration has been examined as a method of physical-chemical treatment of waste water during a pilot study in Salt Lake City. With alum or FeCl13 pretreatment, two-stage counter-current powdered carbon contacting, and typical diurnal flow conditions, the process produced high quality effluent with less than 5 mg/liter COD, 5 mg/liter suspended solids, and 0.3 mg/liter phosphorus. In excess of 90 percent of used carbon was regenerated using a fluidized bed furnace. No significant loss of treatment effectiveness was observed when thermally regenerated carbon was reused in the powder activated carbon process. Costs for the alum-powdered carbon treatment of 10 mgd of Salt Lake City waste water were estimated at 36.2 cents/1000 gal and were reduced to 33.4 cents/1000 gal when carbon was thermally regenerated and reused. Cost sensitivity studies, comparison of parallel granular and powdered carbon systems, further pilot studies, and an evaluation of chemical-primary sludge dewatering alternatives are recommended. (See also W74-00154) (Schulz-FIRL)
W77-11830

THE USE OF POLLUTED SOURCES FOR WATER SUPPLY,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5F.
W77-11858

FINAL ENVIRONMENTAL IMPACT STATEMENT: AUBURN INTERCEPTOR (GREEN RIVER SEWERAGE AREA), KING COUNTY, WASHINGTON.
Environmental Protection Agency, Seattle, Wash. Region X.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 991, Price codes: A19 in paper copy, A01 in microfiche. June 13, 1975, 258 p, 14 fig, 35 tab, 5 append. EPA-C-530475-2.

Descriptors: *Environmental effects, *Interceptor sewers, *Washington, *Wetlands, *Sewage disposal, *Growth rates, Revegetation, Water quality, Sludge disposal, Alternate planning, Land use, Planning, Air quality, Air pollution, Ecosystems, Habitats.
Identifiers: *Seattle(WA), King County(WA), Auburn Interceptor sewers, *Environmental Impact Statement, *Environmental impacts, Green River.

The subject action for this Environmental Impact Statement is the awarding of grant funds to the Municipality of Metropolitan Seattle for the construction of an interceptor sewer line in King County, Washington, to service the Green River Sewerage Area. Major adverse primary impacts and mitigative measures are detailed. The construction corridor passes through a small permanent wetland. summer construction with revegetation, or relocation of the pipeline, are alternatives. The interceptor will cause an increase in the effluent dischargedd by the sewage treatment plant which could diminish water quality. Dechlorination, low flow augmentation, and advanced treatment are possible remedies. Sludge removal alternatives include provision of digestors at other locations, or removal by barge. No adverse impacts are anticipated on archaeological, historical, or cultural resources. Major adverse secondary impacts resulting from growth and development are detailed. Surface water quality will decrease due to urban runoff. Total suspended particulates in the air will exceed secondary standards. There is a potential for loss of wetlands, vegetation, and wildlife habitat, given the present local land use plants. Mitigative measures are suggested. Several alternatives to the Auburn Interceptor are described and evaluated. (Nessa-NC)
W77-11861

PILOT PLANT EXPERIENCES IN DEMINERALIZATION OF SECONDARY EFFLUENT USING ELECTRODIALYSIS,
Environmental Protection Agency, Cincinnati, Ohio.
C. A. Brunner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 748, Price codes: A03 in paper copy, A01 in microfiche. Report Presented at 39th Annual Meeting of the Water Pollution Control Federation, Kansas City, MO on Sept. 29, 1966, October 1966. 37 p, 7 fig, 5 tab, 1 ref.

Descriptors: *Water purification, *Water quality control, *Demineralization, *Water reuse, Tertiary treatment, Separation techniques, *Electrodialysis, *Waste water treatment.

Electrodialysis is one method for partially demineralizing water. Bench-scale studies demonstrated that the process might be economically practical for removing up to one half of the mineral matter from properly pretreated secondary effluent. A pilot plant was constructed at Lebanon, Ohio to determine what operating problems might be encountered in an actual plant, and to realistically estimate the cost of operation. A flow diagram for the electrodialysis stack and pretreatment system is shown. Secondary effluent is fed to a diatomaceous earth filter for clarification. The clarified water from the filter enters a storage tank prior to entering the activated carbon columns. The purpose of the tank is to provide a supply of water for the remainder of the system during filter backwash. The water is pumped next through three carbon columns in series for removal of soluble organics. Water leaving the carbon columns enters a small holding tank which serves as a constant head tank for the electrodialysis stack. It is designed to remove about 40% of the mineral matter from the feed water. The membranes are standard brackish water type and dynel backed. Stack assembly and stream flow details are shown. The polyethylene spacers are of the tortuous path type and serve as perimeter gaskets and spacers. The concentrate stream leaving the stack is recirculated back to the stack after mixing with makeup water. This is done to keep the flow rate through the concentrate compartments nearly the same as through the diluting compartments. (Sinha - OEIS)
W77-11914

REMOVAL OF MERCURY FROM AQUEOUS SOLUTIONS EMPLOYING NAVAL STORES PRODUCTS,
Department of Agriculture, Washington, D.C.
W. H. Schuller.
Patent Application Serial No. 498,164, August 16, 1974. 9 p.

Descriptors: *Patents, *Mercury, *Water pollution treatment, *Industrial wastes, Chemical wastes, Filtration, Separation techniques, *Waste water treatment.
Identifiers: Naval stores products, Tar, Pitch, Turpentine.

Dilute solutions of mercury in aqueous solutions can be lowered drastically in mercury concentration by adding certain naval stores products such as tall oil soap, acidified tall oil soap, tall oil rosin, and others, shaking the mixture, and filtering the solution. Insoluble mercury salts are formed. If solutions of mercuric ions above 100 ppb are used, the naval stores products mentioned will reduce the mercury content to a substantial degree. Further treatments with fresh portions of the naval stores products and removal by filtration, after agitation, will continue to reduce the level of mercury. The naval stores materials, after being used to remove mercury, can then be converted into copper resinates, which are used as fungicides. (Sinha - OEIS)
W77-11916

THIN CELL ELECTROMEMBRANE SEPARATOR,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 3A.
W77-11917

REMOVAL OF TRACE COPPER IONS FROM WATER,
Department of the Interior, Washington, D.C.
Valdes-Krieg.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 894, Price codes: A02 in paper copy, A01 in microfiche. Patent Serial No. 650,395, Filing Date 19 January 1976. 11 p, 1 fig.

Descriptors: *Patents, *Water treatment, *Water pollution treatment, *Foam fractionation, Ions, *Separation techniques, Water purification, Bubbles, Surfactants, Copper, Metals, *Trace elements.
Identifiers: *Copper ions.

The invention consists of a method for separation and recovery of metal ions, particularly copper

ions, from dilute aqueous solutions by means of a bubble fractionation process employing countercurrent contacting of the feed solution with a stream of gas bubbles and a surface-active agent. This is achieved by utilization of an elongated vertical fractionation column, with feed solution being continuously introduces near the top of the column, and the gas bubbles and surfactant, or solution, beign continuously introduced near the bottom of the column. Surfactant loading at the gas-liquid interface substantially throughout the length of the column is thereby obtained, resulting in improved separation of metal ions. The invention provides an improved method for reduction of metal ion content of aqueous streams, as well as for metal ion enrichment for ultimate recovery of the metal. (Sinha - OEIS)
W77-11919

REMOVAL OF EXPLOSIVE MATERIALS FROM WATER BY CHEMICAL INTERACTION ON STRONGLY BASIC ION EXCHANGE RESINS,
Office of Naval Research, Arlington, Va.
J. C. Hoffsomner, L. A. Kaplan, D. A. Kubase, and D. Glover, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/D002 301, Price codes: A02 in paper copy, A01 in microfiche. Patent Serial Number 649,441, Filing date, 15 January 1976. 10 p.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, *Separation techniques, *Anion exchange, Resins, Chemical reactions, *Explosives, *Ion exchange.

The invention relates to the removal of explosive materials from water contaminated with them by treatment on an ion exchange resin. It has been discovered that when an aqueous solution containing a hydrolyzable, non-aromatic, nitroso- or nitro-substituted explosive compound is brought into contact with a strongly basic anion exchange resin, the resin performs two functions in that it substantially removes all of the explosive material from the solution and renders the explosive material harmless by decomposition to harmless products. (Sinha-OEIS)
W77-11921

PROCESS FOR REMOVING OIL FROM OILY WASTE WATER STREAMS,
Exxon Research and Engineering Co., Linden, N.J. (Assignee).
M. Vadekar, and H. S. Wilson.
U.S. Patent No 4,008,160, 4 p, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 955, no 3, p 937, February 15, 1977.

Descriptors: *Patents, *Oil pollution, *Oily water, *Waste water treatment, Industrial wastes, Separation techniques, Emulsions, Polymers, Absorption.
Identifiers: Refinery wastes, Polyvinyl chlorides(PVC).

A process for removing oils from oily waste water streams or in particular a process for removing oil from aqueous refinery streams where the oil is present in the stream as free oil and as an oil-in-water emulsion is described. The oil is removed from the water by passing the stream over a particulate bed of vinyl chloride containing polymers such as PVC and its copolymers. The free oil may be saturated or unsaturated. If it is saturated, then it is removed from the water primarily by physical adsorption onto the surface of the polymer. The emulsified oil is absorbed by and at least partially plasticizes the vinyl chloride containing polymeric media. (Sinha-OEIS)
W77-11922

TREATMENT OF PULP MILL EFFLUENTS,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec). (Assignee).
A. Wong, S. Prahacs, and J. Dorica.
U.S. Patent No 4,008,161, 6 p, 6 ref; Official Gazette of the United States Patent Office, Vol 955, no 3, p 937, February 15, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Organic wastes, *Water pollution treatment, Water purification, Oxygenation, Activated carbon, Toxicity, *Pulp wastes, Pulp and paper industry.

A multi-step method is provided for the purification of waste water, especially pulp mill effluents. It comprises a number of steps carried out in a specific sequence. The first step involves passing an oxygen-containing gas through the waste water while the waste water is in intimate contact with a finely divided activated carbonaceous material. The second step involves adding a clarification agent selected from one or more of a coagulant, a flocculant, and a polyelectrolyte. The third step involves a clarification step carried out by gravitational, flotational or centrifugal means to provide the waste water free of the suspended material and a sludge including the suspended material originally contained in the waste water, the added carbon and the added clarifying agent. Optionally, it includes the fourth step of regenerating the carbonaceous material from the sludge, and/or the fifth step of regenerating the clarification agent from the sludge. (Sinha-OEIS)
W77-11923

WASTE TREATMENT OF FLUOROBORATE SOLUTIONS,
Dart Industries, Inc., Los Angeles, Calif. (Assignee).
T. F. Korenowski, J. L. Penland, and C. J. Ritzert.
U.S. Patent No 4,008,162, 11 p, 7 fig, 4 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 955, no 3, p 937-938, February 15, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Chemical reactions, Hydrolysis, Calcium.
Identifiers: Metal finishing industry, *Fluoroborates, Rinse water.

A two-step process for the waste treatment of fluoroborate solutions involves hydrolysis at an acidic pH in the presence of calcium ions to liberate fluoride. The liberated fluoride, hydrofluoric acid and calcium fluoride formed in this raction can then be treated by any number of techniques known in the art for removal of fluoride values from solution. One such applicable method involves neutralization of the solution with an alkaline compound and precipitation of fluoride as calcium fluoride under alkaline conditions. (Sinha-OEIS)
W77-11924

RECYCLE TREATMENT OF WASTE WATER FROM NICKEL PLATING,
Kayabakogyo-Kabushiki-Kaisha, Tokyo (Japan). (Assignee).
T. Hayashi.
U.S. Patent No 4,009,101, 9 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 955, no 4, p 1263, February 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution control, *Water pollution treatment, *Separation techniques, Chemical reactions, Chemical precipitation, Ion exchange, Filtration, Nickel, Recycling.
Identifiers: *Nickel plating industry wastes, Rinse water.

Nickel plating waste water is treated with cation resins so as to adsorb the nickel ions, which are eluted by sulfuric acid to obtain an aqueous nickel salt solution containing excess sulfuric acid. A portion of this eluted solution is mixed with an alkali to convert the nickel contained into nickel hydroxide for removal by filtration, and the nickel hydroxide so obtained is added to the rest of the eluted solution to react with the free sulfuric acid so as to form a highly concentrated nickel sulfate solution while the free sulfuric acid concentration is reduced. In other words, the solution eluted from the cation resins, which had adsorbed nickel ions, is divided into two portions. The nickel components in one portion is recovered in the form of nickel hydroxide through chemical treatment, and the nickel hydroxide so obtained is added to the rest of the eluted solution so as to neutralize the free sulfuric acid, and thus, a highly concentrated nickel salt solution is obtained. (Sinha-OEIS)
W77-11929

METHOD FOR IMPROVING THE FILTERABILITY OF ALUMINUM SALTS PRECIPITATED FROM AQUEOUS SOLUTIONS,
Teepak, Inc., Chicago, Ill. (Assignee).
N. I. Burke.
U.S. Patent No 4,009,103, 4 p, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 955, no 4, p 1264, February 22, 1977.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, *Separation techniques, Water quality control, Chemical reactions, Chemical precipitation, Hydrogen ion concentration, Aluminum, Food processing industry, Filtration.
Identifiers: Collagen food casings, *Aluminum salts.

This invention relates to a method of treating waste effluent from the manufacture of collagen food casing to remove and recycle aluminum salts. The filterability of aluminum salts precipitated from an aqueous solution containing dissolved aluminum ion is improved by adjusting the pH of the solution to between about 4 and 6, adding less than a stoichiometric amount of a 1,3-dicarbonyl compound such as acetylacetone to the solution to precipitate the aluminum dicarbonyl and then adding a sufficient amount of an alkaline hydroxide to precipitate the remaining dissolved aluminum ion in the form of aluminum hydroxide to obtain a mixed precipitate which can be readily filtered. (Sinha-OEIS)
W77-11930

IMPACT OF HATCHERY WASTEWATER IRRIGATION UPON CONTIGUOUS STREAM QUALITY,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
J. C. Barker, F. J. Humenik, M. R. Overcash, F. Koehler, and R. Phillips.
Paper No. 76-2566, American Society of Agricultural Engineers, 1976 Winter Meeting, Chicago, Illinois, Dec. 14-17, 1976, 8 p. 1 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, Irrigation, Agricultural runoff, Water pollution, Sampling, Chemical analysis, Nitrogen, Rainfall, Fescues, *Farm wastes, Separation techniques, Waste treatment, Cleaning.
Identifiers: Hatchery wastes, Land application, Nonpoint sources, Coastal Bermuda grass.

A waste management system was designed for Chick Sales, Inc., Siler City, North Carolina, in which hatchery wastes are taken care of by in-house cleaning and separation processes prior to entry into an extramural septic tank, aerated lagoon and polishing-storage pond series, and a permanent-set irrigation system. The capability of land application via this irrigation system for handling a no-discharge goal is evaluated on the basis of the monitoring of the stream into which the irrigated fescue pasture and the irrigated Coastal Bermuda pasture drained. The following conclusions were drawn: (1) No observed differences at the 0.05 level of significance were indicated in contiguous stream COD, TOC, TKN, NH3-N and TPO4 concentrations as a result of rainfall runoff

from Coastal Bermuda and fescue pastures irrigated with hatchery wastewater. (2) Although maximum stream impact from nonpoint sources would be expected during runoff events, no significant differences were observed between background and impacted stream reaches when runoff events were examined separately. (3) Land application receiver plots should be designed so that the rate of nitrogen application in wastewater does not exceed crop uptake. (4) Except for the mobile nitrate ion which tends to be released to surface waters during soil-water interflow rather than surface flushing, it appears that nonpoint source sampling and routine chemical analysis is justified only during rainfall runoff events. Furthermore, samples should be collected throughout the entire runoff hydrograph. (Merryman-East Central)
W77-11973

RECURRENT PROBLEMS OF WATER SUPPLY IN MALTA,
Dundee Univ. (Scotland).
For primary bibliographic entry see Field 3A.
W77-11988

MEETING WATER-RECYCLE REQUIREMENTS AT A WESTERN ZERO-DISCHARGE PLANT,
Public Service Co. of New Mexico.
R. E. Dascher, and R. Lepper.
Power, Vol 121 No. 8, August, 1977 p 26-28, 2 tab, 3 fig

Descriptors: *Electric powerplants, *Water pollution, *Waste water treatment, *Recirculated water, *Water quality control, Water quality standards, Water treatment, Water utilization, Water vapor, Powerplants, Reverse osmosis, Evaporators, Arid lands, Pre-treatment(Water), New Mexico, Recycling, Water management.
Identifiers: Vapor-compression evaporator, Evaporation ponds, San Juan generating station, Sludge removal system, Flue-gas desulferization.

Describes efforts of the Public Service Company of New Mexico to meet state and federal water-recycle requirements by reducing its San Juan generating station's wastestream discharges and enhancing wastewater recovery. Evaporation ponds, a vapor compression evaporator, a reverse-osmosis unit, and other pretreatment processes were utilized. Because more wastewater was produced than could be recycled for use in some plant processes, a de-salting method using a large vapor-compression evaporator was exployed. After a year of operation, plant wastes and blow-down streams were greater than anticipated. Because of high acidity and dissolved solids, wastes from plant de-mineralizers could not be used as makeup. Also, in response to additional wastes from subsequently installed units, new water balance calculations showed more wastewater needed desalting. A reverse osmosis method in conjunction with the evaporator was chosen to handle the extra treatment load. A neutralization sludge-removal system for flue-desulferization, increased holding-pond capacity, and product-water-storage tanks were included in the total design of the system. Although some operational problems were found, performances for the reverse-osmosis and evaporator units were considered satisfactory. (Ullery-Arizona)
W77-12006

GROWTH OF SIX SPECIES OF BIVALVE MOLLUSCS IN A WASTE RECYCLING-AQUACULTURE SYSTEM,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W77-12070

BACKWASH OF GRANULAR FILTERS USED IN WASTEWATER FILTRATION,
Iowa State Univ., Ames.
J. L. Cleasby, and E. R. Baumann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 693, Price codes: A17 in paper copy, A01 in microfiche. Report EPA-600/2-77-016, April 1977. 381 p 110 fig, 53 tab, 145 ref, append.

Descriptors: *Filters, *Particle size, *Packed beds, *Equipment, *Filtration, Cleaning, Operation and maintenance, Separation techniques, Clarification, Sewage treatment, Waste water treatment.
Identifiers: *Backwashing, Granular filters.

The design, operation, and maintenance of deep granular filters used in waste water treatment are examined, with special emphasis on bed design, media size, and bed cleaning by backwashing for single-, dual-, and triple-media filters. Backwashing methods discussed include water fluidization, air scour followed by water fluidization, face wash and subsurface wash before and during water fluidization, and simultaneous air scour and subfluidization water backwash. Backwashing by water fluidization alone is considered too inefficient since abrasion between filter grains was negligible. Simultaneous air scour and subfluidization backwash of coarse sand filters is considered the most effective method of backwash, but results in media loss for finer materials. The remaining methods are considered acceptable for single-, dual-, and triple-media filters. Studies on filter performance indicate that filtering abilities of dual- and triple-media filters were comparable. Filter bed expansion, media intermixing, and the use of dual media are further examined. Filter designs are discussed with respect to performance and media size. A literature survey on waste water filtration and backwashing is presented. (Schulz-FIRL)
W77-12077

METHODS FOR IMPROVEMENT OF TRICKLING FILTER PLANT PERFORMANCE: PART II - CHEMICAL ADDITION,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
J. C. Brown, and L. W. Little.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 424, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-77-012, January 1977. 120 p, 27 fig, 38 tab, 19 ref, 2 append.

Descriptors: *Phosphorus, *Nutrient removal, *Trickling filters, *Coagulation, Model studies, Separation techniques, Chemical precipitation, Sludge treatment, Dewatering, Filtration, Sewage treatment, Sludge digestion, Waste water treatment.
Identifiers: *Aluminum sulfate, Chapel Hill(NC).

Laboratory, pilot, and full-scale studies at the Mason Farm Waste Water Treatment Plant, Chapel Hill, North Carolina, were used to examine methods of phosphorus removal. Preliminary studies on phosphorus removal included a survey of pertinent literature, jar testing of various coagulants (lime, alum, and iron salts), studies on the quality and quantity of plant flows, and examination of the effect of the time of alum addition during high-rate trickling filtration. Full-scale studies were then conducted using the two parallel identical treatment trains at Chapel Hill, with liquid alum dosages and flow rates varying for one train and the other train serving as a control. Plant flows, digester performances, and sludge production were monitored throughout the 18-month study, as were qualitative parameters on raw waste water, primary effluents, and secondary effluents. Results indicated that overall plant operation and the removal of phosphorus were enhanced by the addition of alum, particularly with a flow-paced alum feed system, limitation of dry weather settling tank surface loadings to 20.4 cu m/sq m/day, and fine solids removal by tertiary treatment. Alum addition resulted in decreased buffering capacities, alkalinity, and pH in primary digesters and lower solids concentrations in the secondary digester. Longer sand drying was therefore required for adequate sludge dewatering. At an alum dose of 175 mg/liter and cost of $58/ton of dry alum, alum treatment costs were $41/million gallons of waste water. (See also W74-00431) (Schulz-FIRL)
W77-12078

ANAEROBIC AND AEROBIC TREATMENT OF COMBINED POTATO PROCESSING AND MUNICIPAL WASTES,
North Dakota Univ., Grand Forks.
J. K. Neel, J. W. Vennes, G. O. Fossum, and F. B. Orthmeyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 009, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-600/2-76-236, September 1976. 132 p, 22 fig, 30 tab, 14 ref, 1 append.

Descriptors: *Aerobic treatment, *Anaerobic digestion, *Potatoes, *Industrial wastes, *Biochemical oxygen demand, Chemical oxygen demand, Lagoons, Aerated lagoons, Municipal wastes, Design criteria, Model studies, Settling basins, Costs, Food processing industry, Waste water treatment.
Identifiers: Grand Forks(ND), Potato Processing wastes.

The use of unmixed detention and aeration in open ponds in the treatment of combined potato processing (72%) and municipal (28%) wastes was evaluated in a model study in Grand Forks, North Dakota. In a year-long study using four 0.94 hectare cells which received 13,409 Kg BOD daily for 9 months and 3,773 Kg daily for 3 months, the anaerobic-aerated series operation was observed to provide maximum BOD removal at 76% and COD removal at 64%. Variations in the pH of raw waste were controlled by the BOD concentration, which was, in turn, related to the activity of the potato processing industry. Although the treatment method did not remove phosphorus, it reduced nitrogen by as much as 30% to a final concentration of 43 mg/liter and was effective at air temperatures down to -35 C. Temperature and strength did, however, affect bacterial growth and volatile acid production. Organic solids were not settled in aerated cells, but did decrease in anaerobic cells. Construction suggestions include embankment slope protection, provision for gravity dewatering, and the avoidance of steel metal works, narrow dikes, and thin-walled airlines. Construction costs for the four-cell system were estimated at $672,000. Operational costs were estimated at 4.31 cents per kilogram of BOD satisfied. (Schulz-FIRL)
W77-12079

THE SWIRL CONCENTRATOR FOR EROSION RUNOFF TREATMENT,
American Public Works Association, Chicago, Ill.
R. H. Sullivan, M. M. Cohn, J. E. Ure, F. E. Parkinson, and P. E. Zielinski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 598, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/2-76-271, December 1976. 74 p, 46 fig, 5 tab, 6 ref, append.

Descriptors: *Separation techniques, *Erosion control, *Storm runoff, *Suspended solids, Silting, Soil erosion, Surface runoff, Flow rates, Overflow, Waste water treatment, Storm water, Equipment, Design, Research and development, Model studies.
Identifiers: *Swirl concentrator, Erosion runoff.

The applicability of the swirl solids-liquid separator has been examined for the removal suspended solids from storm water erosion flows. The swirl concentrator consists of a circular flat-bottomed basin which contains an internally-supported over-

flow weir, flow spoilers, a concentrate discharge take-off, and a baffled inlet. A cattle watering tank is suggested as a possible swirl concentrator basin. In a series of 62 performance tests, the swirl concentrator reduced the volume of grit-containing waste water by 14-50%. The desilted or clarified effluent could be discharged directly to relieving waters provided erosion solids met existing standards, while the concenrtrated grit-containing portion could be directed to settling ponds for later disposal. Further studies and possible design modifications on the prototype are suggested to establish standards for future use of the swirl concentrator in the treatment of erosion runoff waters. (Schulz-FIRL)
W77-12080

A REVIEW OF TECHNIQUES FOR INCINERATION OF SEWAGE SLUDGE WITH SOLID WASTES,
Weston (Roy F.), Inc., West Chester, Pa.
W. Niessen, A. Daly, E. Smith, and E. Gilardi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 355, Price codes: A11 in paper copy, A01 in microfiche. Report EPA-600/2-76-288, December 1976. 236 p, 30 fig, 47 tab, 60 ref, 4 append.

Descriptors: *Incineration, *Economic feasibility, *Sludge disposal, *Cost comparisons, *Reviews, Sewage treatment, Dewatering, Environmental effects, Municipal wastes, Waste water treatment.
Identifiers: *Co-incineration, Direct-drying incineration, Multiple-hearth incineration, Indirect-drying incineration, Emissions controls, Incineration methods.

This comparison of co-incineration with separate municipal sludge and refuse incineration provided a state-of-the-art review of co-incineration practices and examined economic feasibility, environmental effects, and economic impact. Four methods of co-incineration were chosen for further study. Applicable techniques of current users of co-incineration for mixed municipal refuse and municipal sewage sludge were described. Feasibility studies were conducted for direct-drying, indirect-drying, multiple-hearth and pyrolysis co-incineration. Air pollution aspects and emissions controls for incineration were discussed. Economic considerations include basic cost calculations and cost comparisons for separate disposal and co-incineration. Circumstances which may affect co-incineration feasibility, such as geography, local political situations, public and private considerations, and funding, were presented. (Schulz-FIRL)
W77-12081

SELECTED ORGANIC PESTICIDES OCCURRENCE, TRANSFORMATION AND REMOVAL FROM DALLAS DOMESTIC WASTEWATER,
Texas Univ. at Dallas, Richardson.
F. Y. Saleh.
PhD Thesis, 1976, 214 p.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Pesticide removal, *Pollutant identification, *Water purification, Chemical analysis, Biological treatment, Chemical reactions, Coagulation, Filtration, Activated sludge, Activated carbon, Municipal wastes, Domestic wastes, Waste water treatment.
Identifiers: Dallas(TX).

A pilot study was conducted of the occurrence, transformation, and removal of chlorinated organic pesticides from waste water in Dallas, Texas. The plant studied contained completely mixed activated sludge units, chemical treatment, mixed-media filters, and activated carbon beds. Activated sludge units were operated in a nitrifying mode. Alum-lime and lime-ferric chloride mixtures were used as coagulants. The first study phase developed a characteristic profile of organic residues in feed and effluent from each process and traced the effects of each unit on the profile. Identification and quantification of major components, detected in the residue profiles, composed and second phase. The two-year study revealed a limited number of peaks with a relative retention time of 0.36 to 4.2. Major peaks were less than 1.3. These peaks were identified as aldrin; dieldrin; op'DDT and its analogs; pp'DDT and its analogs; 2,4-D alkyl esters; and inorganic salts of 2,4-D. Activated sludge biological treatment removed insignificant amounts of chlorinated organic pesticides. Transformation of one compound to another was characteristic of this process. Alum-lime and lime-ferric chloride treatment slightly reduced detected organic residues. Only DDT compounds were removed by chemical coagulation. Variable reductions were found for aldrin, dieldrin, and 2,4-D alkyl esters. Multimedia filters evidenced no effectiveness in the removal of organic residues from activated sludge effluents or solids contact effluents. Activated carbon columns were found best for removing chlorinated organic pesticides from chemically treated and filtered waste water. After a year, breakthrough of some compounds was observed in the activated carbon tests. (Collins-FIRL)
W77-12139

OCCURRENCE OF ESCHERICHIA COLI B BACTERIOPHAGES IN MUNICIPAL WASTEWATER AND THEIR REMOVAL AND INACTIVATION BY ACTIVATED SLUDGE SEWAGE TREATMENT,
Miami Univ., Fla.
For primary bibliographic entry see Field 5A.
W77-12140

A KINETIC ANALYSIS OF AMMONIA REMOVAL BY CHLORAMINE CONVERSIONS ON ACTIVATED CARBON,
Massachusetts Univ., Amherst.
A. B. Scaramelli, Jr.
PhD Thesis, 1976, 182 p.

Descriptors: *Kinetics, *Analysis, *Ammonia, *Activated carbon, Chemical reactions, Design criteria, Separation techniques, Nitrogen, Hydrogen ion concentration, Organic matter, Treatment facilities, Waste water treatment.

Chloramine-activated carbon reaction stoichiometry and kinetics were studied to develop design criteria for effective ammonia removal in waste water treatment. Mono- and dichloramine were converted by surface reactions to nitrogen gas. Monochloramine reacted by a parallel pathway to form ammonia and nitrogen gas, and steady-state reaction conditions did not correspond to stoichiometric conversions. Dichloramine reacted by a single pathway to produce only nitrogen gas. This pathway had a potential for 100% ammonia removal. The overall conversion of monochloramine and the parallel reactions to ammonia and nitrogen gas were described by a first-order kinetic model. Increases in pH were accompanied by decreases in the nitrogen gas production rate. The rate constant associated with nitrogen production did not measureably increase with time at any given pH. The dichloramine-carbon reaction also exhibited first-order, irreversible kinetics. The amount of dichloramine applied to the reactor as a measure of surface oxide accumulation was included in this model. Diffusional mass transfer had little effect on the monochloramine reaction rate, but was significant in relation to the dichloramine reaction. It was concluded that dichloramine-activated carbon reactions can provide effective nitrogen removal from waste water. Removals of BOD, suspended solids, phosphorus, and ammonia were expected to be greater than 95%. (Collins-FIRL)
W77-12141

SIGNIFICANCE OF TEMPERATURE IN THE ACTIVATED SLUDGE PROCESS,
Toronto Univ., (Ontario).
K.-C. Lin.
PhD Thesis, 1974.

Descriptors: *Activated sludge, *Temperature, *Kinetics, *Sludge treatment, *Biochemical oxygen demand, Suspended solids, Regression analysis, Statistics, Effluents, Waste water treatment.

Statistical analyses of data collected from 13 waste treatment plants indicated that temperature plays an important role in the efficiency of the activated sludge process. The influence of temperature is second only to that of BOD5 and suspended solid concentrations in raw sewage. Greater percentages of removal, and lower concentrations in effluent, of BOD5 and suspended solids were observed at higher temperatures. The varability of temperature was observed to follow a sinusoidal curve over a 365-day period, with peaks at 30-day intervals, possible due to differences in organic loading. Variabilities of BOD5 and suspended solids were more random in nature. It was suggested that continuous temperature readings be taken for raw sewage and mixed liquor, and that mixed liquor temperatures be used instead of raw sewage temperatures for biokinetic studies. (Schulz-FIRL)
W77-12142

BIOKINETICS OF LOW TEMPERATURE WASTE ASSIMILATION,
Manitoba Univ., Winnipeg.
B. H. Topnik.
PhD Thesis, 1976.

Descriptors: *Kinetics, *Aeration, *Waste water treatment, *Temperature, Domestic wastes, Biochemical oxygen demand, Chemical oxygen demand, Nitrification, Oxygen, Ammonia, Nitrogen, Separation techniques, Model studies, Waste water treatment.
Identifiers: Biokinetics, Kinetic growth, Substrate utilization, Laboratory studies.

The biokinetics of low temperature waste assimilation were studied. Investigations were performed with a 20 liter/day continuous-flow extended aeration unit at temperatures of 20-0C. Raw domestic sewage was used as the feed. Data on kinetic growth and substrate utilization were analyzed after steady state operation at a given temperature. Temperature and substrate concentration effects on growth and substrate utilization were unobservable after 261 days of testing. Average kinetic constants were given and overall BOD5 removals followed a zero-order relationship. Nitrification was evident at all temperatures. About 18% of feed ammonia nitrogen was oxidized to nitrate at 0C. The oxygen uptake rate was temperature-dependent. High BOD5 and COD removal efficiencies at low temperatures were attributed to cellular food storage rather than to cell replication. Other test parameters supported this conclusion. (Collins-FIRL)
W77-12143

5E. Ultimate Disposal Of Wastes

STUDIES ON APPEARANCE MECHANISM OF RICE PLANT DAMAGE BY IRRIGATION WATER POLLUTED WITH NITROGEN COMPOUNDS, (IN JAPANESE),
Tokai-Kinki National Agricultural Experiment Station, Tsu (Japan).
For primary bibliographic entry see Field 5B.
W77-11515

LET'S TALK RUBBISH PART 3: LITTER,
For primary bibliographic entry see Field 5B.
W77-11545

ADEQUACY OF DREDGING METHODS AND EQUIPMENT IN THE UNITED STATES FOR MAINTENANCE OF NAVIGABLE WATERS,
American Society of Civil Engineers, New York. Committee on Waterways of the Waterway, Port, Coastal and Ocean Div.
For primary bibliographic entry see Field 8G.
W77-11595

ANAEROBIC DIGESTION OF SOLID WASTE AND SEWAGE SLUDGE TO METHANE,
Environmental Protection Agency, Cincinnati, Ohio. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5D.
W77-11674

MECHANICAL SEWAGE SLUDGE COMPOSTING - IN MIXER WITH RECYCLED BIOGENIC MASS CHARGING REVOLVING HEATED DRUM.
German Patent DS 2517-381. Issued March 3, 1977. Derwent German Patents Abstracts, Vol Y, No 10, p D3, April, 1977.

Descriptors: *Patents, *Sludge treatment, *Waste disposal, *Recycling, Mechanical equipment, Heat treatment, Waste treatment, Waste water treatment.
Identifiers: Composting.

A patent was issued for a mechanical sludge composting process for sewage sludge and other semi-solid wastes. The sludge to be composted is premixed with recycled sludge compost according to a predetermined formula. The mixture is then added to a revolving drum which already contains rotting sludge compost. Optimum composting conditions are maintained. (Collins-FIRL)
W77-11681

BIOLOGICAL CONTROL OF WATER POLLUTION.
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
For primary bibliographic entry see Field 5G.
W77-11690

PALO ALTO SEES GOLDEN GLINT IN SLUDGE.
For primary bibliographic entry see Field 5D.
W77-11703

EXTENSIONS TO GREAT BILLING STW OPENED.
For primary bibliographic entry see Field 5D.
W77-11707

SLUDGE PROCESSING TO OPTIMIZE DIGESTIBILITY AND ENERGY PRODUCTION,
Regional Wastewater Solids Management Program, Whittier, Calif. Laloma Project.
R. T. Haug.
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1713-1721, July, 1977. 6 fig, 3 tab, 9 ref, 1 append.

Descriptors: *Anaerobic digestion, *Energy budget, *Model studies, Sludge treatment, Biodegradation, Disinfection, Odor, Dewatering, Activated sludge, Digestion, Waste water treatment.
Identifiers: *Thermal conditioning, Sludge pretreatment.

Previous studies on the improvement of anaerobic sludge digestion by thermal pretreatment have prefaced this investigation to verify and quantify the extent of increased biodegradability due to thermal conditioning. A method for thermal pretreatment and anaerobic digestion to improve degradability and increase energy production during the processing of primary and waste-activated sludges is described, in which residual heat from thermal conditioning is used to facilitate mesophilic or thermophilic digestion. To reduce odors, a significant problem in thermally treated sludges, the thermally treated sludge and liquor are not separated, but rather sent directly to a digestion tank. Energy balances were determined for various thermal treatment-anaerobic digestion systems. Energy production was highest for a system in which thermally treated sludge was combined with untreated primary sludge. Second highest in energy production was a system in which untreated primary and waste-activated sludges were used. The digested mixture in either case, however, would not be pathogen-free. A slight expenditure of energy to produce both thermally treated primary and waste-activated sludge would, however, result in a sterilized product. Further laboratory and field studies of the process are being conducted through the Regional Wastewater Solids Management Program (Laloma Project) for the Los Angeles-Orange County Metropolitan Area. (Schulz-FIRL)
W77-11709

SLUDGE HANDLING.
Water and Wastes Engineering, Vol. 14, No. 7, p 10, July, 1977.

Descriptors: *Fertilizers, *Sludge disposal, *Heavy metals, *Soil-water-plant relationships, *Plant growth, Sludge treatment, Corn(Field), Agronomy, Waste disposal, Waste water treatment.
Identifiers: Thermal conduction.

Municipal sewage sludge which has been thermally conditioned at an installation in Levittown, Pennsylvania has been successfully used for fertilizing and conditioning of two one-acre plots in the Portland, Maine area. Yields of corn crops grown on the plots were not appreciably different from control plots. Application of thermally conditioned sludge did not appear to result in excessive concentrations of heavy metals or other contaminants in plant tissues or groundwater. Sludge, with solids of 35%, was reported to contain more nitrogen and phosphorus and less potassium than cow manure. Other advantages to the use of thermally conditioned sludge include application with conventional farm equipment and possible storage over long periods of time without appreciable odor problems. (Schulz-FIRL)
W77-11710

HYGIENIZATION OF SEWAGE SLUDGE BY ELECTRON IRRADIATION,
K. Tofaute.
Brown Boveri Review, Vol. 64, p 180-186, March, 1977. 6 fig, 11 ref.

Descriptors: *Fertilizers, *Sludge treatment, *Irradiation, *Microorganisms, *Disinfection, Application methods, Waste water treatment, Sludge disposal, Sewage treatment, Tertiary treatment, Waste water treatment.

Hygienization of sewage sludge to remove infectious bacteria and parasites is often necessary before treated sludge can be used for agricultural purposes. A method of hygienization utilizing electron irradiation is described. After screening and homogenization, digested sludge is irradiated and passed into storage tanks for subsequent disposal. Irradiation is effective in reducing coliform bacteria and Salmonella, inhibiting future growth, and inactivating viruses. Physical characteristics of sludge are not adversely affected by irradiation, while coagulation and settling abilities may improve. Although fertilizing with untreated sludge is most effective, higher grain yields have been obtained with irradiated sludge than with sludge which has been subjected to steam pasteurization, the traditional method of hygienization. Operating costs indicate that electron irradiation as a method of hygienization is economically viable when the amount of sludge produced is 250 to 400 cu m daily. (Schulz-FIRL)
W77-11712

CHARACTERISTICS OF PERCOLATE OF SOLID AND HAZARDOUS WASTE DEPOSITS,
Municipal Environmental Research Lab., Cincinnati, Ohio. Solid and Hazardous Waste Research Div.
D. R. Brunner, and R. A. Carnes.
Journal of the American Water Works Association, Vol. 69, No. 8, p 453-457, August, 1977. 6 tab, 22 ref.

Descriptors: *Waste dumps, *Irrigation practices, *Landfills, *Waste disposal, *Environmental effects, Return flow, Sewage disposal, Underground waste disposal, Water pollution sources, Polychlorinated biphenyls, Heavy metals, Solid wastes, Municipal wastes, Percolating water, Waste water treatment, Industrial wastes.

Deleterious effects on groundwater and surface water of land disposal of municipal and industrial wastes have prefaced this review of waste disposal practices and percolates emanating from waste disposal sites. The nature and extent of land disposal problems are discussed with respect to the geographic distribution of waste, pollution control legislation, and the entry of waste contaminants into the hydrologic cycle. Common disposal methods considered include dumping, burial, and land application. Physical and chemical characteristics of percolates from municipal solid waste are described, including volumetric production, chemical composition, and the presence of pathogens and toxic organic compounds. Other hazardous wastes considered include arsenic, polychlorinated biphenyls, and heavy metals. (Schulz-FIRL)
W77-11721

VISCOSITY EFFECTS OF SLUDGE.
Water and Waste Treatment, Vol. 20, No. 6, p 34, 36, June, 1977.

Descriptors: Physical properties, *Sludge treatment, *Pump testing, *Pumps, Sludge, Model studies, Analytical techniques, Design criteria, Waste water treatment.
Identifiers: *Sludge viscosity, Sludge characteristics.

Research by BHRA Fluid Engineering, Cranfield, Bedford, United Kingdom, on the viscosity effects of sewage sludge on rotodynamic pump performance and pipline friction is described. BHRA in collaboration with the Water Research Center will also attempt to define limits of sludge solids concentrations for economical pumping and to correlate pump performance with sludge characteristics. A literature survey and on-site testing will be used in the evaluation program. (Schulz-FIRL)
W77-11722

STANDING COMMITTEE ON THE DISPOSAL OF SEWAGE SLUDGE.
Water Services, Vol. 81, No. 976, p 335, 338, June, 1977.

Descriptors: *Sludge disposal, *Sludge treatment, *Incineration, *Waste disposal, Oceans, Water pollution, Land management, Fertilizers, Planning, Waste water treatment, Sewage disposal.

The Standing Committee on the Disposal of Sewage Sludge was set up in 1975 by the Department of the Environment and the National Water Council of the United Kingdom as part of a set of six standing technical committees. Because of the wide range of interests involved in the ultimate disposal of sewage sludge, four subcommittees

were formed covering the areas of land disposal, sea disposal, air disposal (i.e. incineration), and economic aspects. The subcommittee on the disposal of sewage sludge to land initiated a survey on the means of disposal for different parts of England, Scotland, Wales, and Northern Ireland and determined that .75 percent of disposal was to land, 22 percent to sea, and 3 percent to incineration. The committee is examining the effects of land application of sludge on soil, crops, humans, and the environment through field studies. It is also conducting a literature survey on land disposal. The sea disposal subcommittee reviewed the effects of sludge disposal by ocean dumping, existing methods of monitoring, and current research into ocean disposal. The incineration subcommittee surveyed existing sludge treatment plants using incineration as a means of disposal and suggested that the constituents of ash and emissions be examined more closely. The economics subcommittee is collecting information on the economic constraints on disposal and is identifying networks of processes for treating and disposing of sewage sludge. The findings of each of the subcommittees will be evaluated with respect to all possible solutions before final recommendations are made. (Schulz-FIRL)
W77-11740

CURRENT SLUDGE RESEARCH AT THE WRC.
D. Mabey.
Water Services, Vol. 81, No. 976, p 347-348, June, 1977.

Descriptors: *Activated sludge, *Sludge disposal, *Dewatering, *Anaerobic digestion, *Oxygenation, Aeration, Oxygen requirements, Sludge digestion, Waste water treatment, Cost comparisons, Sludge treatment.

Current research on sludge treatment and disposal at the Water Research Center (WRC) at Medmenham, England is described. Increased aeration and supplemental oxygenation are suggested as methods of upgrading an activated sludge plant when existing facilities are no longer able to produce high-quality effluent due to increased loads. An evaluation of an oxygen injection system being used by the Welsh National Water Development Authority indicated that, in spite of higher operating costs and hazards associated with the use and storage of liquid oxygen, oxygen injection may be a viable alternative to aeration, particularly when needed on a short-term basis only. Aspects of sludge dewatering under investigation by the WRC include volume reduction by low-speed centrifugation and the role that sewage depth plays in gravity dewatering. WRC is also attempting to define the controlling factors and sludge characteristics which influence sludge settleability. Anaerobic digestion is being considered for treatment of farm and food industry wastes. Quantification of sludge stability and standard costs indices for water and sewage disposal are being examined. Cost comparisons are being prepared for alternate routes for sludge disposal. WRC is also determining the fate and distribution of hazardous substances in sanitary landfills. A survey by the WRC of farmers using treated sludge for soil conditioning indicated that fertilizing capabilities of land-applied sludge should be better defined. (Schulz-FIRL)
W77-11741

THERMAL DRYING OF SLUDGE,
Ercole Marelli S.p.A., Milan (Italy).
M. Ianelli.
Water Services, Vol. 81, No. 976, p 336-338, June, 1977. 4 fig.

Descriptors: *Dewatering, *Sludge treatment, Heat, *Centrifugation, Filtration, Waste water treatment, Sludge disposal, Separation techniques, Pilot plants, Model studies, *Drying.
Identifiers: *Thermal drying, Thermal sludge drying.

Unpredictable variations in volume of sludge produced by mechanical methods of dewatering such as centrifugation or filtration have prefaced this investigation into thermal drying of sludge. In thermal drying, hot air of relatively low humidity absorbs moisture from sludge and loses heat in the process by an isenthalpic transformation. Thermal drying produces sludge with a water content from 25 to 50 percent, as opposed to 65 to 85 percent produced by mechanical drying. Additional energy requirements for the production of heat for thermal drying may be furnished by incineration of raw sewage or production of gas for fuel in digesters. The Item patented thermal drier uses high-velocity injection of hot air to produce a sludge aerosol, maximizing sludge-hot air contact by decreasing sludge particle size and increasing particle surface area. Operation tests indicated a thermal efficiency of between 65 and 67 percent for the Item thermal drier. A prototype sludge drier which has been in operation in Milan for 4 years has proved adequate for sludge drying requirements of a population of 10,000. (Schulz-FIRL)
W77-11743

SEWAGE SLUDGE FOR AGRICULTURAL USE,
Department of Agriculture, Washington, D.C. Public Information Office.
R. G. Pierce.
Waste Age, Vol. 8, No. 6, p 6, 8-10, 114, June, 1977. 3 tab.

Descriptors: *Sewage sludge, *Heavy metals, *Sludge disposal, *Fertilizers, *Absorption, *Soil-water-plant relationships, Plant growth, Toxicity, Zinc, Nitrogen, Lead, Cadmium, Copper, Soil chemical properties, Hydrogen ion concentration, Application methods, Soil treatment, Waste disposal, Sludge, Waste water treatment.

Problems associated with the land application of sewage sludge, and the need for regular monitoring of heavy metal and nutrient levels in sludge designated for land application, are discussed. Dangers associated with heavy metals such as zinc, copper, nickel, and cadmium include accumulation in the soil, toxicity to plants, and re-entry into the food chain through accumulation in plant tissue. Research by the USDA's Agricultural Research Service examines the controlling factors on the toxicity and uptake of heavy metals, including plant species, soil characteristics such as pH, and sludge application rates. Studies indicate that uptake is minimized at pH values above 6.5 and low concentrations of inorganic metal salts. The Agricultural Research Service recommends that, in addition to the USDA guidelines for maximum metal concentrations in land-applied sludge, soil pH should be adjusted and maintained at 6.5 or greater. Cadmium should not exceed 1.8 lbs/acre, and sludge should not be used to fertilize crops of leafy vegetables. A regular monitoring program is suggested for solids, total-N, inorganic-N, Zn, cu, Pb, Ni, and Cd. Concentrations of Se, As, Mo, Bo, Fe, Al, Hg, Ag, Ba, Co, S, and Na should also be established as sufficiently low before sludge application is considered. (Schulz-FIRL)
W77-11748

IS THERE A POTENTIAL FOR PARASITIC DISEASE TRANSMISSION FROM LAND APPLICATION OF SEWAGE EFFLUENTS AND SLUDGES,
Pittsburgh Univ., Pa. Dept. of Life Sciences.
B. D. Hays.
Journal of Environmental Health, Vol. 39, No. 6, p 424-426, May-June, 1977. 15 ref.

Descriptors: *Animal parasites, *Pathology, *Diseases, *Sludge disposal, *Sewage treatment, Model studies, Sewage disposal, Environmental sanitation, Effluents, Fertilizers, Irrigation, Infection, Waste disposal, Waste water treatment.
Identifiers: Allegheny County(PA), Pittsburgh(PA).

The increased use of sewage treatment plant products for land application and irrigation has led to an evaluation of the fate and distribution of various protozoan cysts and metazoan eggs of human and animal intestinal parasites which can occur in sewage. A literature review includes a survey of parasitic species which have been observed in sewage in the United States. Studies on the survival of parasitic organisms showed that although reduced in number by sewage treatment processes, in particular anaerobic digestion, parasitic forms are not totally destroyed during any process. Sewage-related transmission of intestinal diseases to humans or animals has, however, always been associated with raw or partially treated sewage. An examination of sludges collected from four treatment plants in the Pittsburgh, Pennsylvania area revealed some parasitic eggs in all samples, with the parasite species being related to the waste source. Greater attention to parasites in sludge and their potential for disease transmission is recommeded for land treatment and resource recovery programs. (Schulz-FIRL)
W77-11750

INACTIVATION OF POLIOVIRUS IN WASTEWATER SLUDGE WITH RADIATION AND THERMORADIATION,
Sandia Labs., Albuquerque, N. Mex.
For primary bibliographic entry see Field 5D.
W77-11756

CONCEPT, RESEARCH, APPROVAL...AN EFFLUENT IRRIGATION PROJECT HOUGHTON LAKE SEWER AUTHORITY.
Consulting Engineer, Vol 48, No 5, p 77, May, 1977.

Descriptors: *Marshes, *Irrigation, Food chains, Wildlife management, Planning, *Waste disposal, Organic matter, Nutrients, Treatment facilities, Costs, Waste water treatment.

A marshland irrigation system was proposed for the disposal of treatment plant effluents in Michigan. Two possible advantages were seen: an estimated cost savings of $700,000 over the use of a conventional irrigation system, and improved food supply and wildlife proliferation in the marsh area. Because of the lack of data on wetlands irrigation in Michigan, a test program was conducted before project approval. The test area was evaluated through plant, soil, and insect samples and through water quality tests. The organic deposits proved excellent in nutrient removal without overloading, and no adverse effects were detected in the test program. The application of 12.5 million gallons of waste water during 1975 and 1976 continued to produce favorable results without adverse effects. The marsh ecosystem was not damaged, and plants grew larger and greener. The irrigation project was accepted as financially and environmentally feasible. (Collins-FIRL)
W77-11757

WATER RELATED UTILITIES FOR SMALL COMMUNITIES IN RURAL ALASKA,
Corvallis Environmental Research Lab., College, Alaska. Arctic Environmental Research Station.
For primary bibliographic entry see Field 5D.
W77-11763

SECONDARY SEWAGE TREATMENT VERSUS OCEAN OUTFALLS: AN ASSESSMENT,
Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.
C. B. Officer, and J. H. Ryther.
Science, Vol. 197, No. 4308, p 1056-1060, 9 September 1977. 1 fig, 1 tab, 26 ref.

Descriptors: *Sewage treatment, *Assessment, *Oxygen demand, *Eutrophication, *Water pollution control, *Coasts, Rivers, Estuaries, Mu-

nicipal wastes, Industrial wastes, Equations, Mathematical models, Systems analysis.
Identifiers: *Ocean outfalls, *Marine environment, Order of magnitude, Waste oxidation model, Trace contaminants, Pathogens, Waste assimilation.

Considered are simplified models to obtain order of magnitude estimates of the oxygen demand of municipal and industrial wastes and of their potential eutrophication effects in the marine environment. The models have been applied to assess two major corrective actions that might be considered for such pollution problems--secondary sewage treatment and ocean outfalls. It is concluded that the arguments for secondary sewage treatment as the proper corrective action are not compelling and that the problem should be reexamined with appropriate scientific and engineering evaluations. One goal should be a more thorough understanding of the life histories of possible trace contaminants and pathogens which may have long biological, chemical, or geological retention times in the marine environment. As opposed to secondary sewage treatment, ocean outfalls can virtually eliminate the eutrophication potential; in addition, the sewage nutrients can have the beneficial effect of serving as fertilizers for the aquatic food chain. (Bell-Cornell)
W77-11766

TRACE METALS IN OPEN WATER DISPOSAL OF DREDGED MATERIAL,
University of Southern California, Los Angeles. Environmental Engineering Program.
K. Y. Chen, J. C. S. Lu, and A. Z. Sycip.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WW4, p 443-454, November 1976. 4 tab, 3 fig, 12 ref.

Descriptors: *Water quality control, *Waste water disposal, *Trace elements, *Metals, Water pollution, Dredging, Sedimentation, Sediments, Analytical techniques, Standards, Sea water.
Identifiers: *Spoil.

Upon addition of sediment/seawater mixture to the seawater column, most trace metals were found to display a pattern of immediate release. These released metals were subsequently removed. The removal is gradually under reducing environments and almost immediately under oxidizing environments. The degree of release was significant for Fe, Mn, and Ni. The Ci, Cu, Pb, and An were moderately released. The release of Ag, Cd, and Hg was neglibible. After resedimentation, the migration of trace metals between sediment/seawater interface were found to be influenced by the redox conditions of the overlying water. In general, three patterns of metal behavior were observed: (1) the release amount increased as the redox conditions became more reducing (Fe and Mn); (2) the release amount increased as the environment became more oxidizing (Cd, Cu, Ni, Pb, and An); and (3) no significant release (Cr and Hg). The soluble metal concentrations during and after open water disposal of dredged materials were found to be in the range of sup-ppb to ppb with the exception of Fe, under reducing condition.
W77-11780

FINAL ENVIRONMENTAL IMPACT STATEMENT: AUBURN INTERCEPTOR (GREEN RIVER SEWERAGE AREA), KING COUNTY, WASHINGTON.
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5D.
W77-11861

LANDSAT OBSERVATIONS OF OCEAN DUMP PLUME MOVEMENT AND DISPERSION,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5B.
W77-11894

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, CHEMICAL OCEANOGRAPHY.
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Atmospheric Labs.
For primary bibliographic entry see Field 5B.
W77-11896

AN ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT: 6TH QUARTERLY REPORT.
National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-11899

TANKER SLUDGE REMOVAL AND DISPOSAL,
Exxon International Co., New York; and Exxon Research and Engineering Co., Florham Park, N. J.
V. X. Lanotte, and J. E. Shewmaker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 174, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. MA-RD-940-76055 to U.S. Maritime Administration, Washington, D.C., June 1976. 50 p, 8 tab, 14 ref. C-5-38000.

Descriptors: *Sludge disposal, *Water pollution control, Oil pollution, Waste treatment, Incineration, Solid wastes, Separation techniques.
Identifiers: Oil tankers, Tanker sludge, Crude washing, Tank cleaning.

The varied aspects of the problem of cargo tank sludge on crude carries in reported. A general description of the problem is given and the sludge management alternatives in selecting a strategy is scanned. Crude washing is briefly discussed as a combined removal and disposal technique. In-tank removal methods involving portable eductors and a vacuum clearner arrangement are described and conclusions are drawn from test results. Current and potential shore disposal methods are presented including sludge farming, incineration (also shipboard), oil extraction, chemical fixation, and aqueous extraction. (Sinha -OEIS)
W77-11911

HEALTH HAZARDS OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL WASTES APPLIED TO LAND,
Universitaet Hohenheim (Landwirtschaftliche Hochschule). (West Germany). Inst. of Animal Medicine and Animal Hygiene.
For primary bibliographic entry see Field 5C.
W77-11975

MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
For primary bibliographic entry see Field 5C.
W77-11976

ECONOMIC POTENTIAL AND MANAGEMENT CONSIDERATIONS IN LAND APPLICATION OF BEEF FEEDLOT WASTES,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-11977

USING LIQUID POULTRY WASTES IN WOODLANDS,
Connecticut Agricultural Experiment Station New Haven.
G. R. Stephens, and D. E. Hill.
In: Proceedings of the International Conference on Land for Waste Management, Ottawa, Canada, Oct., 1973, p. 234-242. Department of the Environment and National Research Council of Canada, 1974. 3 fig, 5 ref.

Descriptors: Application rates, Nitrates, Volitization, Liquid wastes, Groundwater, Nitrogen, Nitrification, *Farm wastes.
Identifiers: Poultry wastes, Land application, Woodlands, Tree response.

During 1970-1972, liquid poultry manure was applied to a plantation of white pine (Pinusstrobus L.) in order to: (1) determine the application rate that will neither damage the trees nor pollute the environment, and (2) determine the nutrient storage capacity in trees and soil. Applications to well-drained and poorly drained soils varied from 25 to 225 t/ha and contained 260 to 2,250 kg/ha N. Within two weeks of application, approximately 50% of the N. applied was volatized. Concentrations of NH4-N in the plots were dependent upon rate of application and season of the year. At low application rates, rapid conversion of NH4-N to NO-N or direct uptake of NH4-N by pine trees resulted in low soil concentration during the dummer. From December to May, nitrifivation rate decreased and NH4-N was increased. At the highest application rate, excess NH4-N was present throughout the year and was neither completely converted to NO3-N nor taken up by the trees. Nitrates not utilized by plants and soil organisms were subject to leaching. Nitrate levels in groundwater under all plots receiving 27-83 t manure were not objectionable, although NO3-N is poorly drained plot receiving 83 t manure reached 7.5 ppm in December, 1972, when the depth to groundwater was less than 1 m. Groundwater beneath the poorly drained plot that received 225 tons/ha in 1970 contained as much as 80 ppm NO3-N after 27 months. Foliage of understory conifer seedlings was damaged by 1 or 2 applications during the growing season; 5 applications killed the seedlings. However, none of the larger trees were visibly injured. Utilization of available nitrogen by pine trees was evidenced by greening of the foliage within 7 months of application. On heavily manured plots, foliar nitrogen was increased as much as 58%. Manuring also increased needle weight and aided retention of older needles. After 3 years, manuring doubled the relative growth rates of the boles on the well-drained site but not on the poorly drained site. These studies indicate that 1 ha of pine plantation will safely utilize on a sustained basis manure from 1,000 hens. (Merryman-East Central)
W77-11979

RESIDUAL WASTE BEST MANAGEMENT PRACTICES: A WATER PLANNER'S GUIDE TO LAND DISPOSAL,
Environmental Protection Agency, Washington, D.C. Div. of Water Planning.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 849, Price codes: A13 in paper copy, A01 in microfiche. Report WPD EPA-440/9-76-022, June 1976. 285 p, 26 fig, 46 tab, 4 append.

Descriptors: *Waste disposal, *Landfills, *Sludge disposal, *Water management(Applied), Costs, Water pollution sources, Industrial wastes, Municipal wastes, Farm wastes, Ultimate disposal, Underground waste disposal, Environmental effects, Legal aspects, Management, Waste water disposal.

A handbook for waste disposal is presented to aid in decision-making in water quality management. Nine residual waste categories are discussed, including waste water sludge, septage residuals,

water treatment, municipal refuse, combustion and air pollution control residuals, industrial wastes, feedlot residuals, mining wastes, and dredge spoil residuals. Quality, quantity, environmental effects, and compliance regulations are discussed for each waste category. Methods of ultimate waste disposal discussed include land application, waste reutilization, trench disposal, and ocean disposal. Various technical and scientific aspects which may affect waste disposal decisions include climate, topography, groundwater infiltration and hydraulics, subsurface chemistry, and vegetation. Legal consequences of alternative residual waste management plans and waste disposal regulations are discussed. Planning processes necessary to develop an effective comprehensive residuals management program are outlined and illustrated for a hypothetical example. Appendices to this report discuss field monitoring and sampling, laboratory procedures for residual wastes, a site evaluation checklist for land disposal, and a glossary of related terms. (Schulz-FIRL)
W77-12076

A REVIEW OF TECHNIQUES FOR INCINERATION OF SEWAGE SLUDGE WITH SOLID WASTES,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W77-12081

SOLUBILITY AND AVAILABILITY OF CADMIUM IN CADMIUM-SLUDGE AMENDED SOIL,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5B.
W77-12144

THE EFFECTS OF WASTEWATER APPLICATION ON THE GROWTH AND CHEMICAL COMPOSITION OF FORAGES,
Cold Regions Research and Engineering Lab. Hanover, N.H.
A. J. Palazzo.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 774, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-39, p 1-8, October 1976. 8 tab, 9 ref.

Descriptors: *Waste water(Pollution), *Environmental sanitation, *Forages, *Soil management, *Waste water disposal, *Waste water treatment, Path of pollutants, Sewage disposal, Degradation(Decomposition), Recycling, Nitrogen, Growth rates, Forage grasses.

The data presented were related to the capabilities of the vegetation in renovating land applications of wastewater. This information was useful when applied to the design and operation of a land treatment system. The results showed that the greatest forage yields and N and P removal occurred when 15 cm/wk (6 in/wk) of wastewater was applied. Forages grown on the heavier textured Charlton soils produced greater yields and removed more N and P than those grown on the lighter textured Windsor soils. Yields ranged from 9.63 to 12.99 metric tons/hectare (4.33 to 5.81 tons/acre), and total uptake of N and P ranged from 309 to 453 kg/ha (278 to 408 lb/acre) and from 32 to 42 kg/ha (29 to 38 lb/acre), respectively. Also included in the report were results which reflect on the management of a system for sustained plant performance and nitrogen removal. Analyses performed in 1974 and 1975 showed reductions in the levels of K in soil and forage, indicating a need for K fertilization for sustained forage productivity. The reduction of K was related to the uptake of this element by the forage and its low concentration in the wastewater. Analyses also showed reductions in soil pH and total exchangeable cations to levels which could be corrected by lime application. (Katz)
W77-12198

5F. Water Treatment and Quality Alteration

DECONTAMINATING LAKE SUPERIOR OF ASBESTOS FIBERS,
Army Mobility and Equipment Research and Development Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 5D.
W77-11539

PROGRESS OF STUDIES ON THE TYPE A (INFECTIOUS) HEPATITIS VIRUS IN WATER,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W77-11571

STUDIES ON DISINFECTION AND CHEMICAL OXIDATION WITH OZONE AND CHLORINE IN WATER RECLAMATION,
National Inst. for Water Research, Pretoria (South Africa).
W. R. Ross, J. Van Leeuwen, and W. O. Grabow.
Water SA., Vol. 2, No. 1, p 25-32, 1976. 6 fig, 2 tab, 34 ref.

Descriptors: Laboratory studies, *Chlorination, *Ozonation, Water reuse, Pesticides, Activated carbon, Filtration, Costs, Dieldrin, Parathion, Lindane, *Oxidation, *Chlorine, *Disinfection, Water treatment.
Identifiers: South Africa.

Laboratory studies showed that Pseudomonas aeruginosa, Aeromonas hydrophila and Acinetobacter anitratum are more resistant to chlorine and ozone than Escherichia coli. Pseudomonas aeruginosa was the most resistant of all strains tested and was selected as test organism for pilot studies on the efficiencies of chlorine and ozone disinfection. The disinfectants proved equally efficient for the disinfection of chlorine demand-free water but ozone was much more efficient in the case of water with a chlorine demand. This difference was confirmed to be due to the property of chlorine to react with nitrogenous substances to form chloramines which are less efficient disinfactants than chlorine. Ozone does not share this property. Laboratory studies showed that ozone was highly efficient in the chemical oxidation of the pesticides parathion, fenthion, lindane and dieldrin and the detergents Manoxol OT and LAS. These compounds are not oxidised under conventional conditions of chlorination. Consideration of the above findings and other advantageous and disadvantages of chlorine and ozone accentuate the value of using appropriate combinations of disinfactants for the treatment of certain waters. A final treatment sequence of ozonation, activated carbon filtration and chlorination may improve costs and efficiency of water reclamation. (So African Water Info Center)
W77-11572

HEALTH ASPECTS OF POTABLE WATER SUPPLIES,
National Inst. for Water Research, Pretoria (South Africa).
W. H. Hattingh, and E. M. Nupen.
Water SA., Vol. 2, No. 1, p 33-46, 1976. 8 tab, 8 fig, 32 ref.

Descriptors: *Public health, *Potable water, Water reuse, Sewage treatment, Water quality standards, Bioassay, Waste water treatment, Water treatment.
Identifiers: South Africa.

A ten-year research programme to assess the chemical and microbiological quality of potable water, including water reclaimed from purified sewage effluents, has been started by the National Institute for Water Research of the South African Council for Scientific and Industrial Research. This project involves a study of eight different but related aspects of water quality. The results obtained during the first two years of the investigation are presented and discussed. These show that the quality of all potable waters tested to date, was excellent and that of reclaimed water was the same, if not better than potable water from surface sources. Those aspects needing further research are also indicated and centre around a knowledge of the pollutants present in the water environment. Pure chemical and microbiological assays will have to be supported by bioassaying techniques to assess the long-term effect of pollutants present in small concentrations. (So African Water Info Center)
W77-11573

CHEMICAL TECHNOLOGY AND ECONOMICS IN ENVIRONMENTAL PERSPECTIVES: TASK II. REMOVAL OF BORON FROM WASTEWATER,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W77-11666

ENHANCEMENT OF HIGH-RATE DISINFECTION BY SEQUENTIAL ADDITION OF CHLORINE AND CHLORINE DIOXIDE,
O'Brien and Gere Engineers, Inc., Syracuse, N.Y.
For primary bibliographic entry see Field 5D.
W77-11668

AIR BLOWERS FOR SEWAGE AND WATER TREATMENT.
Water Services, Vol 81, No 976, p 344, June, 1977.

Descriptors: Equipment, *Aeration, *Oxygenation, Sewage treatment, Waste water treatment, Coagulation, Water treatment.
Identifiers: *Air blowers, *Positive displacement air blowers.

Positive displacement air blowers have been used in the activated sludge treatment process to supply oil-free air which is used to agitate the sludge, coagulate colloids, and provide oxygen for aerobic processes. Air is also used to back clean filters. Peabody Holmes Ltd. of Turnbridge, Huddersfield, England has designed a rationalized series of positive displacement blowers, which covers the volume and pressure range from 80 cu m/hr to 50,000 cu m/hr. Higher rotational speeds resulting from strong impellers have reduced from 66 to 26 the number of machines necessary to cover the volume and range. Mechanical noise levels have been reduced. Peabody Holmes air blowers also contain various protection devices including automatic power shut-off, vacuum switches, pressure switches, and thermostatically controlled heaters. (Schulz-FIRL)
W77-11697

EVALUATION OF RESIDUAL CHLORINE CONTROL SYSTEMS,
Fischer and Porter Co., Warminster, Pa.
R. N. Roop.
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1591-1603, July, 1977. 19 fig, 2 tab, 6 ref.

Descriptors: *Chlorination, *Disinfection, *Automatic control, *Control systems, *Equipment, *Instrumentation, Monitoring, Chemcontrol, Chemical wastes, Water pollution sources, Costs, Model studies, Pilot plants, Electronic equipment, Waste water treatment.
Identifiers: *Residual chlorine.

The high economic and energy costs of chlorine and the environmental hazard posed by overchlorination have made automatic control of residual chlorine in water and waste water treatment advantageous. Three systems for automatic

gas dispenser control are currently used, with the choice being controlled by flow signal present in the system. In studies to determine the actual chlorine demand of waste water, results indicated that most of the demand for chlorination was satisfied during the first five minutes of contact time and that residual decay followed an exponential function. Five strategies for automatic control of residual chlorine were investigated using a laboratory-scale chlorination system with a hypochlorite pump. An evaluation of two-mode, three-mode, sampling, two-timer, and cascade control systems indicated that there were no obvious advantages of three-mode (proportional band, reset, derivative) over two-mode control (proportional band, reset). It was determined that for performance purposes controller response time was more imporlant than the type of controller. Cascade control is suggested for residual control when the first sample point is 5 to 15 minutes downstream from the plant. Feedforward flow pacing is suggested to minimize differences between control methods. (Schulz-FIRL)
W77-11708

EXPERIENCE WITH THE BACTERIOLOGICAL CONTROL OF WASTE WATER PURIFICATION (A SZENNYVIZTISZTAS BAKTERIOLOGIAI ELLENORZESENEK TAPASZTALATAI),
For primary bibliographic entry see Field 5D.
W77-11725

INACTIVATION OF VIRUSES DURING ANAEROBIC SLUDGE DIGESTION,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W77-11737

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),
Wastewater Treatment.
Water and Wastes Engineering, Vol. 14, No. 7, p 9, July, 1977.

Descriptors: *Water resources, *Water reuse, *Tertiary treatment, *Deep wells, *Injection wells, Waste water treatment, Saline water intrusion, Sewage treatment, Reverse osmosis, Treatment facilities, Waste disposal, Water treatment.

An advanced waste water treatment facility designed to recycle waste water for municipal and industrial use has been constructed in Fountain Valley, California. The Orange County Water District had the facility built to provide an alternative to ocean disposal of waste water and to create a hydraulic fresh water pressure barrier to sea water intrusion. Treatment processes at Water Factory 21, which receives secondary treated sewage from the Orange County Sanitation District, include: coagulation and settling, ammonia removal, pH adjustment, filtration, carbon adsorption, demineralization by reverse osmosis, and chlorination. Treated water is diluted and then undergoes deep well injection for storage. (Schulz-FIRL)
W77-11753

INSTRUMENTATION AND AUTOMATION EXPERIENCES IN WASTEWATER-TREATMENT FACILITIES,
Raytheon Co., Portsmouth, R. I.
For primary bibliographic entry see Field 5D.
W77-11760

IMPACT OF WATER RESOURCES ON VECTOR-BORNE DISEASES,
Center for Disease Control, Fort Collins, Colo.
For primary bibliographic entry see Field 5B.
W77-11774

A FUNDAMENTAL STUDY OF REMOVAL MECHANISMS OF SUSPENDED PARTICLES IN THE DEEP FILTER (III) (KYUSOKU ROKAROSO NO KYODO (III): TEIJO ROKAJI NO RIHAKU TO SONO SAYO KIKO NO KENTO),
For primary bibliographic entry see Field 5D.
W77-11829

THE USE OF POLLUTED SOURCES FOR WATER SUPPLY,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. A. Okun.
APWA Reporter, p 23-25, September 1976.

Descriptors: *Potential water supply, *Potable water, *Water delivery, *Water costs, Management, Annual costs, Public health, Water treatment, Toxins, Viruses.
Identifiers: *Dual water supply systems.

One-third of the U.S. population draws its drinking water from contaminated sources. A breakdown in water treatment facilities may carry contaminated water to users. The potential hazards of conventional water supply systems include viruses and exotic chemical that are not neutralized by conventional treatment. Long term ingestion of low levels of pollution may have negative health effects. Three approaches exist for protecting the public health: eliminate toxic substances at the source, eliminate toxic substances from waste streams, or avoid use of polluted sources for potable supplies. The last option would often require dual water supply systems. The advantages of a dual system are: the demand on high quality sources would be relieved, the cost of providing polluted sources for nonpotable sources is less than the cost of developing new potable sources, and the risk of long term ingestion of contaminants is eliminated. Examples of places using or planning to use dual supply systems are presented. The annual costs for dual and conventional systems are compared. The need to integrate and regionalize water supply and water pollution control operations is examined in light of economies of scale and the protection of downstream sources. (Nessa-NC)
W77-11858

PILOT PLANT EXPERIENCES IN DEMINERALIZATION OF SECONDARY EFFLUENT USING ELECTRODIALYSIS,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W77-11914

ELECTROCHEMICAL CHLORINE FLUX MONITOR,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 5A.
W77-11915

SEMIPERMEABLE MEMBRANES AND THE METHOD FOR THE PREPARATION THEREOF,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 3A.
W77-11918

REMOVAL OF TRACE COPPER IONS FROM WATER,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 5D.
W77-11919

EVALUATION OF POTABLE WATER AS A VEHICLE OF TRANSMISSIBILITY AND VIABILITY FOR HERPESVIRUS,
North Dakota State Univ., Fargo. Dept. of Virology and Pharmacology.
For primary bibliographic entry see Field 5B.
W77-11935

RECURRENT PROBLEMS OF WATER SUPPLY IN MALTA,
Dundee Univ. (Scotland).
For primary bibliographic entry see Field 3A.
W77-11988

5G. Water Quality Control

OIL-SPILL DISPERSANT FOR MARINE POLLUTION.
Public Health, Vol. 76, No. 12, p 374-375, December 1976.

Descriptors: *Oil spills, *Dispersants, Toxicity, Marine life, Spraying, *Pollution abatement, Beaches, Water pollution control.
Identifiers: South Africa, Marine pollution.

The first specification for oil-spill dispersant for use in dispensing crude and fuel oil floating on sea water in harbours and on high seas, as well as for use in beach cleaning, has been finalized by the South African Bureau of Standards. These specifications lay special stress on dispersing efficiency, suitability for use in conventional spray equipment, and toxicity to marine life. Prohibited ingredients are benzenes, chlorinated hydrocarbons, phenols, creosols, free caustic alkalis, mineral acids, and solvents containing more than 3% aromatic hydrocarbons. 76 Cases of oil pollution at sea have been handled since the Department of Transport accepted responsibility for this task. Major problems were experienced with the following ships 'Wilstar' at Port Elizabeth, 'Oriental Pioneer' at Cape Town, 'Produce' at Duban, and 'Oranjeland' at East London. Aerial application of dispersants by means of helicopter is tested. Booms, pick-up, burning, sinking, absorbents, and dispersants as methods of treating off-shore oil slicks are discussed. (So African Water Info Center)
W77-11549

APPLICATION OF HERBICIDES THROUGH A MICROJET IRRIGATION SYSTEM,
Citrus and Subtropical Fruit Research Inst., Nelspruit (South Africa).
For primary bibliographic entry see Field 3F.
W77-11558

SCIENTIFIC INFORMATION IN THE DECISION TO DAM GLEN CANYON,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 8E.
W77-11583

PRELIMINARY EVALUATION OF WATER QUALITY OF PROPOSED LAFARGE LAKE, KICKAPOO RIVER, VERNON COUNTY, WISCONSIN,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W77-11584

WATER YIELD CHANGES AFTER THE URBANIZATION OF THE CANON'S BROOK CATCHMENT, HARLOW, ENGLAND,
University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W77-11600

TRADITIONAL METHODS OF WATER PURIFICATION IN THE RIVERAIN SUDAN IN

RELATION TO GEOGRAPHIC AND SOCIOECONOMIC CONDITIONS,
For primary bibliographic entry see Field 5D.
W77-11620

AQUACULTURE,
New York Sea Grant Inst., Albany.
O. W. Terry.
MESA New York Bight Atlas Monograph No. 17, New York Sea Grant Institute Atlas No. NYSSGP-AM-77-009, June 1977. 36 p, 11 fig, 2 tab, 2 map, 80 ref.

Descriptors: *Aquiculture, *Waste disposal, *Water quality control, Resources development, *Oysters, Dams.
Identifiers: *New York Bight, Mariculture.

The oyster industry, probably the earliest form of American aquaculture, has a long and important history in the various inshore waters adjoining New York Bight. With the introduction of modern technology the future of oyster production is now promising despite the industry's recent difficulties. Stricter environmental protection will sometimes work to constrain aquaculture as well as to promote it, but the overall balance promises to be favorable to the industry. The greatest long-term potential for Bight aquaculture probably lies in sharing worldwide progress toward novel high-technology systems just now beginning to be seriously considered--offshore or open seammariculture. The Bight has unique advantages for aquaculture; the Bight's presently most intractable waste disposal problems may be converted into resources through recycling. (NOAA)
W77-11665

PLANNING FOR URBAN STORMWATER CONTROL,
Fell, Brusso, Bruton, and Knowles, Inc., Tulsa, Okla.
W. J. Fell.
Public Works, Vol 108, No 8, p 81-85, August, 1977. 4 fig, 2 tab.

Descriptors: *Unit hydrographs, *Rainfall-runoff relationships, *Watersheds(Basins), *Storm water, Hydrologic data, Duration curves, Discharge(Water), Hydrograph analysis, Mathematical models, Runoff, Precipitation(Atmospheric), Storms, Water management(Applied), Waste water treatment, *Planning.
Identifiers: Tulsa(OK).

The elements of hydrograph construction and the use of hydrographs are discussed with respect to storm water management and the Soil Conservation Service (SCS) unit hydrograph. Hydrographs are graphical presentations of storm flow or discharge rates with respect to storm duration, with the unit hydrograph representing the flow from one inch of rainfall over the entire catchment area. The Soil Conservation Service (SCS) unit hydrograph relates ratios of discharge and time, the shape of the curve being determined by field observations from actual watershed flows. Applications of the unit graph in constructing discharge hydrographs for actual storms are discussed. A series of equations relating rainfall, peak discharge, time to peak, and runoff is presented. An area of 160 acres in Tulsa, Oklahoma is used in a numerical example for hydrograph construction. (Schulz-FIRL)
W77-11669

THE INVESTIGATION OF SEWER NETWORKS BY COMPUTER,
London Borough of Hammersmith (England). Directorate of Engineering.
L. A. Cook, and B. Lockwood.
Proceedings of the Institution of Civil Engineers, Part 2, Vol 63, p 481-494, June, 1977. 4 fig, 5 ref.

Descriptors: *Algorithms, *Computer programs, *Sewerage, *Storm runoff, *Hydrograph analysis, Hydrographs, Analytical techniques, Storm drains, *Sewers, Urban hydrology, Design criteria, Water management(Applied), Drainage systems, Pipes, Mathematical models, Waste water treatment.
Identifiers: Borough of Hammersmith, London, England, TRRL.

Computer-based algorithms have been used by the London Borough of Hammersmith to examine the area's sewer system. The Sewcheck suite of programs and the Transport and Road Research Laboratory (TRRL) method of hydrographic analysis were the major components of the evaluation program. TRRL as used in Hammersmith was modified to produce hydraulic gradients, provide line-printer output, characterize surcharge, allow for pipes with oval and circular cross-sections, accept input data in a more compact form than the original version, and minimize cost in operating the program. A series of flow charts is provided to illustrate program logic. Calculated individual and cumulative surcharge figures may be high because of program limitations on relaxation of pipes and storage of storm water. Dry weather flow velocity should be checked for all new additions to the sewer network. Recommendations for weir placement, pipe size, and pipe gradient based on peak flow are presented. The size and other characteristics of the network control operating costs for the hydrograph program, with a system of 110 pipes requiring 105,000 octal words of storage per run using a CDC 6600. (Schulz-FIRL)
W77-11670

POTENTIAL VALUE OF TREATMENT OF URBAN STORMWATER,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
I. Cordery.
The Institution of Engineers, Australia, Vol CE 18, No 2, p 60-63, 1976. 2 fig, 4 tab, 9 ref.

Descriptors: *Urban runoff, *Storm water, *Water quality, *Tertiary treatment, *Settling basins, Suspended solids, Biochemical oxygen demand, Surface runoff, Water pollution sources, Model studies, Waste water treatment.
Identifiers: Storm water treatment.

Storm water quality was examined for two sites in Sydney, Australia, to examine the feasibility of storm water treatment. Flow rate, suspended solids, BOD, phosphate, and ammonia were measured for approximately 100 water samples collected from 13 floods within a catchment area. Analyses indicated that pollutant loads were highest during the 'first flush' of the storm and also tended to be higher during morning storms than afternoon storms. Laboratory studies on settling for from 4 minutes to 24 hours as a treatment method for storm water showed that suspended solids could be reduced by as much as 87% with a settling time of only 15 minutes. A comparison of estimated annual loads indicated that settling of urban runoff could produce effluent qualities similar to those produced by tertiary treatment but at a much lower cost. (Schulz-FIRL)
W77-11675

BIOLOGICAL CONTROL OF WATER POLLUTION.
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
University of Pennsylvania Press, Philadelphia, Pennsylvania. 1976. 340 p. J. Tourbier and R. W. Pierson, Jr. (ed.).

Descriptors: *Biological treatment, *Soil-water-plant relationships, *Potable water, *Waste water treatment, *Groundwater recharge, Artificial recharge, Municipal wastes, Model studies, Plant growth, Cycling nutrients, Marsh plants, Biochemical oxygen demand, Chemical oxygen demand, Absorption, Aerobic treatment, Color, Sewage treatment, Biocontrol.
Identifiers: *Water pollution biocontrol.

A series of articles presented as part of an International Conference on Biological Water Quality Improvement Alternatives comprises this review of waste water pollution and treatment methods. Biological methods for the treatment and reclamation of waste water discussed include land application, the use of vegetation in nutrient cycling, controlled eutrophication, and bacterial cleaning of sewer lines. Aquatic ecosystems and nutrient cycles are discussed with respect to waste water treatment. More efficient methods of waste water treatment which also result in groundwater recharge are considered. Various aspects of drinking water are discussed, including possible contaminants, future supplies, and primitive treatment methods. (See W77-11691 thru W77-11695) (Schulz-FIRL)
W77-11690

EXPERIMENTAL USE OF EMERGENT VEGETATION FOR THE BIOLOGICAL TREATMENT OF MUNICIPAL WASTEWATER IN WISCONSIN,
Wisconsin Univ., Oshkosh. Dept. of Biology.
F. Spangler, W. Sloey, and C. W. Fetter.
In: Biological Control of Water Pollution (ed. Tourbier, J., and Pierson, R. W., Jr.), University of Pennsylvania Press, 1976. p 161-171, 9 tab, 19 ref.

Descriptors: *Soil-water-plant relationships, *Pilot plants, *Cycling nutrients, *Plant growth, Biological treatment, Nitrogen, Phosphorus, Absorption, Marsh plants, Vegetation establishment, Marsh management, Model studies, Waste water treatment, Sewage treatment, Aerobic treatment, Biochemical oxygen demand, Chemical oxygen demand, Waste treatment.
Identifiers: Seymour(WI), Bulrushes, Irises.

The use of a marsh and its associated vegetation in waste water purification has been investigated as an economical method to reduce bacteria, nutrients, and organic compounds in municipal waste water. In laboratory studies on the use of iris (Iris versicolor), softstem bulrush (Scirpus validus), and hardstem bulrush (Scirpus acutus) grown in gravel-lined basins, removal from effluent of BOD, COD, O-PO4, total-P, and dissolved solids was investigated for 5-, 3-, and 1.5-day retention times. Retention in all beds, including the gravel control, resulted in reductions of 49-98% of BOD and COD. Significant reductions in total-P and O-PO4 were observed for all planted beds, with bulrushes being more effective at removal than irises. A pilot plant, employing ten plastic-lined, gravel-filled retention basins, showed that gravel-filled control ponds were as effective at water purification as planted ponds. Retention times of as little as five hours resulted in significant reductions in BOD (87-92%), turbidity (77-91%), and coliforms (90-99.7%). Reductions of dissolved solids (0.3-9.5%) and total-P (5-25%) were not appreciable. It was suggested that water purification is actually caused by microflora on the growing media rather than the plants themselves. (See also W77-11690) (Schulz-FIRL)
W77-11691

RENOVATION OF MUNICIPAL WASTEWATER FOR GROUNDWATER RECHARGE BY THE LIVING FILTER METHOD,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
W. E. Sopper.
In: Biological Control of Water Pollution (ed. Tourbier, J., and Pierson, R. W., Jr.), University of Pennsylvania Press, 1976. p 269-282, 10 tab, 9 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Soil-water-plant relationships,

*Absorption, *Biological treatment, Soil contamination, Soil chemical properties, Phosphorus, Nitrogen, Forests, Forest soils, Agronomy, Corn(Field), Forage grasses, Trace elements, Waste water treatment, Municipal wastes, Model studies.
Identifiers: *Spray irrigation, University Park(PA).

Studies at the Pennsylvania State University were performed on the use of vegetative cover to supplement removal of waste water constituents by soil interactions. Treated effluent was used to spray-irrigate forested areas and cropland for a period of 12 years (1963-1974) at a rate of 5 cm/wk. Samples of percolating water collected in agronomic areas at 120 cm soil depth indicated that phosphate had been consistently reduced by more than 98% and was not significantly higher than control values. Nitrate-nitrogen removal at this application rate was not adequate for Public Health Service drinking water standards in corn-planted areas, but was sufficient in canary grass covered areas. Although phosphorus was effectively removed in forested areas, without harvesting of trees it was continuously recycled. Nitrogen reduction was variable in forested areas, with an apparent system collapse when application rates were increased by 50%. Soil analyses showed that pH and concentrations of exchangeable K, organics, and N were not affected by spray irrigation. However, Ca, Mg, Na, P, and B increased significantly while Mn decreased. Harvesting of crops showed removal efficiencies of 334% of the applied N, 230% of the applied P, and 280% of the applied K for corn silage crops and 145%, 143%, and 130% for reed canary grass. One effect of spray irrigation was an annual groundwater recharge of from 10,300 cu m to 17,300 cu m per hectare irrigated. It was suggested that at an application rate of 5 cm/wk, 4 million liters of waste water could be disposed of on 52 hectares of land, using agricultural areas, recreation areas, and open space as available. (See also W77-11690) (Schulz-FIRL)
W77-11692

THE POTENTIAL OF SUBMERSED VASCULAR PLANTS FOR RECLAMATION OF WASTEWATER IN TEMPERATE ZONE PONDS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
C. D. McNabb.
In: Biological Control of Water Pollution (ed. Tourbier, J., and Pierson, R. R. Jr.), University of Pennsylvania Press, 1976. p 123-132, 8 fig.

Descriptors: *Pilot plants, *Aquatic plants, *Aquatic populations, *Biological treatment, Cycling nutrients, Soil-water-plant relationships, Absorption, Plant growth, Aerobic treatment, Nitrogen, Phosphorus, Trace elements, Model studies, Algae, Waste water treatment, Sewage treatment, Fish diets, Aquatic microorganisms, Waste treatment, Municipal wastes.
Identifiers: East Lansing(MI), Submersed vascular plants.

Tertiary treatment of municipal waste water using submersed vascular plants in aerobic stabilization ponds has been investigated by Michigan State University. An on-campus pilot system designed to treat 2 million gallons of sewage per day includes a primary treatment unit, an activated sludge facility, four ponds comprising 40 acres, and 143 acres of land for spray irrigation. Growth of the larger, more easily harvested, submersed vascular plants in stabilization ponds was favored by aerobic conditions, temperatures above 10C, and high water clarity which is, in turn, related to high concentrations of algae-grazing zooplankton. The introduction of fish which fed on zooplankton resulted in clouding of the water through unconstrained algae production. At a retention time of 28 days, harvested plants were reported to have concentrated 20-25% of the phosphorus, 50-70% of the nitrogen, 80-100% of the manganese, 20-30% of the iron, 5-10% of the copper and zinc, and 1-3% of the cadmium, chromium, cobalt, and nickel present in the effluent. Ultimate removal of these elements does, however, require harvesting to remove waste-enriched plants. As some vegetation must remain in the pond during the winter to insure continuous crop production, plant degeneration which returns a portion of the wastes to the pond may limit total ultimate removal. (See also W77-11690) (Schulz-FIRL)
W77-11693

MACROPHYTES AND WATER PURIFICATION,
Max-Planck-Gesellschaft fuer Zuechtungsforshung, Krefeld (West Germany). Limnological Research Group.
K. Seidel.
In: Biological Control of Water Pollution (ed. Tourbier, J. and Pierson, R. W., Jr.), University of Pennsylvania Press, 1976. p 109-123, 9 fig, 6 tab, 4 ref.

Descriptors: *Soil-water-plant relationships, *Plant physiology, *Sewage treatment, *Pathogenic bacteria, *Waste water treatment, Sludge treatment, Effluents, Plant growth, Model studies, Hydrogen ion concentration, Disinfection, Coliforms, Salmonella, Waste treatment.
Identifiers: Schoenoplectus lacustris, Phragmites communis. Mentha aquatica, Juncus effusus, Macrophytes.

The growth of plants in substandard water and waste treatment products has been studied to determine to what extent plant growth is affected by suboptimal conditions and to what extent plants influence water, subsoil, and sludge characteristics. Changes in chemical absorption and uptake, morphology, physiology, and growth rate were related to both species and sewage type. Root secretions of certain aquatic plants such as Mentha aquatica, Acorus calamas, Juncus effusus, and Phragmites communis were observed to have disinfective properties, reducing E. coli, Enterococci, and Salmonella by as much as 90% after two hours contact time with sewage. Schoenoplectus lacustris neutralized acidic or alkaline sewage. The use of plants was suggested for the purification, reclamation, dewatering, and sterilization of sludge. The Max Planck Institute has made several recommendations on the use of plants in sewage treatment, including: use of inert planting material to encourage nutrient uptake from waste water, oxygenation of root areas by periodic draining or cascade construction, use of algicides, equal distribution of effluent over planting beds, periodic harvesting of stems, and use of additional chemical treatment if necessary to insure high effluent quality. (See also W77-11690) (Schulz-FIRL)
W77-11694

THE PURIFICATION OF WASTEWATER WITH THE AID OF RUSH OR REED PONDS,
Federal Commission for the Ijsselmeerpolders, The Hague (Nederlands).
J. De Jong.
In: Biological Control of Water Pollution (ed. Tourbier, J., and Pierson, R. W., Jr.), University of Pennsylvania Press, 1976. p 133-139, 7 fig, 5 tab, 5 ref.

Descriptors: *Soil-water-plant relationships, *Sewage treatment, *Biochemical oxygen demand, *Infiltration, Chemical oxygen demand, Nitrogen, Phosphorus, Biological treatment, Plant growth, Model studies, Pilot plants, Aquatic populations, Aquatic plants, Waste water treatment.
Identifiers: Phragmites australis, Flevoland, Lake Yssel, Netherlands.

A pilot study conducted in the Netherlands on the use of rushes, reeds (Phragmites australis), and polypropene fibers to reduce BOD, COD, N, and P in sewage is described. Campground sewage was emptied into ponds which initially had a star-shaped layout, later changed to a series of elongated ditches for ease in maintenance. Significant reductions of almost 100% in BOD, COD, and bacteria (MPN) for pond-retained influent were attributed to purification by soil infiltration and nutrient uptake by pond-dwelling organisms. A decrease in rate of removal in latter parts of the study was attributed to saturation of the organisms with respect to the measured parameters. Optimal purification was reported for retention times of greater than 10 days. In a comparison of Dutch treatment facilities, the pond detention purification method proved more effective and less costly than the use of trickling filters or the activated sludge process. (See also W77-11690) (Schulz-FIRL)
W77-11695

USING WETLANDS FOR WASTEWATER TREATMENT.
For primary bibliographic entry see Field 5D.
W77-11700

PROBLEMS IN IMPLEMENTING U. S. WATER QUALITY GOALS,
California Univ., Los Angeles. Dept. of Geography.
W. E. Westman.
American Scientist, Vol. 65, No. 2, p 197-203, March-April, 1977. 21 ref.

Descriptors: *Planning, *Federal Water Pollution Control Act, *Legislation, *Water pollution control, *Water quality, *Water policy, Water pollution, Urban runoff, Storm water, Water pollution sources, Water pollution effects, Reclaimed water, Monitoring, Sea water, Trace elements, Metals, Fertilizer, Treatment, Costs, Water management(Applied), Waste water treatment, Waste water disposal.
Identifiers: National Commission on Water Quality.

Key elements and goals of the 1972 Federal Water Pollution Control Act Amendments (FWPCA), the degree to which these goals are reflected by the National Commission on Water Quality (NCWQ), and possible future strategies for implementation are evaluated. Factors which are thought to reduce the cost-effectiveness of implementaion policies are: assigning higher priority to the treatment of municipal and industrial wastes than to nonpoint sources of wastes, discouraging treatment of urban runoff, lacking optimal strategies for storm water treatment, and failing to rank pollution sources by severity. Criticisms were leveled at the current monitoring program for the lack of enforcement, lack of distinction between point and nonpoint sources of pollution, inadequate storm water and groundwater monitoring, and insufficient staff to insure accurate reporting by dischargers. Technologies available for land application as an alternate means of ultimate disposal of sewage wastes are examined. Hindrances to the reclamation and reuse of waste water are summarized as public health uncertainties, historical or legal uncertainties, and revenue requirements. Regulations for the protection of coastal waters are considered inadequate from an ecological standpoint in not considering the food chain paths of various pollutants being dumped into the ocean. Suggestions for the future include the development of more cost-effective routes toward attaining the goals set forth by the FWPCA and NCWQ. (Schulz-FIRL)
W77-11739

WATER QUALITY MANAGEMENT--RESEARCH AND DEVELOPMENT AREAS,
Water Pollution Research Lab., Stevenage (England).
M. J. D. White.
The Public Health Engineer, Vol. 5, No. 3, p 72-75, May, 1977. 2 fig, 49 ref.

Descriptors: *Research and development, *Water quality, *Biochemical oxygen demand, *Treatment, *Filtration, Suspended solids, Treatment facilities, Model studies, Pilot plants, Nitrate, Costs, Design criteria, Activated sludge, Sewage treatment, Automatic control, Waste water treatment.

Current areas of research and development for improved effluent quality and reduced costs are discussed with respect to practical water quality management. Methods for suspended solids removal, which generally results in the removal of BOD, include flocculation and filtration by sand filters, microstrainers, pebble beds, and grass plots. As filter media require backwashing to prevent clogging, researchers in the United Kingdom and the United States are investigating air-water backwashing and the use of dual media as more efficient, more economical methods of backwashing. Dissolved air flotation, normally used for the treatment of drinking water, has been studied recently for removal of suspended solids from effluent. The use of anaerobic processes for removal of nitrate from secondary effluents is described as an alternative to the normal physicochemical methods of nitrate removal. Alternate methods of sludge disposal, dewatering, and stabilization are considered as means of reducing costs while maintaining high effluent quality. Automatic control systems employing sensory devices, central processing, and integrated monitoring systems are discussed. (Schulz-FIRL)
W77-11747

PLANNING FOR IMPLEMENTATION UNDER SECTION 208,
Environmental Protection Agency, Washington, D. C.
W. C. Lienesch, and G. A. Emison.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 283-295, November 1976. 1 tab, 3 ref.

Descriptors: *Water quality, *Land use, *Planning, Regions, Environmental engineering, Regulation, Water law, Wastewater treatment.
Identifiers: *Federal laws, Government agencies, Citizen participation.

Limited experience with the development of water quality management plans by the initial 208 agencies indicates that there are certain common problems and issues that are arising. Perhaps the most difficult of these is the establishment of implementable institutional arrangements and regulatory programs, both of which will require action by local, state and Federal governments. In addition, the agencies are finding that their work on wastewater treatment alternatives is being constrained, sometimes significantly, by ongoing facilites planning. Finally, it is also becoming apparent that overemphasis on sophisticated analytical approaches, which is typical of many plans, will not be sufficient for plan implementation. More emphasis must be placed on the continual involvement of local and state decision makers, especially those who will affect the implementaion of the plan. (Bell-Cronell)
W77-11776

MATHEMATICAL MODELING OF TRANSPORT PROCESSES IN AQUATIC SYSTEMS,
Battelle Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5B.
W77-11786

BIOLOGICAL EVALUATION OF BEST PRACTICABLE AND BEST AVAILABLE TREATMENT CONTROL TECHNOLOGY FOR PETROLEUM REFINERY WASTEWATERS,
Oklahoma State Univ., Stillwater. Reservoir Research Center.
For primary bibliographic entry see Field 5D.
W77-11790

FUTURE NEEDS FOR DRY OR PEAK SHAVED DRY/WET COOLING AND SIGNIFICANCE TO NUCLEAR POWER PLANTS,
General Electric Co., San Jose, Calif.
For primary bibliographic entry see Field 3E.
W77-11848

SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACTS OF COAL GASIFICATION AND LIQUEFACTION PLANTS,
AME Technology, Inc., Lexington, Ky.
For primary bibliographic entry see Field 6G.
W77-11851

USER MANUAL FOR SEWER AND WATER ACCOUNTS PROCESSING MODULE.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 898, Price codes: A08 in paper copy, A01 in microfiche. Prepared for U.S. Department of Housing and Urban Development, Washington D.C., Report USAC-RPA2-4042A, May 1975. 143 p, 3 append. H-1212.

Descriptors: *Data storage and retrieval, *Data processing, *Computer programs, Data collections, Documentation, Data transmission, Automation, Computer models, Sewers.
Identifiers: *Municipal Information System, *Sewer and water accounts.

The Urban Information Systems Inter-agency Committee (USAC) commissioned the City of Reading, Pennsylvania to develop a physical and economic development (PED) subsystem for a comprehensive municipal information system. This report explains how to use the sewer and water accounts processing (SWAP) module of the PED subsystem. It describes the responsibilities of the various bureaus and offices, and the forms used for collecting input to the module. Appendix A contains samples of the input forms that are described in the text. Appendix B contains the instruction forms for executing the nine SWAP module programs. The SWAP module includes those operations that secure information on individual accounts, update changes in this information, determine volume of customer usage, produce water and sewer bills, receive payment on accounts, and maintain account status. The SWAP module includes the following operational uses: applications processing, meter reading, cash receipts, billing, and reporting. Implementation of this module will provide a foundation for a thorough city property data base, and substantial clerical hours will be saved in processing the sewer and water bills. Components of the USAC Information System are designed for use in regional information systems anywhere in the U.S. (Nessa-NC)
W77-11856

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS,
V. P. Wilson.
Environmental Affairs, Vol. 5, p. 545-566, Summer 1976.

Descriptors: *Water law, *Legal aspects, *Judicial decisions, *Federal Water Pollution Control Act, *Groundwater, Regulation, Common law, Legislation, Water pollution, Injection wells, Navigable waters.
Identifiers: *Safe Drinking Water Act of 1974.

The study evaluates statutory and common law remedies for ground water pollution. Common law actions are available only to plaintiffs who own the land damaged by ground water pollution. The plaintiffs must prove negligence, nuisance or trespass, and that a causal link exists between the damages and the pollution. Statutory remedies include the Safe Drinking Water Act (SDWA) of 1974 and the Federal Water Pollution Control Act (FWPCA) of 1972. The major provisions and limitations of both acts are summarized. The FWPCA seems to be the best remedy since the applicability of the SDWA is statutorily limited. A recent federal district court decision in the case of United States v. GAF Corporation raises serious questions as to the applicability of the FWPCA to groundwaters. The court's reasoning is evaluated and arguments are developed for the inclusion of groundwaters within the protection of the FWPCA. The Court's interpretation of the Act's legislative history is questionable. Injection wells, except for those expressly excluded, are part of the definition of point sources in the FWPCA. The FWPCA definition of navigable waters has been interpreted in other decisions as including groundwater. It is concluded that the GAF decision is in error. (Nessa-NC)
W77-11863

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULATIONS IN LAKES,
Wisconsin Univ.-Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C.
W77-11864

WATER AND SEWER RATES IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6C.
W77-11868

MOSQUITO CONTROL IN THE AQUATIC ENVIRONMENT WITH MONOMOLECULAR ORGANIC SURFACE FILMS,
Naval Research Lab., Washington, D.C. Chemical Oceanography Branch.
W. D. Garrett.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-028 077, Price codes: A02 in paper copy, A01 in microfiche. Laboratory Report No. 8020, July 16, 1976. 17 p, 4 fig, 5 tab, 17 ref.

Descriptors: *Air-water interfaces, *Monomolecular films, *Mosquitoes, *Aquatic environment, Mortality, Ecosystems.
Identifiers: Surface films, Anopheles quadrimaculatus, Aedes aegypti, *Mosquito control.

The lifestyle of immature forms of the mosquito in water is highly dependent upon the properties of the air-water interface. Nonionic monomolecular organic films, which reduce surface tension and increase the wettability of breathing structures, produced high cumulative mortalities and mortality rates in fourth-instar larvae of Anopheles quadrimaculatus. The mechanisms by which the film-induced surface affects the life cycle of the mosquito are discussed. Optimum properties of film-forming materials for practical mosquito-control applications are itemized and related to chemical structural considerations. The applicability and limitations of this approach to mosquito control are reviewed. (Sinha-OEIS)
W77-11888

VLCC 'METULA' OIL SPILL,
Texas A and M Research Foundation, College Station.
R. W. Hann, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-003 805, Price codes: A04 in paper copy, A01 in microfiche. Prepared for U.S. Coast Guard Office of Research and Development Final Report No. CG-D-54-75, December 1974. 69 p, 11 fig, 1 tab, 5 append. DOT-CG-42444-A.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution control, Beaches, Birds, Aquatic animals, Pollution abatement.

Identifiers: *Outer Continental Shelf, Chile, Straits of Magellan.

On 9 August 1974, the METULA, a 206,000 deadweight VLCC (Very Large Crude Carrier) enroute from Ras Tenura, Saudi Arabia to Quintera Bay, Chile with a load of 195,673 tons of Arabia light crude, ran aground on the Satellite Patch Shoal in the Straits of Magellan, Chile. The author was detailed by the U.S. Coast Guard to proceed to the spill site to serve in the capacity of Science Advisor to the U.S. National Strike Force sent to assist the Chilean government abate the spill. The report summarizes the history of the spill, the deposition of oil on the shore, impact of the oil on the shore, and comments regarding feasibility of containment, cleanup or stabilization. (Sinha-OEIS)
W77-11889

SOCIAL COST OF OIL POLLUTION,
Naval Postgraduate School, Monterey, Calif.
H. S. Mudjiardjo.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-027 257, Price codes: A04 in paper copy, A01 in microfiche. Master's Thesis, March 1976. 67 p, 10 fig, 17 reg, 2 append.

Descriptors: *Oil pollution, *Oil spills, *Economics, *Water pollution effects, *Baseline studies, Resources development, Environmental effects, Damages, California.
Identifiers: Outer Continental Shelf, *San Francisco Bay.

A method of improving decision making relative to the problems created by oil spillage is investigated. This thesis uses a simulation to consider the spread and damage caused by oil spills using data from San Francisco Bay. A projection of social costs from these spills has been made. Formulation of a methodology for deriving the social cost of oil spills is a prerequisite in reaching optimal, rational decisions in managing oil pollution. Such decisions may include the establishment of a fine structure, determination of the required level of clean-up and identification of socially significant spills. (Sinha - OEIS)
W77-11892

ALABAMA PUBLIC MEETING SERIES ON COASTAL ZONE BOUNDARIES, NOVEMBER - DECEMBER, 1975. INTERPRETATIONS,
Alabama Development Office, Montgomery.
For primary bibliographic entry see Field 6E.
W77-11900

SIGNIFICANCE OF LOW MOLECULAR WEIGHT HYDROCARBONS IN EASTERN GULF WATERS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W77-11902

SEPARATION OF OIL IN BILGE WATER BY SEMIPERMEABLE MEMBRANE,
Naval Ship Research and Development Center, Annapolis, Md.
W. L. Adamson, and M. W. Titus.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A023 289, Price codes: A03 in paper copy, A01 in microfiche. Report No. 7-580, May 1971. 26 p, 6 fig, 3 ref, append.

Descriptors: *Oil pollution, *Separation techniques, *Membrane processes, Semipermeable membranes, Water quality control, Water pollution treatment, Filtration, Equipment.
Identifiers: Bilge water, Flux rates.

The oil-separation characteristics of cellulose-acetate membranes were experimentally analyzed with a bench-scale apparatus. Experiments were initially conducted on distilled water solutions to determine permeate (product water) flux rate through the membrane as a function of operating time when the feedwater contained minimal impurities. A group of membrane separation experiments were then carried out with distilled water and 1% 2190-TEP lubricating oil. For the oil/water tests, the change in permeate flow rate with time and the oil concentration of the permeate, the feedwater, and the waste water were measured. The results of the oil-water tests showed that the oil concentration could be reduced from 10,000 to less than 25 parts per million in a single pass through the membrane. The primary difficulty was a gradual decrease in permeate flux rate that resulted from the membrane becoming coated with an oil film. (Sinha-OEIS)
W77-11909

TANKER SLUDGE REMOVAL AND DISPOSAL,
Exxon International Co., New York; and Exxon Research and Engineering Co., Florham Park, N. J.
For primary bibliographic entry see Field 5E.
W77-11911

OIL/WATER SEPARATOR EVALUATION,
Naval Coastal Systems Lab., Panama City, Fla.
J. Mittleman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A013-210, Price codes: A04 in paper copy, A01 in microfiche. Informal Report No. NCSL-252-75, July 1975. 56 p, 16 fig, 3 append.

Descriptors: *Oil pollution, *Oil spills, *Separation techniques, Oily water, Water pollution treatment, Water pollution control, Equipment.
Identifiers: Ballast water, *Oil-water separators.

A coalescing plate type oil/water separator, rated at 1000 gallons per minute was investigated during the period from January through November, 1974. An attempt was made to evaluate its performance in the context of oil spill clean-up operations by running a test series involving seawater and Navy Special Fuel Oil. This series was terminated in July when it became apparent that the test configuration was responsible for the formation of a 'permanent' water in oil emulsion. Then the separator's evaluation as a potential tool for implementing in-port deballasting of Naval ships was performed using contaminated Navy Distillate and seawater contained aboard tow sludge barges. The theory and operation of the separator are described. In the testing in the shore-based deballastor contest tow important design requirements are relaxed: a free surface is permissible since no ship motion is encountered, and the range of oils to be separated does not include heavy oils since these are not products normally carried by Naval vessels. (Sinha - OEIS)
W77-11912

OIL/WATER SEPARATION WITH NONCELLULOSIC ULTRAFILTRATION SYSTEMS,
Naval Ship Research and Development Center, Annapolis, Md.
P. Schatzberg, L. R. Harris, C. M. Adema, D. F. Jackson, and C. M. Kelly.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A008 315, Price codes: A03 in paper copy, A01 in microfiche. Report for Program Element 62765N, April 1975. 18 p, 13 fig, 13 ref, 3 append.

Descriptors: *Oil pollution, Oily water, Water pollution treatment, Water pollution control, *Separation techniques, Membrane processes, Detergents, Filtration.
Identifiers: Ballast water, *Ultrafiltration, *Oil-water separators.

In accordance with current efforts for environmental protection, oily wastewater generated aboard ships will require treatment before discharge. One of the several processes being investigated is ultrafiltration, a pressure-driven membrane process. Satisfactory separation of oil from water has been achieved using cellulose-acetate-type membranes, however these membranes exhibit hydrolytic instability and temperature sensitivity. Now several different ultrafiltration membrane systems have been experimentally examined for their capability to separate emulsified and suspended oil from water. The active separation surfaces were noncellulosic, being either inorganic or orgainc polymer types. configurations studied were tubular, spiral-wound, hollow-fiber, and plate-and-frame. Ultrafiltration rates (fluxes) were observed to vary significantly among the different systems. Although membrane cleaning (with or without detergent) could recover part of the flux decline, an irreversible cumulative fouling occurred. Detergent cleaning of the membranes was found to be a time-consuming procedure and disposal of detergent flush and rinse water presents a problem. (Sinha - OEIS)
W77-11913

LIGHTWEIGHT END CONNECTORS FOR POLLUTION CONTAINMENT BOOM,
J. J. Gallagher.
U.S. Patent No 4,008,575, 4 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 955, no 4, p 1094, February 22, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water quality control, Barriers, *Water pollution control, Floating, Equipment.
Identifiers: Containment, Floating pollution barriers, Connectors.

In connecting oil boom elements, there is a requirement that the means for carrying out the connection be fluid tight, quick, simple and durable so that the boom elements may be readily interconnected under adverse conditions. There is also an essential requirement that the means be resistant to damage from the diverse forces, dangers and misuses encountered in the marine environment. This invention provides a connector having a tongue-in-groove joint formed such that the resultant transverse force components generated in the joint by tension load between the elements are directed inwardly toward one another thereby reducing the requirement for the joint to resist large transverse movements in bending. A durable boom element connector is made out of a flexible or deflectible material which is resistant to permanent deformation under abusive or accidental overloading or misapplication of loads during use. (Sinha-OEIS)
W77-11925

LIMNOLOGICAL STUDIES OF THE ISLAND AREA OF WESTERN LAKE ERIE,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 2H.
W77-11926

THE EFFECT OF INCREASED REGULATION ON A NORWEGIAN LAKE, (IN NORWEGIAN),
Zoologisk Museum, Oslo (Norway).
R. Borgstrom.
Fauna (Oslo). 26(3), p 190-197, 1973.

Descriptors: *Regulation, Lakes, *Trout, *Mortality, *Water levels, Turbidity, Fish migration, Fish diets, *Fish food organisms.
Identifiers: *Lepidurus arcticus, *Norway(Marvann Reservoir).

Increased lowering of the water level of Marvann, a Norwegian high mountain reservoir, during the winter 1969/70 resulted in an especially low water level the following summer together with an increase in turbidity. The yield of trout fell almost to

zero in the following years, probably due to increased mortality, increased migration to the inlets and a decreased immigration. The most important food item of trout before 1969, Lepidurus arcticus almost disappeared from the diet of trout in 1970/71 and in 1972the amount of L. arcticus in the stomach contents of trout was still much less than in the years previous to the increased regulation. The reasons for the disappearance of L. arcticus are discussed. Copyright 1974, Biological Abstracts, Inc.
W77-11931

CHANGES IN AQUATIC MACROPHYTES ACCOMPANYING PHOSPHORUS REDUCTION IN A EUTROPHIC LAKE IN NEW YORK STATE: AN ASSESSMENT BASED ON REMOTELY SENSED AND OTHER DATA,
Cornell Univ., Ithaca, N.Y. Center for Environmental Research.
For primary bibliographic entry see Field 5A.
W77-11940

ANIMAL WASTES MANAGEMENT,
Utah State Univ., Logan. Coll. of Engineering.
E. J. Middlebrooks.
Public Works, p 67-69, Feb., 1975.

Descriptors: Water pollution, Legal aspects, *Feed lots, Agricultural runoff, Nitrogen, Phosphorus, *Farm wastes, Waste treatment.
Identifiers: Waste management, Manure spreading.

Increased efficiency of agricultural production, and the influx of suburbia into rural areas has increased the recognition of the problems generated by handling and disposing of agricultural wastes. Proper planning and appropriate legislation is needed to strike a balance between adequate food production and proper waste management. Animal waste management would be simpler if the waste were to be collected in feedlots. But small beef and dairy cattle feeding operations, and poultry farms are scattered in relatively isolated areas, the majority along small streams. Many use the streams as a means of disposing of their wastes, causing pollution of our waterways, deplete the oxygen supply and add excessive quantities of nitrogen and phosphorus. Manure spreading is practiced by small animal farms, but as the size of these farms increases, it necessitates hauling the excess manure to other disposal sites or attempts to sell the manure as a soil conditioner, with little success. It is known that the impact on the water quality caused by animal wastes is due to the periodic sludge discharges of pollutants that reach a waterway. A number of feedlot runoff control measures, such as diversion, retention ponds, confinement, proper location, use of evaporation ponds, and land disposal of the excess liquid. (East Central)
W77-11970

THE IMPLICATION OF HYDROGEOLOGIC FACTORS IN WASTE MANAGEMENT ON LAND (WITH SPECIAL REFERENCE TO THE NOVA SCOTIA ENVIRONMENT),
Department of the Environment, Halifax (Nova Scotia). Water Planning and Management Div.
J. F. Jones, and J. E. Gibb.
In: Proceedings of the International Conference on Land for Waste Management, Ottawa, Canada, Oct., 1973, p 147-160. Department of the Environment and National Research Council of Canada, 1974. 6 fig, 1 tab, 19 ref.

Descriptors: Hydrogeology, *Canada, Water pollution, Groundwater, Sewage lagoons, *Farm wastes, Waste treatment.
Identifiers: Nova Scotia, Waste management.

The importance of hydrogeologic factors in waste management must be revealed to the public and to the planners of waste management systems in order to minimize environmental pollution. Ignorance of the implications of such factors has often resulted in groundwater and surface water pollution from such sources as leachate from septic tanks, industrial sewage lagoons, farm animal waste, and solid waste disposal sites. Hydrogeologic factors of particular importance for the protection of groundwater and surface water in Nova Scotia include the groundwater flow systems, groundwater recharge and discharge areas, geology, topography, seasonal and climatic factors, the influence of pumping wells, etc. A continuing program of collection of hydrogeologic data should be maintained in Nova Scotia so that this information will be available to the appropriate agencies. These data should be reduced so that they can be understood by non-hydrogeologists. Blanket regulations regarding waste disposal site locations are inadequate. Since conditions vary from area to area, an on-site hydrogeologic investigation is needed to determine the suitability of a given area for waste disposal. (Merryman-East Central)
W77-11971

INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS,
New Zealand Agricultural Engineering Inst., Lincoln.
For primary bibliographic entry see Field 5B.
W77-11974

ECONOMIC POTENTIAL AND MANAGEMENT CONSIDERATIONS IN LAND APPLICATION OF BEEF FEEDLOT WASTES,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
D. D. Badger.
In: Land as a Waste Management Alternative, Proceedings of the 1976 Cornell Agricultural Waste Management Conference, Ann Arbor Science Publishers Inc., Ann Arbor, Michigan, 1977, p. 727-742. 5 tab, 13 ref.

Descriptors: *Land application, Cattle manure.
Identifiers: *Feed lots, Nutrients, *Economics, Legal aspects, Water pollution sources, Farm wastes, *Application rates.

New guidelines related to reducing water pollution from nonpoint sources are being implemented for Section 208 of PL 92-500, the Federal Water Pollution Control Act Amendments of 1972. The way these Section 208 regulations are implemented will have a significant impact on future application of both solid and liquid beef feedlot wastes to crop and pastureland. Recently, farmers have returned more and more to feedlot wastes as a source of nutrients. High fertilizer prices have made use of feedlot wastes more economically viable. While manure nutrients are highly variable, farmers realize that manure use provides additional benefits. Moisture intake and water-holding capacity of sandy and loam type soils is improved. Texture or tilth of soil is improved. The appearance or 'richness' of light-colored tight soils is improved. Problems resulting from manure use have been: compaction of soil due to large, heavy trucks that deliver and spread manure, slower rate of application compared to commercial fertilizer application, the necessity of working the field one to two times more to incorporate manure into soil, unevenness of application, imbalance in ratio of nutrients applied relative to soil needs, increased salinity, and introduction of weeds. In the Oklahoma and Texas panhandle areas, a general rule of thumb for manure application has been that manure may be applied safely for several consecutive years at 10 tons/acre/year. Most farmers surveyed in the panhandle areas were convinced that the nutrient value of beef feedlot wastes was sufficiently high to pay the current rate of $3.00 to $3.50 per ton of manure. Engineering design and economic feasibility studies are needed to determine more efficient methods of storing, transporting and applying beef feedlot wastes, to retain a higher percentage of the nutrients for cropland use than is now the case. There appears to be a real need for some research on how to measure the trade-offs involved as well as to find mutually acceptable solutions for cropland utilization of manure and for minimizing runoff to comply with Section 208 of PL 92-500. (Merryman-East Central)
W77-11977

EPA WILL USE KSU MODEL AS WASTE SYSTEMS TOOL.
Kansas Farmer, V. 113, No. 20, p. 39, Nov. 20, 1976.

Descriptors: *Computer models, Feed lots, *Water pollution, Watersheds(Basins), Agricultural runoff, Design, Management, Rain, Snow, Model studies, *Farm wastes.

The Environmental Protection Agency has given Kansas State University a $108,556 grant as a first step in EPA's program to develop a complete water quality index for feedlots—an index which will show what pollutants are in the water, where the water goes, and what effects pollutants might have on the environment. Kansas State University scientists are developing a computerized watershed model to predict the effects of rain and snow on the waste runoff from feedlots. The model will be used by EPA to evaluate waste control systems of feedlots. KSU research may also be helpful in designing new cattle feedlots. By using a computerized model, a representation is given of how different systems might work. This would be a definite boon in selection the best design for particular feedlots. (Merryman-East Central)
W77-11978

WATER AND DEVELOPMENT IN SAUDI ARABIA,
Durham Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 4B.
W77-11991

EFFECT ON IRRIGATION WATER QUALITY, SULFURIC ACID AND GYPSUM ON PLANT GROWTH AND ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF PIMA SOIL,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W77-11998

NITROFURAZONE FOR CONTROL OF THE MICROSPORIDAN PARASITE PLEISTOPHORA OVARIAE IN GOLDEN SHINERS,
Oklahoma Cooperative Fishery Research Unit. Stillwater.
M. L. Nagel, and R. C. Summerfelt.
The Progressive Fish-Culturist, Vol. 39, No. 1, p 18-23, 1977. 2 fig, 6 tab, 12 ref.

Descriptors: *Fish physiology, *Mode of action, *Fish parasites, *Shiners, *Protozoa, *Microbiology, Animal pathology, Path of pollutants, Reproduction, Fish populations, Organic compounds, Bioassay, Bactericides, *Fish diseases.
Identifiers: *Golden shiners, *Pleistophora ovariae, *Nitrofurazone, Notemigonus crysoleucas, Bioaccumulation, Tissue analysis.

In a test of the efficacy of nitrofurazone to control infection of the Microsporidan parasite Pleistophora ovariae in ovaries of golden shiners (Notemigonus crysoleucas), the chemical was fed at levels of 1.10, 1.65, 2.20, 3.30, 5.51, and 7.71 g active ingredient per kilogram of feed (50-350 g/100 lb.). The dosage response was nonlinear; maximal drug effect on incidence of infection was at a dose of 2.20 g and maximal effect on intensity of infection was at 3.30 g. The net production of

shiners (not evaluated at the three highest treatment levels) was reduced in a pond in which the fish were given the 2.20 g treatment, suggesting that high levels of this drug may inhibit gonad development. None of the dosages tested yielded a complete cure. (Klein)
W77-12008

CONTROL OF EXTERNAL BACTERIAL INFECTIONS OF BLUEGILLS WITH POTASSIUM PERMANGANATE,
Auburn Agricultural Experiment Station, Ala. Dept. of Fisheries and Allied Aquacultures.
R. P. Phelps, J. A. Plumb, and C. W. Harris.
The Progressive Fish Culturist, Vol 39, No 3, p 142-143, 1977. 1 tab, 11 ref.

Descriptors: *Sunfishes, *Potassium compounds, Fish physiology, *Mortality, *Bactericides, *Fish diseases, *Copper sulfate, Copper compounds, Dissolved oxygen, Bacteria, Bioassay, Research and development, Organic compounds, Microbiology.
Identifiers: *Bluegills, *Diuron, *Potassium permanganate, Bacterial infection control, Tissue analysis, Aeromonas sp., Flexibacter sp.

The efficacy of copper sulfate, Diuron, and potassium permanganate in controlling external bacterial infections of bluegills (Lepomis macrochirus) was determined. Potassium permanganate at 3 mg/1 significantly reduced mortality whereas other concentrations and the other chemicals did not. Dissolved oxygen was reduced significantly in the pools treated with Diuron. (Klein)
W77-12024

CHLORINATED COOLING WATERS IN THE MARINE ENVIRONMENT: DEVELOPMENT OF EFFLUENT GUIDELINES,
Woods Hole Oceanographic Institution, Mass.
J. M. Capuzzo, J. C. Goldman, J. A. Davidson, and S. A. Lawrence.
Marine Pollution Bulletin, Vol. 8, No 7, p 161-163, 1977. 1 fig, 13 ref.

Descriptors: *Entrainment, *Toxicity, *Chlorine, *Respiration, *Water cooling, *Chlorination, *Mortality, *Regulation, Powerplants, Lobsters, Water quality standards, Larval growth stage, Juvenile growth stage, Killifishes, Bioassay, Laboratory tests, Analytical techniques, Metabolism.
Identifiers: *Sublethal effects, *Chloramine, *Chlorine residuals.

The effects of free chlorine and chloranie on stage I lobster larvae and juvenile killifish were investigated in continuous flow bioassay units. In comparing mortality and changes in standard respiration rates during and after exposure to either chlorine form, significant respiratory stress was observed with exposure to sublethal levels. Sublethal responses to free and combined chlorine should be considered when establishing regultions for chlorine residuals in cooling waters. (Katz)
W77-12036

TANNIN AS AN AGENT TO ELIMINATE ADHESIVENESS OF WALLEYE EGGS DURING ARTIFICIAL PROPAGATION,
Southeastern Senior Coll., Juneau, Alaska. Div. of Fisheries.
D. L. Waltemyer.
Transactions of the American Fisheries Society, Vol 109, No 6, p 731-736, 1977. 3 fig, 16 ref.

Descriptors: *Perches, *Walleye, *Fish reproduction, *Growth stages, *Fish eggs, Mode of action, Fish physiology, Mortality, Organic compounds, Laboratory tests, Fish farming, Aquiculture.
Identifiers: Survival rates, *Tannin, Artificial propagation, *Stizostedion vitreum, Hatching success.

Tanin has been used to decrease adhesiveness of walleye (Stizostedion vitreum) eggs for the purpose of shortening the water-hardening phase of walleye propagation. In this study, adhesiveness of fertilized walleye eggs decreased after exposure to tannin concentrations between 200 and 1,000 mg/liter. Reduction in adhesiveness was generally proportional to tannin concentration and exposure time. Adhesiveness was further reduced and eliminated in higher tannin concentrations by stirring the eggs during a 2-minute exposure. Hatching success of nontreated (control) eggs averaged 37 and 47 percent whereas hatching success of tannin-treated eggs averaged 38 and 50 percent for 1974 and 1975, respctively. A 2-minute exposure at tannin concentrations ranging from 400-1,000 mg/liter would expedite artificial propagation and could enhance egg survival. (Katz)
W77-12049

OPTIMIZATION AND EVALUATION OF A FLUORESCENCE OIL SPILL DETECTOR. VOLUME 2 - PROTOTYPE DESIGN,
Baird-Atomic, Inc., Bedford, Mass.
For primary bibliographic entry see Field 5A.
W77-12145

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, PHASE II PROTOTYPE DESIGN, FABRICATION, AND TESTING,
Ocean Systems, Inc., Reston, Va.
R. L. Beach, F. A. March, L. S. Brown, T. S. McMahon, and J. Papp.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-003 933, Price codes: A03 in paper copy, A01 in microfiche. U.S. Coast Guard Report No. CG-D-84-74, June 1973. 104 p, 5 fig, 3 append. DOT-CG-22651-A.

Descriptors: *Oil pollution, *Water quality control, Water pollution, *Pollution abatement, Equipment.
Identifiers: *Outer Continental Shelf, *Oil recovery.

This Phase-II report covers design, construction, and test of a prototype 2000gpm oil recovery system for the high seas. A similar 1/3 scale system is described in Phase-I report. The prototype system consists of a weir/basin assembly, transfer and control system, and auxiliary equipment which includes a handling system, packaging system, and a flotsam fence. The transfer system has four hydraulic-motor-driven gear pumps, a 300-ft. hydraulic umbilical, an oil-water interface sensor array, and a remote-control system. The report describes subsystems tests, component assembly, air transport capability, and a complete oil-recovery test in a pool at Battelle Northwest, Richland, Washington. Pool tests utilized light and heavy fuel oils in calm water and 2 foot waves, with tow speeds to 2.76 knots. System performance nearly met predictions obtained from 1/3 scale model testing (Phase I). Efficiency (% of oil in recovered fluid) exceeded 80% for oil depths over 9 inches in the basin. Recovery rates up to 2000 gpm are possible with light oil. These rates are projected for viscosities up to 6000 ssu. (See also W77-00236) (Sinha - OEIS)
W77-12146

A PLAN FOR A NATIONAL COASTAL WATER QUALITY MONITORING NETWORK.
Interstate Electronics Corp., Arlington, Va. Environmental Engineering Div.
For primary bibliographic entry see Field 4C.
W77-12147

CALLAHAN RESERVOIR: I. SEDIMENT AND NUTRIENT TRAP EFFICIENCY,
Agricultural Research Service, Columbia, Mo. North Central Watershed Research Center.
D. L. Rausch, and J. D. Schreiber.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 2, p 281-284, 290, March-April 1977. 2 fig, 3 tab, 10 ref.

Descriptors: *Reservoirs, *Sediments, *Nutrients, *Missouri, *Trap efficiency, Sedimentation, Water pollution, Phosphorus, Nitrogen, Runoff, Inflow, Discharge(Water), Path of pollutants, Lakes.
Identifiers: *Callahan Reservoir(MO).

Small reservoirs remove and trap significant amounts of sediment and nutrients from storm runoff. Callahan Reservoir, a small flood-detention reservoir in central Missouri, which permanently stores 1 cm of runoff from its 1,440-ha drainage area, trapped an average of 87% of the incoming sediment, 72% of the total phosphorus (P), and 30% of the inorganic nitrogen (N) in 1973. Sediment efficiency and P trap efficiency in the reservoir were both related to the incoming sediment particle-size; however, only sediment trap efficiency was related to detention time. The annual amount of NO3 trapped seemed related to annual runoff volume. For 1973, the soluble nutrients, total soluble P, and NO3 were trapped at similar rates, 32% and 34%, respectively. More NH4, dissolved organic P and dissolved hydrolyzable P were found in outflow than in inflow. The increases, which are less than 2% of the nutrient budget, may be attributed to biological activity in the reservoir. (See also W77-12150) (Sims-ISWS)
W77-12149

CALLAHAN RESERVOIR: III. BOTTOM SEDIMENT-WATER-PHOSPHORUS RELATIONSHIPS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
A. Olness, and D. Rausch.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 2, p 291-297, 300, March-April 1977. 6 fig, 3 tab, 38 ref.

Descriptors: *Reservoirs, *Bottom sediments, *Water quality, Sediments, Chemical properties, Chemical analysis, Physical properties, Cores, Sampling, Phosphorus, Nutrients, Water chemistry, Lakes, Limnology.
Identifiers: *Callahan Reservoir(Mo).

Sediment core samples obtained from a 164,000 cu m reservoir in central Missouri showed highly significant correlations between sediment clay content and phosphorus concentrations. Both sediment clay content and phosphorus concentrations increased with distance from the reservoir inlet. No strong correlations between phosphorus concentration and sediment depth were observed. Phosphorus concentrations varied widely between and within core profiles ranging from less than 100 ppm to more than 1000 ppm and from less than 200 ppb to more than 3000 ppb for total phosphorus and total soluble phosphorus, respectively. The mean total phosphorus concentration in the reservoir water was 108 ppb. About 25% and 10% of the total suspended phosphorus was soluble phophorus and soluble reactive phosphorus, respectively. The adsorption or planktonic and mineral sedimentation. (See also W77-12144) (Sims-ISWS)
W77-12150

A TEST OF ALTERNATIVES FOR MEETING PUBLIC POTABLE WATER REQUIREMENTS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Urban Studies.
M. R. Greenberg, and R. M. Hordon.
Water Resources Bulletin, Vol. 12, No. 4, p 669-680, August 1976. 3 fig, 3 tab, 12 ref. OWRT C-114(No. 1583)NI(6).

Descriptors: *Water requirements, *Potable water, *Water supply, *Linear programming, Simulation analysis, Economics, Optimization, Costs, *New Jersey, Mathematical models, Equa-

tions, Systems analysis, Planning, Water demand, Regional analysis.
Identifiers: Cost minimization.

The relative economic costs of meeting projected public potable water demands through increasing the supply, controlling the demand, and increasing the capacity for interagency water tranfers are explored. These alternaives and combinations are evaluated, with the aid of a linear programming model, for the years 1975 to 2000 in northeastern New Jersey, a major metropolitan region of over 4.5 million people. After more than 30 model tests, it has been found that a combination of increased interagency transfers and added water supplies is the least expensive solution. (Bell-Cornell)
W77-12159

LAKE MICHIGAN DIVERSION--STREAM QUALITY PLANNING,
Metropolitan Sanitary District of Greater Chicago, Ill.
B. Macaitis, S. J. Povilaitis, and E. B. Cameron.
Water Resources Bulletin, Vol. 13, No. 4, p 795-805, August 1977. 4 fig.

Descriptors: *Lake Michigan, *Diversion, *Water quality, *Planning, *Streams, *Projections, Computer models, Simulation analysis, Water supply, Water allocation(Policy), Dissolved oxygen, Rivers, Mathematical models, Systems analysis.
Identifiers: *Discretionary diversion, *Pollution loads, Capital improvements, Drainage basins, Chicago.

By United States Supreme Court action, the diversion of water from Lake Michigan and the Lake Michigan Drainage Basin in the Metropolitan Chicago Area is regulated at an annual maximum rate of 3,200 cfs. Approximately 1,700 cfs of this diversion is used for water supply, and the remaining 1,500 cfs consists primarily of stormwater runoff with lesser amounts of direct lake diversion, such as lockage and leakage, navigational makeup water flows, and discretionary diversion needed to maintain water quality standards in the Metropolitan Sanitary District of Greater Chicago's basic waterways. In order to assess the schedule of its discretionary diversion needs, the District, using a computer model of its basic waterway system, has calculated the minimum discretionary diversion requirements for projected water quality conditions as successive elements of the District's water pollution control program are completed. The results of these analyses can be used as a basis for developing plans for future allocations of the limited supply of Lake Michigan water to other uses such as domestic water supply, when and if such supplies become available. (Bell-Cornell)
W77-12163

AN OPTIMIZATION MODEL FOR EFFICIENT MANAGEMENT OF URBAN WATER RESOURCES,
Utah Water Research Lab., Logan.
R. Narayanan, B. C. Jensen, and A. B. Bishop.
Water Resources Bulletin, Vol. 13, No. 4, p 691-708, August 1977. 4 fig, 7 tab, 13 ref.

Descriptors: *Water allocation(Policy), *Economic efficiency, *Linear programming, *Recycling, *Optimization, Water supply, Water quality, Standards, Effluents, Constraints, Pricing, Algorithms, Municipal water, Planning, Feasibility, Waste water treatment, Utah, Regions, Equations, Mathematical models, Systems analysis.
Identifiers: *Separable programming, *Urban water management(Policy), Constant elasticity demand, 'Lambda formulation', Surplus maximization, Cost minimization.

A separable programming approach to water management is proposed to determine economically efficient urban water resource allocation and pricing policy by maximizing the sum of the consumer and producer surplus. The optimization is accomplished utilizing a linear programming algorithm. The feasibility of using recycled water for municipal purpose is examined in a planning context. The impact of higher water quality discharge standards on pricing and allocation of water is analyzed and the attractiveness of water reuse option is demonstrated. Results of the application of the technique to Salt Lake County Utah are presented. Through use of the approach described herein, urban water management policies are derived which are economically efficient, that is (a) total cost is minimum at the quantity supplied, (b) marginal cost equals price, and (c) quantity demanded equals quantity supplied. Model results indicate the suitability of the separable programming approach to analyzing problems with nonlinear demand and cost functions and to utilizing standard linear programming algorithms for solution procedure. (Bell-Cornell)
W77-12165

REGIONAL MANAGEMENT OF URBAN AND AGRICULTURAL POLLUTION,
Windsor Univ. (Ontario).
R. S. Lashkari, C. L. Hwang, and L. T. Fan.
Journal of the Water Pollution Control Federation, Vol. 49, No. 8, p 1877-1888, August 1977. 6 fig, 6 tab, 13 ref.

Descriptors: *Water quality control, *Salinity, *Biochemical oxygen demand, *Economic efficiency, *Water policy, *Optimization, *Drainage area, Costs, Constraints, Water demand, Agriculture, Utah, Standards, Desalination plants, Irrigation, Equations, Mathematical models, Systems analysis.
Identifiers: *Utah Lake drainage area, *Regional planning, Urban water, Agricultural wastes, Improvements, Cost minimization, Cost effectiveness, Balance equations.

Presented is an approach to water quality management in areas where a variety of urban and agricultural pollutants are discharged into a body of water. The Utah Lake drainage area is considered in which the urban and agricultural return flow from four districts of the Utah Valley are discharged into the Lake. A model of salinity and biochemical oxygen control is used which coordinates the pollution control activities of the urban and agricultural sectors in each district. The model consists of a wastewater treatment system and a desalting plant in the urban sector, and a combination of structural and practice improvements in the irrigation system of the agricultural sector. The objective is to minimize the costs of maintaining certain biochemical oxygen demand and salt reduction standards in the districts' aggregate effluents to the Lake under two assumptions: that each district is to maintain the standards independently, and that the salinity-biochemical oxygen demand control efforts of the individual districts are regionally coordinated. The results indicate that savings can be achieved through regional coordination of pollution control efforts. (Bell-Cornell)
W77-12167

INTENSIVE BREEDING OF CARP IN A CLOSED WATER CIRCULATION SYSTEM, INTENSIVHALTUNG VON KARPFEN IM GESCHLOSSENEN KREISLAUFSYSTEM,
Battelle-Institut e.V., Frankfurt am Main (West Germany).
U. Muller, W. Schonborn, and G. v. Sengbusch.
Archiv fur Fischwissenschaft, Vol. 27, No. 1, p. 1-8, 1976. 5 fig, 7 ref.

Descriptors: *Methodology, *Fish farming, Fish populations, *Carp, *Fish management, *Fish reproduction, Design, *Growth rates, *Denitrification, Aquiculture, Waste treatment, Research and development, Nitrates, Nitrites.
Identifiers: *Closed water circulation system.

Intensive breeding of fish in closed water circulation systems required a most effective treatment of the recirculated water to prevent autointoxication of the system. A system with a special denitrification stage was proposed in which nitrate remains below 100 mg/l and nitrite below 1 mg/l even n case of a closely packed fish stock. Optimum conditions provided, carp with a weight between 500 and 1000 g showed a growth rate of more than 30 percent per month and a feeding valued of less than 2.5. (Katz)
W77-12226

NEW YORK'S MARINE FISHERIES: CHANGING NEEDS IN A CHANGING ENVIRONMENT,
New York State Dept. of Environmental Conservation, Stony Brook. Div. of Marine and Coastal Resources.
For primary bibliographic entry see Field 6B.
W77-12247

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

DETROIT AND ST. CLAIR RIVER TRANSIENT MODELS,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
F. H. Quinn, and J. C. Hagman.
NOAA Technical Memorandum ERL GLERL-14, June 1977. 49 p, 15 fig, 3 tab, 3 ref, 2 append. Also as: GLERL Contribution No. 106.

Descriptors: *Mathematical models, Water resources, *Flow rates, Michigan, Great Lakes, *River flow.
Identifiers: *Detroit River(Mich), *St. Clair River(Mich).

A series of hydraulic transient models have been developed for the St. Clair and Detroit Rivers to simulate hourly and daily flow rates. These flows are necessary for water quantity and quality studies of the Great Lakes. This memorandum describes the mathematical models, their calibration, sensitivity, and applications. (NOAA)
W77-11659

A NONLINEAR MULTILEVEL MODEL FOR REGIONAL WATER RESOURCES PLANNING,
Khonkaen Univ. (Thailand). Faculty of Engineering.
S. Pratishthananda, and A. B. Bishop.
Water Resources Bulletin, Vol. 13, No. 3, p 611-625, June 1977. 6 fig, 19 ref.

Descriptors: *Water resources, *Regional development, *Planning, *Water allocation(Policy), *Waste water treatment, *Water supply, Optimization, Management, Treatment facilities, Computer programs, Algorithms, Equations, Water costs, Mathematical models, Systems analysis.
Identifiers: *Nonlinear programming, *Cost minimization, *Multilevel analysis, Transportation matrix, Conjugate gradient projection method, Salt Lake County(Utah).

A nonlinear multilevel transportation model is developed to study large-scale allocations in a water resources system. The model uses a modified transportation matrix formulated with nonlinear cost functions as the basic subregional model and the goal coordination method for multilevel decomposition and optimization of the overall regional system. The objective function is to minimize the total cost of water supply and wastewater treatment for the system, subject to constraints on water source availabilities, water use requirements and facility capacities, system

continuity, exported water less than or equal to external (import) requirements, and imported water not to exceed supplies available for export. The model is applied to projected water requirements for Salt Lake County in 1985. Sources of water supply--surface water, groundwater, import water, and reuse of reclaimed wastewater on a restricted basis--are available to satisfy water requirements for municipal, industrial, and agricultural sectors in four subregions. The conjugate gradient projection method is used to optimize the first level subregional models having cost functions of the form of C = aX, and the second level problem is solved using the conjugate gradient method. (Bell-Cornell)
W77-11772

A MULTICRITERIA ANALYSIS FOR WATER RESOURCE AND LAND USE DEVELOPMENT,
Vrije Universiteit, Amsterdam (Netherlands). Dept. of Economics.
P. Nijkamp, and J. B. Vos.
Water Resources Research, Vol. 13, No. 3, p 513-518, June 1977. 6 tab, 26 ref.

Descriptors: *Water resources development, *Land use, *Alternative planning, *Projects, Evaluation, Design, Land reclamation, Equations, Systems analysis.
Identifiers: *Multicriteria analysis, Concordance analysis, Satisficing, Intangibles, Netherlands.

A new variant of the concordance analysis is developed and discussed herein. The concordance procedure, in general, is a multicriteria evaluation method for alternative projects. It is based on a pairwise comparison of (weighted) project outcomes, and it can be used both as an elimination method for less desirable projects and as a selection method for good projects. The new variant introduced is based on the idea of satisficing (or norm) project outcomes, which may serve as a frame of reference for the evaluation techniques. Such satisficing outcomes are also important in attacking the dimensional problems of a multicriteria analysis. The new concordance variant is illustrated by means of an empirical application to the selection of the most desirable plan from a series of alternatives for the development of the Markerwaard area in the Netherlands. It is concluded that the concordance analysis is a useful tool in taking account of intangibles in water resource and land use design. (Bell-Cornell)
W77-11773

NEW GROWTH CENTERS--A ROLE FOR THE BUREAU OF RECLAMATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W77-11775

SOCIO-ECONOMIC STUDIES OF THE UPPER ST. JOHNS RIVER BASIN, CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W77-11859

SHORT COURSE PROCEEDINGS - APPLICATIONS OF STORMWATER MANAGEMENT MODELS, 1976,
Massachusetts Univ. Amherst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 321, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/2-77-065, March 1977. Edited by F. A. DiGiano, et. al. 434 p, 80 fig, 41 tab, 176 ref.

Descriptors: *Mathematical models, *Federal Water Pollution Control Act, *Storm water, Model studies, Water management(Applied), Storm runoff, Planning, Management, Urban runoff, Legislation, Cities, Waste water treatment.
Identifiers: Storm water management, SWMM, STORM, FILTH, USLE.

This short course, held in Chicago, Illinois on July 18-23, 1976, focused on the role of mathematical models and simulations in storm water management. The U.S. EPA Storm Water Management Model (SWMM) is discussed in detail. Applications of other models, including FILTH, STORM, and USLE, are also considered. Topics discussed in the eleven papers presented include cost assessments for storm water management planning programs; a description of program blocks, data requirements, and capabilities of SWMM; various criteria for the selection of storm water management models; methods for proper collection of field data for model input; and sample applications of model use. (See W77-12075) (Schulz-FIRL)
W77-12074

SENSITIVITY ANALYSIS IN AQUIFER STUDIES,
Stanford Univ., Calif. School of Earth Sciences.
For primary bibliographic entry see Field 4B.
W77-12160

LAKE MICHIGAN DIVERSION--STREAM QUALITY PLANNING,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5G.
W77-12163

AN OPTIMIZATION MODEL FOR EFFICIENT MANAGEMENT OF URBAN WATER RESOURCES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W77-12165

SIMULTANEOUS INVESTMENT AND ALLOCATION DECISIONS APPLIED TO WATER PLANNING,
Texas Univ. at Austin.
R. D. Armstrong, and C. E. Willis.
Management Science, Vol. 23, No. 10, p 1080-1088, June 1977. 2 tab, 27 ref.

Descriptors: *Water resources, *Planning, *Investment, *Economic efficiency, *Water allocation(Policy), Decision making, Regions, California, Algorithms, Equations, Constraints, Optimization, Mathematical models, Systems analysis.
Identifiers: *Benders' decomposition, Quadratic programming, Integer programming, Sequencing, Benefit maximization.

Developed are models for water planning that simultaneously consider investment and allocation decisions. The framework is demonstrated for a region which includes the counties of San Luis Obispo and Santa Barbara in California. The quadratic discontinuous mathematical programming problems resulting from such models are solved optimally by using generalized Benders decomposition, a method for breaking a larger problem into a series of manageable subproblems which yield frasible solutions to the overall system. In this case, the decomposition is used to incorporate a quadratic programming allocation subproblem with an integer programming investment sequencing problem. The objective function is the maximization of benefits; considered are the present value of a stream of expected net returns over time. Denoted is the vector of investment options, each element of which is location, scale, and time specific, giving the row vector of present values of expected investment costs for these options. Details of the results of the regional application are discussed. (Bell-Cornell)
W77-12168

AN ILLUSTRATIVE EXAMPLE OF THE USE OF MULTIATTRIBUTE UTILITY THEORY FOR WATER RESOURCE PLANNING,
Woodward-Clyde Consultants, San Francisco, Calif.
R. L. Keeney, and E. F. Wood.
Water Resources Research, Vol. 13, No. 4, p 705-712, August 1977. 5 fig, 2 tab, 8 equ, 34 ref.

Descriptors: *Water resources, *Alternative planning, Regional development, Decision making, Assessment, Equations, Systems analysis.
Identifiers: *Multiattribute utility theory, *Multiobjectives, Tisza River basin(Hungary), Rating, Trade-offs, Scaling factors.

Selecting a plan to devlop the water resources of a region involves the consideration of economic, environmental, social, and technical objectives. Twelve attributes are defined to indicate the degree to which such objectives are achieved in the Tisza River basin of Hungary. A preliminary multiattribute utility function is assessed over these attributes. This is combined with existing information describing the possible consequences of five alternative development plans to yield an overall rating of their desirability. The utility function explicitly indicates the preference trade-offs among attributes. Discussion indicates further uses of the utility function in the planning and evaluation processes. Preliminary case study results indicate that building interbasin water transfers from the Danube River or small reservoirs in the northeast is to be preferred to developing three other planning alternatives. (Bell-Cornell)
W77-12169

6B. Evaluation Process

THE APPLICATION OF TECHNOLOGY IN DEVELOPING COUNTRIES.
Arizona Univ., Tucson. Office of Arid Lands Studies.
Papers presented during an Interdisciplinary Programs Seminar Series, August-December, 1976, The University of Arizona, Tucson, Office of Interdisciplinary Programs, Office of Arid Lands Studies, 1977. 176 p. Edited by R. L. Bulfin, Jr. and J. Richard Greenwall.

Descriptors: *Technology, *Foreign countries, *Adoption of practices, *Foreign projects, Projects, Arid lands, Resources development, Resources, Water storage, Industries, Nuclear energy, Greenhouses, Farm equipment, Remote sensing, Social aspects, Economics, Political aspects.
Identifiers: *Developing countries, Appropriate technology, US Foreign Assistance Programs, Technology transfer.

The successful transfer of Western technology to developing countries requires the technologist to realize that most Western technology is designed to be operated by well-trained and experienced people; requires special maintenance tools and test equipment; and is geared to the philosophy of inexpensive and unlimited energy, water, and other resources. For Western technology to assist developing countries effectively it must be appropriately adapted to local conditions in which specialized expertise, equipment, and resources are often lacking. The papers of this publication are grouped into an overview, low-level technology, high-level technology, and a discussion of the U.S. Foreign Assistance Program. Applications of technology transfer in agriculture, water and grain storage, industry, nuclear technology, and remote sensing are addressed. In addition, one paper discusses the criteria for technology selection. (See W77-11638 thru W77-11640) (Ullery-Arizona)
W77-11637

DUAL TECHNOLOGICAL SYSTEMS IN WATER AND GRAIN STORAGE,
Wunderman Foundation, New York.
H. Guggenheim.
In: The Application of Technology in Developing Countries, Papers Presented During an Interdisciplinary Programs Seminar Series, August-December, 1976, The University of Arizona, Office of Interdisciplinary Programs, Office of Arid Lands Studies, 1977. p 21-35, 1 tab.

Descriptors: *Dependable supply, *Arid lands, *Foreign countries, *Water storage, *Storage requirements, *Cisterns, *Water tanks, *Construction, *Construction materials, Water shortage, Technology, Projects, Structures, Architecture, Structural design, Cements, Waterproofing, Coatings, Droughts, Grains(Crops), Political aspects, Social aspects, Tangible benefits, Economics.
Identifiers: *Mali, Sahel, Operation mil, Appropriate technology, Technology transfer.

The problems of introducing modern technologies which both benefit local populations and allow for the survival of traditional society is illustrated by assistance given to three villages in constructing water and grain storage systems in response to Mali's Sahelian drought. The uncertainty of rain on Mali's Dogon plateau makes storage an important means of reducing risk. Features of modern technology were introduced which blended traditional building methods and village ssociety without harming the environment. A household cistern was constructed of local clay but was waterproofed and reinforced with a lining of chicken wire and ferro-cement. Basic characteristics of Dogon architecture were employed to channel water into the granery. In a second village all wells were dry and villagers searched three hours per day for water. Consultation with the village chief and elders made clear that for architectural, technical, and cultural reasons water graneries would be inefficient. Instead, with the assistance of villagers, a natural rock shelter that received run-off was converted into a cistern using traditional construction techniques in combination with chicken-wire, cement, and metal forming ferro-cement. in a third effort, an AID-financed Operation Mil granuary to ensure grain availability was constructed incorporating modern technical features and blending with other local structures. However, construction of large government storage facilities may not benefit the population due to the effects of government grain quotas and taxation systems. (See also W77-11637) (Ullery-Arizona)
W77-11638

REMOTE SENSING AND DEVELOPING COUNTRIES: POTENTIAL AND PROBLEMS IN THE TRANSFER OF TECHNOLOGY,
Clark Univ., Worcester, Mass. Graduate School of Geography.
L. Berry.
In: The Application of Technology in Developing Countries, Papers Presented During an International Programs Seminar Series, August-December, 1976, The University of Arizona, Tucson, Office of Interdisciplinary Programs, Office of Arid Lands Studies, p 73-83, 2 ref.

Descriptors: *Remote sensing, *Satellites(Artificial), *Data collections, *Mapping, *Terrain analysis, *Monitoring, Regional development, Natural resources, Information exchange, Land use, Institutions, Institutional constraints, Planning, Population, Distribution patterns, Water resources, Surface water availability, Human resources.
Identifiers: *Developing countries, Egypt, Technology transfer.

Remote sensing data gathered by ERTS/LANDSAT satellites and now being provided to developing countries includes mapping of large scale features and remote areas; land use analysis; mineral deposits and geological mapping, structural analysis for locating mineral and water resources; monitoring population changes; agricultural inventories; locating surface water resources; and regional planning. Greatest emphasis in developing countries has been on the collection and analysis of data on natural resources needed to promote national development. Factors which may determine the nature, volume, and particular mix of information needed include the size of the country, resource endowment, available information, development goals, capacity to absorb information, and cost. Some problems include ineffective gathering of human resources information, the tendency to proceed too rapidly from relatively straightforward to sophisticated analysis, and a lack of institutional coordination for gathering and using information. Several developing nations have created institutional capabilities for using remote sensing technologies, and the way in which these institutions develop may be an important factor in delimiting the character and extent of remote sensing use in coming years. (See also W77-11637) (Ullery-Arizona)
W77-11639

CONTROLLED-ENVIRONMENT AGRICULTURE AND THE DEVELOPING COUNTRIES,
Arizona Univ., Tucson. Environmental Research Lab.
W. L. Collins, and C. N. Hodges.
In: The Application of Technology in Developing Countries, Papers Presented During an International Programs Seminar Series, August-December, 1976, Tucson, Arizona, The University of Arizona, Office of Interdisciplinary Programs, Office of Arid Lands Studies, p. 85-93, 1977.

Descriptors: *Greenhouses, *Experimental farms, *Environmental control, *Agriculture, *Crop production, Drought resistance, Soil conservation, Water conservation, Irrigation efficiency, Irrigation systems, Cultivation, Nutrient requirements, Environmental effects, Insect resistance, Deserts, Arid climates, Arid lands, Food abundance.
Identifiers: *Developing countries.

The intensified production and locale flexibility of controlled-environment agriculture (EDA), i.e. greenhouses, may help solve basic problems of world agriculture, especially for developing countries. CEA can increase crop yields, reduce losses due to pests and weather, and uses less water, fertilizer, and land than conventional open-field agriculture thereby helping increase production while conserving resources. Selective use of CEA components in conventional agriculture such as seedhouses during drought or insect plague, and drip irrigation and fertilizer injection systems developed for CEA may be one of CEA's greatest contributions. CEA also frees growers from the uncertainties of weather, insects, and disease, thereby stabilizing the pattern of supply and demand. It may be the only answer to the problem of environmental damage from agriculture because it uses little land and does not deplete soil nutrients. Environmental damage of agriculture caused by man and global climate changes may be lessened by CEA because it permits crop production near urban and industrial areas and makes possible the retention of local food production in areas which no longer have good growing climates. (See also W77-11637) (Ullery-Arizona)
W77-11640

DISASTERS AS A NECESSARY PART OF BENEFIT-COST ANALYSES,
Geological Survey, Menlo Park, Calif. Branch of Western Environmental Geology.
R. K. Mark, and D. E. Stuart-Alexander.
Science, Vol. 197, No. 4309, p 1160-1162, 16 September 1977. 29 ref.

Descriptors: *Cost-benefit analysis, *Diasters, Water resources, *Projects, *Costs, Dam failure, Earthquakes, Reservoirs, Landslides, Probability, Risks, Estimating.
Identifiers: Urban areas.

Cost-benefit analyses for water resources projects generally do not include the expected costs (residual risk) of low-probability disasters, such as dam failures, impoundment-induced earthquakes, and landslides. Analysis of the history of these types of events demonstrates that dam failures are not uncommon and that the probability of a reservoir-triggered earthquake increases with increasing reservoir depth. Because the expected costs from such events can be significant and risk is project-specific, estimates should be made for each project. The cost of expected damage from a 'high-risk' project in an urban area could be comparable to project benefits. (Bell-Cornell)
W77-11765

A FACTOR ANALYSIS OF SOCIOECONOMIC CHANGE IN THE TENNESSEE RIVER WATERSHED,
Tobacco Tax Council, Richmond, Va.
V. G. Chappell, Jr.
Water Resources Bulletin, Vol 13, No. 3, p 543-550, June 1977. 1 tab, 8 ref.

Descriptors: *Tennessee River, *Watersheds(Basins), Regional analysis, Data collections, Equations, Economics, Social aspects, Watershed management.
Identifiers: *Factor analysis, *Socioeconomic change.

Factor analysis is utilized to identify and summarize the socioeconomic changes occurring in the Tennessee River Watershed. A general factor analysis program is applied to a set of 25 socioeconomic variables hypothesized to represent many of the dimensions of regional socioeconomic change. The analysis identifies seven factors that underlie and explain socioeconomic change in the Tennessee River Watershed. The factors may be used to describe satisfactorily the major portion of the variation in the 25 socioeconomic variables without increasing the problem of multicollinearity in further analyses. As an aid in watershed research, factor analysis permits inferences about the structure of economic and social development. Dependency among the various socioeconomic changes can more easily be determined. (Bell-Cornell)
W77-11767

INSTITUTIONALIZED INEFFICIENCY: THE UNFORTUNATE STRUCTURE OF COLORADO'S WATER RESOURCE MANAGEMENT SYSTEM,
Colorado State Univ., Fort Collins. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W77-11768

PROCEDURES FOR THE EVALUATION OF ENGINEERING ALTERNATIVES,
Engineering-Science, Inc., Arcadia, Calif.
D. V. MacDonald, K. P. Barney, Jr., and S. F. Jones.
Water Resources Bulletin, Vol. 13, No. 3, p 583-598, June 1977. 5 fig, 2 tab.

Descriptors: *Engineering, *Evaluation, Economics, Water resources, Environment, Feasibility, Performance, Projects, Political aspects, Social aspects.
Identifiers: Public participation, Nonquantifiable parameters, Alternative evaluation procedures, Evaluation criteria, Rating scale, Evaluation system, Alternative selection, Local evaluation participation.

Described is a method of analyzing the nonquantifiable parameters which should be considered in the evaluation of engineering alternatives. The nonquantifiable parameters can include environmental impact, feasibility of implementation, and

performance. The method considers rating all the alternatives on the basis of a set of criteria which reflect these parameters. A procedure is discussed for obtaining review and guidance in the evaluation of engineering alternatives from the local elected officials or governing bodies and for obtaining the views and desires of the local communities. This is achieved through the formation of project review committees and an evaluation procedure which allows for the technical rating of alternatives by the engineer and the weighing of the evaluation criteria by the political and social groups. With the growing environmental concern and the high cost of engineering projects, the involvement of the public during the evaluation of engineering projects is becoming increasingly important to the final success of the project. The evaluation factors considered are general, economic, energy, environmental (including the quality of ground, surface, and supply water), feasibility, and performance. (Bell-Cornell)
W77-11771

A NONLINEAR MULTILEVEL MODEL FOR REGIONAL WATER RESOURCES PLANNING,
Khonkaen Univ. (Thailand). Faculty of Engineering.
For primary bibliographic entry see Field 6A.
W77-11772

A MULTICRITERIA ANALYSIS FOR WATER RESOURCE AND LAND USE DEVELOPMENT,
Vrije Universiteit, Amsterdam (Netherlands). Dept. of Economics.
For primary bibliographic entry see Field 6A.
W77-11773

NEW GROWTH CENTERS--A ROLE FOR THE BUREAU OF RECLAMATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. A. Koelzer.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 311-326, November 1976. 22 ref.

Descriptors: Water resources, *Growth rates, *Population, Irrigation, Planning, Urbanization.
Identifiers: *Bureau of Reclamation, *Population(Statistics), Population growth, Food supply, Urban planning.

Faced with a probable decline in its historic role of developing irrigation in the West, a new role is hypothesized for the U.S. Bureau of Reclamation. This role is in planning for other types of economic growth that will draw additional population to the West and cause the growth there of new population centers. The causes of a probable decline in subsidized irrigation, the rationale for encouraging future population growth to occur in the West rather than in the East, the means of such growth, and the types of impacts that would have to be analyzed are considered. This new planning role for the Bureau is seen as one way of utilizing the Bureau's capability. (Bell-Cornell)
W77-11775

PLANNING FOR IMPLEMENTATION UNDER SECTION 208,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-11776

CARRYING CAPACITY: A BASIS FOR COASTAL PLANNING.
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
D. R. Godschalk, F. H. Parker, and T. R. Knoche.
June 1974, 183 p, 4 tab, 2 fig.

Descriptors: *Carrying capacity, *Coastal areas, *Balance of nature, *Institutional constraints, *Limiting factors, Environmental effects, Social aspects, Psychological aspects, Political aspects, Ecology, Environmental control, Planning, Management, Social values, *Planning, North Carolina.
Identifiers: Carteret County(NC), *Coastal planning.

Carrying capacity results from the interaction of environmental, socio-psychological, and institutional factors. In an area experiencing development pressure, carrying capacity, or the amount of development that is allowed to take place, depends on: the area's natural characteristics that limit development; the perceptions and values of area residents as expressed in their preferences for lifestyles and environment; and the ability of the area's governing body and management agencies to provide the services and impose the controls necessary to insure that the desired quality of life is maintained. The environmental, socio-psychological, and institutional aspects of the carrying capacity concept are applied to the Carteret County case in North Carolina as they might be used to justify limiting the ultimate growth level or the rate of growth. The usefulness of the carrying capacity idea as a growth planning and policy tool is examined. The study includes an annotated bibliography of carrying capacity literature. This literature is summarized and integrated. Carrying capacity, as a planning tool, has primarily been applied in two ways: in planning the intensity of activity for park and recreation areas; and in determining growth limits for areas experiencing development pressure. (Nessa-NC)
W77-11853

POTENTIAL OF TIDAL AND GULF STREAM POWER SOURCES,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 3E.
W77-11854

THE CALIFORNIA COASTAL PLAN: A CRITIQUE,
Institute for Contemporary Studies, San Francisco, Calif.
E. Bardach, D. K. Benjamin, T. E. Borcherding, R. D. Eckert, and H. E. Frech, III.
1976. 199 p, 7 fig, 2 tab, 114 ref. $3.95.

Descriptors: *Coasts, *Land use, *Planning, Pricing, Cost-benefit analysis, *Resource allocation, *Resource development, *Pollution taxes(Charges), *California, Taxes, Costs, Economics, Administration, Administrative costs, Cost allocation, Cost comparisons, Alternative costs, Associated costs, Indirect costs, Intangible costs, Marginal costs, Real costs, Variable costs.
Identifiers: *Coastal planning, Externalities.

A series of essays have been assembled that revolve around the idea that private activity is the most efficient and productive way to allocate resources when market prices correctly reflect the social costs and benefits. The externalities that regulations impose are compared to the externalities that regulations eliminate. The ability of centralized planning to collect the accurate and timely information needed to price environmental goods is compared with the market system's ability to perform the same task. The costs of implementing the plan are assessed. A system of environmental usage fees is proposed. The impact of the proposed plan on the poorest segments of society is explored. A model is developed to analyze whether or not the Coastal Commission has actually changed land use patterns in the coastal zone. The plan is viewed from the private property owner's perspective. The institutional manifestations of property rights and their ability to resolve several specific economic problems are analyzed. Fundamental considerations of fairness and equity in dealing with cost allocations are addressed. The adequacy of the energy and transportation elements of the plan are analyzed. The study concludes that a more efficient supply mechanism is needed to satisfy demands for environmental improvement. (Nessa-NC).
W77-11855

SOCIO-ECONOMIC STUDIES OF THE UPPER ST. JOHNS RIVER BASIN, CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. P. Heaney, and W. C. Huber.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A021 680, Price codes: A19 in paper copy, A01 in microfiche. Prepared for Army Corps of Engineers, Engineer District, Jacksonville, FL, Report ENE 74071, July 1974. 433 p, 58 fig, 51 tab, 136 ref.

Descriptors: *River basin development, *Comprehensive planning, *Projections, *Environmental effects, *Social aspects, *Economic impact, Political aspects, Cost-benefit analysis, Hydrologic models, Linear programming, Computer simulation, Alternative planning, Water resources, *Florida.
Identifiers: *St. Johns River Basin(FL), *Environmental Impact Statements, Digital simulation models.

This study is divided into two parts, the first of which deals with the creation of a technique and procedure for use in the assessment of alternative water resources development plans with due consideration of economic, social, and environmental effects relating to development and construction in the study area is described, an historical perspective is offered, the management alternatives are explained and the analytical framework is presented. The state of the art in environmental impact statment preparation is presented. The magnitude and significance of economic, social, and environmental effects are described, wherever possible, in terms of either monetary or energy units, and their interactions are explored. The social aspects are reviewed with respect to available merthodologies, and the results of field survey work in the context of a hypothetical regional board. A multi-objective linear programming model was developed for the economic analysis, which explores questions of national economic effciency and regional costs and benefits. The environmental analysis is based on a digital simulation model that traces the flow of water and associated environmental impacts. The spatial and temporal distribution of the environmental impacts are evaluated. (Nessa-NC)
W77-11859

EVALUATION OF AND RECOMMENDATIONS FOR LEGAL, INSTITUTIONAL AND FINANCIAL METHODS FOR IMPLEMENTING PURPOSES AND PLANS FOR FLOOD PLAIN MANAGEMENT IN CONNECTICUT RIVER BASIN: LIF REPORT, PHASE II,
Institute for Public Administration, New York.
For primary bibliographic entry see Field 6F.
W77-11860

CROWDING AND VISITOR CONFLICT ON THE BOIS BRULE RIVER,
Wisconsin Univ., Madison. Dept. of Rural Sociology.
T. A. Heberlein, and J. Vaske.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 314, Price code: A06 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, WIS WRC 77-04, 1977. 109 p, 6 fig, 25 tab, 6 ref, 2 append. OWRT A-066-WIS(1), 14-31-0001-5050, 14-34-0001-6052.

Descriptors: *Recreation, Water sports, *Attitudes, *Behavior, *Recreation demand, *Social participation, *Tourism, *Parks, Camping, *Psychological aspects, *Carrying capacity, Wisconsin, Recreation facilities.
Identifiers: *Bois Brule River(Wisc).

Nearly three thousand canoers, tubers, and fishermen were interviewed as they left the upper Bois Brule river on 24 days in the late summer of 1975. Their perceptions of crowding, satisfaction, and reported contacts with other visitors were measured. In spite of daily use levels which ranged as high as 308 visitors on a ten mile stretch there was no relation between use level satisfaction ($r = -.01$). Use level is related to perceived crowding ($r = .32$, $p < .001$), and feeling crowded is one aspect of overall satisfaction, ($r = .14$, $p < .001$). This study replicates prior research by Shelby on Colorado River visitors, and casts further doubt on an econometric model of carrying capacity which is based on an assumed relationship between use level and satisfaction of river visitors. Canoers and fishermen were the most visible recreationists in terms of contacts, and tubers were the least encountered, largely due to a natural zoning which takes place on the river. All visitor groups expressed similar motivations for their visit, such as being close to nature, while differing in level of commitment, and background variables. Tubers were more recent initiates to their sport and had less experience on other rivers than canoers and fishermen.
W77-11865

REGIONAL WATER MANAGEMENT WITH FULL CONSUMPTIVE USE,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
R. R. Lansford, S. Ben David, and B. R. Beattie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 313, Price codes: A06 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 088, June, 1977, 112 p, 3 fig, 50 tab, 3 append. OWRT B-046-NMEX(1).

Descriptors: *Water utilization, *Optimization, Water supply, Water demand, Water resources development, *Regional development, Economics, Model studies, *Consumptive use, *Regional analysis, *Economic impact, *Social impact, *New Mexico, Evaluation, Texas.
Identifiers: Rio Grande Basin, *Elephant Butte Reservoir(N Mex), Fort Quitman(Tex), Input-Output model, Linear programming model.

The evaluation of social and economic impacts caused by alternate strategies dealing with water scarcity in the region of the Rio Grande Basin between Elephant Butte Reservoir, New Mexico and Fort Quitman, Texas was obtained through the development of a model which describes the water supply and demand characteristics of the region; describes the economic conditions of the region as related to water resources availability; identifies selected alternative futures with respect to water use, industrial development, and population growth and their impact upon the agricultural sector of the economy; evaluates the alternatives in terms of water use, employment, agricultural and industrial development, environmental impacts, and other related factors; and identifies institutional changes necessary for efficient management of the regional water resources. (Stockton - N Mex State)
W77-11866

FUTURE PROBLEMS AND WATER RESOURCES RESEARCH NEEDS OF THE ILLINOIS RIVER SYSTEM.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 405, Price codes: A11 in paper copy, A01 in microfiche. Report UILU-WRC-77-0006, Special Report No. 6, June 1977. 212 p, 25 tab, 30 fig, 3 ref, Edited by P.C. Welch. OWRT A-999-ILL(5).

Descriptors: *Research priorities, Inland waterways, *Conferences, *River systems, *Illinois, Large watersheds, Water Resources Institute, *Water resources development.
Identifiers: *Illinois River.

The Illinois River is a major pathway for the movement of freight between the Mississippi River at St. Louis and Chicago on the Great Lakes. Its basin includes large agricultural land areas in central and northern Illinois as well as a large industrial area in northeastern Illinois and is heavily used by recreationists. Representatives of numerous disciplines and agencies were invited to review all aspects of potential problems and to define topics on which research is needed. One problem is the impact of barge traffic on the river, both in the erosion of banks and in the scouring og the river bottom, with sediment dept in suspension. Other sediment problems include agricultural runoff adn the die-off of bottom-dwelling organisms, with the subsequent loss of some wildlife. Energy production is another danger to small fish, which are sometines entrained in the cooling water flow. Important research areas also involve a study of the impact of increased withdrawals for supplementary irrigation of crops and the changes in water quality problems in the upper reaches of the Illinois River as the Metropolitan Sanitary District of Greater Chicago upgrades its waste treatment facilities and retains storm water for treatment. Current plans by state agencies to develop a water permit system will also create many changes which need to be fully studied. (Stout-Illinois)
W77-11937

SELECTING AND PLANNING HIGH COUNTRY RESERVOIRS FOR RECREATION WITHIN A MULTIPURPOSE MANAGEMENT FRAMEWORK,
Colorado State Univ. Fort Collins. Dept. of Recreation Resources.
R. Aukerman, C. A. Carlson, R. L. Hiller, and J. W. Labadie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 402, Price codes: A15 in paper copy, A01 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 78, July 1977. 330 p, 8 fig, 11 tab, 63 ref, 3 append. OWRT B-132-COLO(3), 14-34-0001-6062.

Descriptors: *Recreation, *Reservoirs, *Planning, Water resources, *Management, *Decision-making, Fisheries, Fishing.

This report is presented to help decision makers, managers, planners and owners of water and its adjacent lands make more informed decisions on the selection and development of high country reservoirs for recreation. The following questions are answered in varying degrees by the scientific findings of the study: (1) How can we determine which reservoirs are best suited for various recreation user groups. (2) What important factors must be considered in selecting suitable reservoirs and developing these reservoirs for recreation. (3) Why is it important to consider those factors. (4) What is the effect of drawdown on the reservoir fishery. (5) Is there enough available water in the river basin to meet recreation needs as, at the same time, meet the water rights of agricultural, municipal and domestic users. What trade-offs are required. (6) How can the practitioner determine water availability for recreation. (7) What managerial options are available for enhancing recreation use as much as possible without harming other water users. (8) What are the legal options, liabilities, and limitations on obtaining water and utilizing reservoirs for recreation. Findings which are incorporated into a practical decision process in the process orders data and provdes a framework for selecting, planning and managing reservours for recreation. recreation resources, fishery biology, water resources engineering and law combine in a truly interdisciplinary study finding which are incorporated into a practical decision process. The process orders data and provides a framework for selecting, planning and managing reservoirs for recreation.
W77-11938

THE CENTRAL ARIZONA PROJECT: 1918-1968.
Central Arizona Project Association, Phoenix.
R. Johnson.
The University of Arizona Press, Tucson. 1977, 242 p, 56 ref.

Descriptors: *Arizona, *Colorado River, *Water resources development, *Political aspects, *Water transfer, *Colorado River compact, *Mexican Water Treaty, California, Dams, Southwest US, Legal aspects, Legislation, Competing uses, Water rights, Water allocation(Policy), Water utilization, Projects.
Identifiers: *Central Arizona Project.

The plan to bring water from the Colorado River mainstream into central Arizona is discussed in detail. Controversial water problems and issues facing Arizona and other involved western states are examined, legal and political events from 1919 to 1968, are clarified, and the battle within Arizona over the project described. Compromises made to satisfy conflicts among the seven concerned states are explained and the passage of the Central Arizona Project Act is described. Water issues and problems since 1968 are briefly examined. (Jewkes-Arizona)
W77-11999

SHORT COURSE PROCEEDINGS - APPLICATIONS OF STORMWATER MANAGEMENT MODELS, 1976,
Massachusetts Univ. Amherst.
For primary bibliographic entry see Field 6A.
W77-12074

METHODOLOGY FOR EVALUATING THE COST OF URBAN STORMWATER QUALITY MANAGEMENT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. P. Heaney, and S. H. Hasan.
In: Short Course Proceedings, Applications of Stormwater Management Models - 1976, 1977. p 15-33, 3 fig, 2 tab, 14 ref. Report EPA-600/2-77-065.

Descriptors: *Costs, *Forecasting, *Storm water, *Combined sewers, *Model studies, Urban runoff, Mathematical models, Mathematical studies, Cost comparisons, Storm runoff, Water quality, Waste water treatment.
Identifiers: Storage-treatment isoquants, STORM, SWMM.

Procedures used during an EPA-sponsored study to estimate the nationwide cost of treating combined sewer overflows and storm water runoff are described. The EPA Storm Water Management Model (SWMM) was used to simulate a single storm event for a single catchment area for each of five cities in the U.S. The HEC STORM model was used to estimate hourly precipitation, runoff, and discharge rates for projections of the total volume of storm water treated for a specified size of storage unit and treatment rate. Results were used to derive storage-treatment isoquants. Mathematical derivations and procedures for adjustment according to treatment efficiency are given for the calculated isoquants. Formulas are given for the estimation of costs for storm water management based on quality control. Potential savings due to multipurose planning and the integration of wet- and dry-weather treatment are considered. (See also W77-12074)

W77-12075

CHICAGO METROPOLITAN FLOODWATER MANAGEMENT PLAN,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 4A.
W77-12162

A NEW APPROACH FOR ESTIMATING IRRIGATION CONVEYANCE LOSSES AND THEIR ECONOMIC EVALUATION,
Escuela Nacional de Agricultura, Chapingo (Mexico). Colegio de Postgraduados.
For primary bibliographic entry see Field 3F.
W77-12164

REGIONAL MANAGEMENT OF URBAN AND AGRICULTURAL POLLUTION,
Windsor Univ. (Ontario).
For primary bibliographic entry see Field 5G.
W77-12167

SIMULTANEOUS INVESTMENT AND ALLOCATION DECISIONS APPLIED TO WATER PLANNING,
Texas Univ. at Austin.
For primary bibliographic entry see Field 6A.
W77-12168

AN ILLUSTRATIVE EXAMPLE OF THE USE OF MULTIATTRIBUTE UTILITY THEORY FOR WATER RESOURCE PLANNING,
Woodward-Clyde Consultants, San Francisco, Calif.
For primary bibliographic entry see Field 6A.
W77-12169

NEW YORK'S MARINE FISHERIES: CHANGING NEEDS IN A CHANGING ENVIRONMENT,
New York State Dept. of Environmental Conservation, Stony Brook. Div. of Marine and Coastal Resources.
A. C. Jensen.
New York Fish and Game Journal, Vol 24, No 2, p 99-127, 1977. 7 fig, 2 tab, 52 ref.

Descriptors: *Management, *Fish management, *Fisheries, *Commercial fishing, *Marine fisheries, Technology, New York, Fish, Environmental effects, Water pollution sources, Water quality, Water pollution effects, Mercury, Polychlorinated biphenyls, Commercial shellfish, Reviews.

New York marine fisheries has undergone tremendous changes over the past quarter-century. Increased pressure from foreign fishing fleets, changing domestic emphasis from commercial to recreational fishing and a changing marine environment (from natural as well as man-made causes) has produced changes in species composition in some ecosystems and in the availabiltiy and usability of a number of food species. Mercury, PCB's and other pollutants have threatened the usefulness of several species. Pollution from domestic wastes has forced the closure of productive shellfish grounds. The possibility of offshore drilling for oil and gas poses a serious dilemma for coastal zone managers and fisheries managers. The increase in the number of marine anglers has put heavy pressure on several fish stocks. New management programs were suggested to bring our present programs into line with technological, social, and environmental changes. (Klein)
W77-12247

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

DISASTER-CAUSED INCREASES IN UNIT REPAIR COST,
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 6F.
W77-11777

WATER AND SEWER RATES IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
R. L. Gardner, and J. J. Waelti.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 307, Price codes: A08 in paper copy, A01 in microfiche. Water Resources Research Center, Univ. of Minn., Bulletin 94, August 1977. 151 p, 2 fig, 16 tab, append. OWRT A-031-MINN(3), 14-34-0001-7050.

Descriptors: *Minnesota, *Water rates, *Use rates, Sewers, *Pricing, *Cities, *Rates, Water Utilization, Data collection.
Identifiers: *Sewer rates.

Results are summarized of a survey of water and sewer rates in the State of Minnesota. Typical monthly water and sewer bills were computed for small, medium and large municipalities. Summaries were made of the frequency of various rate forms for various sizes of municipalities. Individual water and sewer rates are given for those municipalities responding to the survey.
W77-11868

AGRICULTURAL RESPONSE TO CHANGING WATER PRICES IN ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
T. G. Carr.
Master of Science thesis (1977). 61 p, 9 fig, 4 tab, 37 ref, 2 append.

Descriptors: *Water policy, *Water rates, *Water costs, *Competing uses, *Water supply, *Arizona water users, Water demand, Water sources, Costs, Economics, Agriculture, Water conservation, Water management(Applied), Water consumption, Prices, Farms, Economic impact, Irrigation, Water allocation(Policy), Forecasting, Legal aspects.
Identifiers: Central Arizona Project, Maricopa County, Pima County, Pinal County.

Sixty percent of Arizona's water supply comes from groundwater aquifers. Agriculture accounts for 89 percent of all water use in Maricopa (Phoenix), Pima (Tucson), and Pinal Counties of Arizona, but irrigated agriculture returns the lowest amount of personal income per acre foot of water among the major Arizona economic sectors. Many wish to reallocate water from irrigated agriculture since it is the largest and most economically inefficient user. This study analyzes some of the current strategies proposed. Arizona's water resources, water conservation strategies, and economic projections concerning water costs are reviewed, policies and strategies to relieve water problems are evaluated. Conclusions presented suggest that the basic policy contemplated by the State is to reduce overdraft situations through comprehensive management of Arizona's water resources, entailing physical management such as the Central Arizona Project, to increase renewable supplies and demand management, entailing economic or legal strategies. Most of Arizona's proposed demand strategies would reduce agricultural water use through higher pricing. (Jamail-Arizona)
W77-11997

SUBSURFACE DRAINAGE COST AND HYDROLOGIC MODEL,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W77-12166

MODIFICATION OF RIVER BEDS AND OF THE COURSES OF RIVERS IN UPPER BELGIUM, (IN FRENCH),
P. Staner.
Nat Belg 57(6/7), p 150-162, 1976.

Descriptors: Rivers, *Flood control, Ecology, Environmental effects, River beds, Aquatic plants, Birds, Fish population.
Identifiers: *Belgium, Ourthe River, Semoir River, Vierre River, Lomme River.

The destruction of aquatic plant, bird and fish populations resulting from flood control efforts along the Ourthe, Semois, Vierre and Lomme Rivers is discussed. Consideration of ecological implications is suggested before further planning.--Copyright 1977, Biological Abstracts, Inc.
W77-12183

6D. Water Demand

REMOTE SENSING OF WATER DEMAND INFORMATION,
California Univ., Santa Barbara. Dept. of Geography.
J. R. Jensen, J. E. Estes, L. W. Bowden, and L. R. Tinney.
Geographical Review, Vol 67, No 3, July, 1977. p 322-334, 4 fig, 6 tab.

Descriptors: *Remote sensing, *Water demand, *Water supply, *Water management(Applied), *Water resources, *Projections, *Model studies, *Forecasting, *Data collections, Aerial photography, Mapping, Regions, Analytical techniques, Urban mapping, Land use, Land classification, Agriculture, Computer models, Data storage and retrieval, Terrain analysis.
Identifiers: Landsat imagery.

Existing water supply and demand prediction models are localized in areal extent and rely on historical data and therefore are inadequate for urban and agricultural use on regional, state, and international bases. Models capable of structuring, synthesizing, and producing viable user-oriented water demand data over large areas have not yet been fully developed. The results of research in California's Kern County and Upper Santa Ana River Basin indicate the existence of remote sensing capabilities necessary to improve the efficiency and utility of such models. To test the effectiveness of remote sensing to provide cropland information in Kern County as model input, data obtained from high-altitude photography and Landsat imagery were compared with data obtained from ground surveys. Analysis confirmed both remote sensing techniques to be almost as accurate as conventional surveys. In the Upper Santa Ana River Basin the applicability of remote sensing images for mapping land use categories related to water demand was demonstrated by researchers. The demonstration indicated considerable benefits in terms of time, cost, and accuracy. (Ullery-Arizona)
W77-11635

FUTURE NEEDS FOR DRY OR PEAK SHAVED DRY/WET COOLING AND SIGNIFICANCE TO NUCLEAR POWER PLANTS,
General Electric Co., San Jose, Calif.
For primary bibliographic entry see Field 3E.
W77-11848

POTENTIAL OF TIDAL AND GULF STREAM POWER SOURCES,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 3E.
W77-11854

CROWDING AND VISITOR CONFLICT ON THE BOIS BRULE RIVER,
Wisconsin Univ., Madison. Dept. of Rural Sociology.
For primary bibliographic entry see Field 6B.
W77-11865

REGIONAL WATER MANAGEMENT WITH FULL CONSUMPTIVE USE,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
For primary bibliographic entry see Field 6B.
W77-11866

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--GREAT BASIN REGION,
Geological Survey, Carson City, Nev. Water Resources Div.; and Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-11873

CONSERVATION IN KANO,
For primary bibliographic entry see Field 4B.
W77-11993

AGRICULTURAL RESPONSE TO CHANGING WATER PRICES IN ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6C.
W77-11997

A TEST OF ALTERNATIVES FOR MEETING PUBLIC POTABLE WATER REQUIREMENTS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Urban Studies.
For primary bibliographic entry see Field 5G.
W77-12159

6E. Water Law and Institutions

THE APPLICATION OF TECHNOLOGY IN DEVELOPING COUNTRIES.
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6B.
W77-11637

INSTITUTIONALIZED INEFFICIENCY: THE UNFORTUNATE STRUCTURE OF COLORADO'S WATER RESOURCE MANAGEMENT SYSTEM,
Colorado State Univ., Fort Collins. Dept. of Political Science.
W. Peak.
Water Resources Bulletin, Vol. 13, No. 3, p 551-562, June 1977. 3 ref.

Descriptors: Water resources, *Water management(Applied), *Colorado, Water rights, Control, Irrigation, Technology, Investment, Human population, Economics, Water distribution(Policy), *Institutions, *Institutional constraints.
Identifiers: Technological innovation, Special interests, Water distribution patterns, Water use patterns.

Identified are two basic structural features of Colorado's water management system which inhibit constructive reform and perpetuate inefficiencies in water utilization and distribution patterns. These features are: (1) the fragmentation of authority and influence over water, and (2) the estrangement of interest in reform from formal control over water policy. These interrelated features have continued to produce: sproadic, high conflict battles over proposed changes in the status quo; decision making which tends to exaggerate the importance of narrow, special interests while virtually ignoring legitimate interests of major sectors of the public; an inertia which discourages innovation; and an agglomeration of rules and water rights that are predicted on obsolete social and economic needs. Two radical proposals for reforming the state's water resource management system in order to overcome these problems and to enhance the probability that wise water policy will result are offered. These proposals are: (1) the abolition of the present system of water rights founded on the doctrine of prior appropriation; and (2) the consolidation of authority over water allocation in a single board of governors. (Bell-Cornell)
W77-11768

PLANNING FOR IMPLEMENTATION UNDER SECTION 208,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-11776

EFFICIENCY PROBLEMS FROM USER FEES IN MUNICIPAL WASTEWATER TREATMENT,
National Bureau of Standards, Washington, D.C. Building Economics Section.
For primary bibliographic entry see Field 5D.
W77-11783

THE WINTERS DOCTRINE: SEVENTY YEARS OF APPLICATION OF 'RESERVED' WATER RIGHTS TO INDIAN RESERVATIONS,
Arizona Univ., Tucson. Office of Arid Lands Studies.
M. C. Nelson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 299, Price codes: A08 in paper copy, A01 in microfiche. Arid Lands Resource Information Paper No. 9, September 1977. 147 p, 3 fig, 3 tab, 87 ref. OWRT W231(No. 7303)(1).

Descriptors: *Water law, *Water rights, *Indian reservations, *Irrigable land, *Allotments, Legal aspects, Riparian rights, Treaties, Priorities, Beneficial use, Prior appropriation, Reservation doctrine, Federal-State water rights conflicts, Federal jurisdiction, River systems, *Reviews, Bibliographies.
Identifiers: *Winters doctrine, McCarran Amendment.

An in-depth study is provided of the literature, both legal and general, relating to the Winters doctrine (Winters v. United States, 207 U.S.), commonly used to designate Indian implied by the courts from treaties and other government agreements involving Indian tribes. The topic is currently of considerable importance in water-short western states because of the effects of waters so 'reserved' being exempt from appropriation by non-Indians. The literature relating to the original Winters doctrine as enunciated first in 1908 is scattered throughout a wide spectrum of sources, and in bringing such together here it is expected that both the general public and the legal profession will benefit from this historical overview of subsequent claims over the past seventy years. Included are chapters on the nature of Indian reserved water rights; western water law and Indian reserved water rights; a case law development -- Winters through Arizona v. California (1963) -- which describes in detail twelve major cases that have determined the bounds of Indian reserved water rights; and judicial protection of Indian water rights under the McCarran Amendment. A list of 64 additional related cases is given, with brief annotations, arranged chronologically first, then by court level; and finally those reserved water rights cases currently pending before the courts, 28 in number. An 87-item annotated bibliography of the general literature dealing with Winters is appended. (Paylore-Arizona)
W77-11787

METHODOLOGY FOR DESIGNATION OF ADJACENT COASTAL STATES,
Little (Arthur D.), Cambridge, Mass.
C. B. Cooper, M. C. Huston, and A. S. Kalelkar.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 483, Price codes: A05 in paper copy, A01 in microfiche. Final report to U.S. Coast Guard, Revised, Report CG-WDWP-1-76, March 12, 1976. 70 p, 6 fig, 3 tab, 12 ref, 2 append. C-78784-20, DOT-CG-52269-A.

Descriptors: *Environmental effects, *Shore protection, *Coasts, *Harbors, Methodology, Decision making, Management, Planning, Risks, Forecasting.
Identifiers: *Deepwater Port Act, *Adjacent coastal state.

Section 9 of the Deepwater Port Act of 1974 (P.L. 93-627) provides for the designation of 'adjacent coastal states.' The report discusses a designation methodology, involving: (1) receipt of a State's request for designation, which must include all available supporting documentation; (2) estimation, based upon interpretation of port applicants' data, of independent risks to the coastal environment of any state directly connected by pipeline to the deepwater port (especially oil spills), and port-related secondary development; (3) evaluation of the validity of the State's estimates of potential port-related damage; (4) comparison of the damage estimates rom (2) and (3) without artificial aggregation to a single unit of measure (e.g. dollars); the risk of environmental damage would be compared to a resource-by-resource basis; (5) consideration of the recommendation submitted by the Administrator of NOAA; and (6) granting of adjacent coastal state status to any petitioning state that appears to risk equal or greater damage to its coastal environment than would the pipeline State from either facilities or activities directly associated with the port or port-related secondary development. Two appendices provide information regarding additional sources of data on cultural resources in Gulf Coast states, and detailed aspects of environmental risk methodology. (Nessa-NC)
W77-11849

THE APPLICATION OF NONSTRUCTURAL MEASURES TO COASTAL FLOODING,
Cheney, Miller, Ellis, and Associates, Inc., Putnam, Conn.
For primary bibliographic entry see Field 2L.
W77-11852

CARRYING CAPACITY: A BASIS FOR COASTAL PLANNING.
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6B.
W77-11853

THE CALIFORNIA COASTAL PLAN: A CRITIQUE,
Institute for Contemporary Studies, San Francisco, Calif.
For primary bibliographic entry see Field 6B.
W77-11855

EVALUATION OF AND RECOMMENDATIONS FOR LEGAL, INSTITUTIONAL AND FINANCIAL METHODS FOR IMPLEMENTING PURPOSES AND PLANS FOR FLOOD PLAIN MANAGEMENT IN CONNECTICUT RIVER BASIN: LIF REPORT, PHASE II,
Institute for Public Administration, New York.
For primary bibliographic entry see Field 6F.
W77-11860

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS,
For primary bibliographic entry see Field 5G.
W77-11863

ALABAMA PUBLIC MEETING SERIES ON COASTAL ZONE BOUNDARIES, NOVEMBER - DECEMBER, 1975. INTERPRETATIONS,
Alabama Development Office, Montgomery.
L. W. Hyde.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 021, Price codes: A07 in paper copy, A01 in microfiche. Mississippi-Alabama Sea Grant Consortium Publication No. MASGP-76-011, March 1976. 128 p.

Descriptors: *Coasts, *Water quality control, *Conferences, *Boundaries(Property), Alabama, Water law, Wetlands, Water management(Applied).
Identifiers: Coastal zone management.

Five meetings were held in Mobile and Baldwin Counties in November and December, 1975, for the purpose of soliciting public input into the definition of the Alabama coastal zone boundary. In addition to serving as a forum for developing ideas on the boundary definition, the meetings served as an opportunity to create public awareness of the coastal zone program and as a medium of interchange of ideas on a wide range of coastal zone related topics. This report summarizes the meetings and attempts to draw general conclusions from the public's comments regarding the coastal zone boundary and related items. Transcripts of meetings are included with only a minor amount of editing. (Sinha-OEIS)
W77-11900

THE CENTRAL ARIZONA PROJECT: 1918-1968,
Central Arizona Project Association, Phoenix.
For primary bibliographic entry see Field 6B.
W77-11999

6F. Nonstructural Alternatives

DISASTERS AS A NECESSARY PART OF BENEFIT-COST ANALYSES,
Geological Survey, Menlo Park, Calif. Branch of Western Environmental Geology.
For primary bibliographic entry see Field 6B.
W77-11765

DISASTER-CAUSED INCREASES IN UNIT REPAIR COST,
Army Engineer District, Norfolk, Va.
T. N. Yancy, Jr., L. D. James, D. E. Jones, Jr., and J. Goedert.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 265-282, November 1976. 1 fig, 8 tab, 25 ref.

Descriptors: *Flood control, *Flood damage, *Repairing, *Costs, *Construction, *Disasters, Floods, Hurricanes, Tornadoes.
Identifiers: Economic analysis.

Disaster damage estimates customarily assume that labor and materials will be readily available for repairs. When major disasters do more damage than the local building industry can repair, the resultant shortage of repair resources causes prices to escalate. Examination of the factors that effect the supply of and demand for repair services in the context of such recent disasters as Hurricane Camille and Tropical Storm Agnes suggests the amount of direct damage divided by the annual volume of contract constuction in the local BEA Economic Area as a reasonable index to the degree of escalation. Information on 15 disasters suggests that serious escalation begins at an index value of about 1.0. Information on damages caused by Agnes to Wilkes-Barre, Pa., indicates that an event of index value 9.1 increased repair costs by a factor of 2.7 and total damages (including relief programs) by a factor of 4.0, an effect that more than doubled average annual flood damages. (Bell-Cornell)
W77-11777

SPECIAL FLOOD HAZARD INFORMATION: ALAMEDA AND LAS CRUCES ARROYOS, LAS CRUCES, NEW MEXICO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W77-11834

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH JUNIATA RIVER,
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W77-11835

FLOOD PLAIN INFORMATION: BUFFALO CREEK, N.Y. IN THE TOWNS OF ELMA AND WEST SENECA.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W77-11836

FLOOD PLAIN INFORMATION: CAZENOVIA CREEK, NEW YORK, CITY OF BUFFALO AND TOWN OF WEST SENECA.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W77-11837

FLOOD PLAIN INFORMATION: RIVER ROUGE, MICHIGAN, MAIN, EVANS DITCH, AND FRANKLIN BRANCHES IN WAYNE AND OAKLAND COUNTIES.
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W77-11838

FLOOD PLAIN INFORMATION: UPPER RIVER ROUGE, FARMINGTON, MICHIGAN.
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W77-11839

FLOOD PLAIN INFORMATION: ATLANTA, TEXAS: BLACK BAYOU AND TRIBUTARIES.
Army Engineer District, New Orleans, LA.
For primary bibliographic entry see Field 4A.
W77-11840

FLOOD PLAIN INFORMATION: CHADAKOIN RIVER, JAMESTOWN-FALCONER, NEW YORK.
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W77-11841

FLOOD PLAIN INFORMATION: ANTELOPE CREEK, SECRET RAVINE AND TRIBUTARIES, ROCKLIN, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-11842

BLACKSMITH FORK AND SPRING CREEK FLOOD PLAIN INFORMATION, MILLVILLE, UTAH.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-11843

FLOOD PLAIN INFORMATION: ANDROSCOGGIN AND DEAD RIVERS, LEEDS, MAINE.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-11844

FLOOD PLAIN INFORMATION: MERRIMACK, SHAWSHEEN, AND SPICKET RIVERS, LAWRENCE, METHUEN, ANDOVER AND NORTH ANDOVER, MA.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-11845

FLOOD PLAIN INFORMATION: PENOBSCOT AND STILLWATER RIVERS, OLD TOWN AND MILFORD, MAINE.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-11846

FLOOD PLAIN INFORMATION: SACO RIVER, FRYEBURG, MAINE.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-11847

A PERSPECTIVE ON FLOOD PROTECTION OF AGRICULTURAL LANDS.
Development and Resources Corp., Sacramento, Calif.
Submitted to U.S. Army Engineer Institute for Water Resources, Fort Belvoir, VA, December 1976. 76 p, 23 tab, 2 fig. IWR: 76-3, DACW31-76-M-0310.

Descriptors: *Flood control, *Crop production, *Agriculture, Flood data, Soils, Land reclamation, Wetlands, Drainage systems.
Identifiers: *National Water Assessment, Interregional model, Food production, Agricultural land use, Crop damage.

U.S. agricultural policy has shifted from controlling overproduction to encouraging more production. The impact of this shift on agricultural flood control is analyzed. Five major studies projecting world food demand and production are summarized. The interregional model being developed at Iowa State University for the National Water Assessment (NWA) is evaluated. The evaluation includes the NWA's potential application in indicating the use of rural lands protected by Army Corps of Engineers (ACE) projects. Program data from ACE on the status of rural lands affected by flood control and drainage projects are surveyed. A cross section of flood plain data now available is surveyed, including the content and format of the data. The present ACE methodology for flood control and drainage impacts on agricultural productivity is examined as it relates to flood plain soils. The methodology used to evaluate these impacts is appraised. Increased pressure can be expected for grains in export markets. Alluvial

soils are highly competitive producers. The total area of irrigated and reclaimed agricultural wetlands will increase. Program priority for agricultural flood control needs examination. If balance of payments and foreign policy factors are significant, a higher priority for agricultural flood control might be in order. (Nessa-NC)
W77-11850

EVALUATION OF AND RECOMMENDATIONS FOR LEGAL, INSTITUTIONAL AND FINANCIAL METHODS FOR IMPLEMENTING PURPOSES AND PLANS FOR FLOOD PLAIN MANAGEMENT IN CONNECTICUT RIVER BASIN: LIF REPORT, PHASE II,
Institute for Public Administration, New York.
R. P. Mack, H. C. Miller, J. R. Flood, and A. H. Walsh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 122, Price codes: A17 in paper copy, A01 in microfiche. Prepared for New England River Basins Commission, Boston, Mass., March 1976. 365 p, 25 ref, append.

Descriptors: *Connecticut River, *Non-structual alternatives, *Land use, *Cost comparisons, *Planning, Warning systems, Flood plain insurance, Mapping, Floodproofing, Relocation, Cost-benefit analysis, Building codes, Governments, Institutional constraints.
Identifiers: *Flood plain management, Open space preservation, Citizen participation, Flood episode management.

The objective is to determine how the flood plain of the Connecticut River Basin can be used most wisely. Major impoundments were not found to be a cost-effective solution. Consequently, emphasis is placed on nonstructural methods such as river forecast services and community flood episode management, the Federal Flood Insurance Program, mapping, preserving land for open space, temporary or permanent relocation or floodproofing under a cost-effective constraint, land use and building regulations, and encouraging and facilitating desirable shifts in locational patterns. Nonstructural methods that attempt to resettle all flood plain occupants at public expense were not found to be cost-effective. Instead, partial and piecemeal resettlement is advocated. There appears to be adequate room in most towns or urban areas to accommodate future growth, as well as the accommodate relocation. The net result in most places should be neutral or beneficial for the community as a whole. State governments must take primary responsibility in devising and effectuating these procedures. They must do so as part of an overlay of local, state, regional and federal governments, each using the instrumentalities available to them. Citizen involvement and participation at many levels is essential. (Nessa-NC) (See also W77-03774 and W76-05653)
W77-11860

GUIDELINES FOR FLOOD DAMAGE REDUCTION.
Army Engineer District, Sacramento, Calif.
1976, 21 p, 7 fig.

Descriptors: *Flood protection, *Control structures, *Non-structural alternatives, Flood plain zoning, Flood plain insurance, Building codes, Land use, Planning, Levee, Embankments, Floodwalls, Dams, Reservoirs, Diversion structures, Erosion control, Channel improvement, Dredging.
Identifiers: *Encroachment lines, *Flood plain management, *Structural alternatives.

Flood plain management involves local government control over the use of flood plain lands, separately or in combination with control of floodwaters. Conventional management techniques utilize physical alteration of the landscape in order to control floodwaters. Dams and reservoirs store water when streamflow is excessive. Levees and floodwalls act as barriers between a stream and the area to be protected. Channel improvements reduce flooding by improving flow conditions. Flood-way bypasses and diversions decrease the flow in the main channel, improve flow characteristics, and decrease flood stage. Watershed treatment measures render soils more capable of absorbing and retaining excessive rainfall. Nonconventional management techniques, known as flood plain regulations, mold flood plain use and development to reduce flood hazards and minimize damage. Zoning is used to control and direct the use and development of land. Building codes specify construction standards that protect health, safety, and the general welfare. Subdivision regulations specify the manner in which land may be divided and developed for sale. Development policies that limit extension of streets and utilities into flood prone areas will funnel growth into appropriate areas. Other techniques, such as flood proofing, evacuation, tax adjustments, open space acquisition and flood plain insurance are discussed. (Nessa-NC)
W77-11862

FLOOD-PRONE AREAS AND LAND-USE PLANNING--SELECTED EXAMPLES FROM THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.; Geological Survey, Menlo Park, Calif. Conservation Div.; and William Spangle and Associates, Portola Valley, Calif.
For primary bibliographic entry see Field 4A.
W77-11871

CHICAGO METROPOLITAN FLOODWATER MANAGEMENT PLAN,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 4A.
W77-12162

6G. Ecologic Impact Of Water Development

GUIDEBOOK TO GEOLOGIC AND BEACH FEATURES OF THE RACHEL CARSON SALT POND AREA, NEW HARBOR, MAINE,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
For primary bibliographic entry see Field 2L.
W77-11656

NEW ENGLAND OFFSHORE MINING ENVIRONMENTAL STUDY (PROJECT NOMES),
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2L.
W77-11660

NEW YORK BIGHT PROJECT. PROJECT DEVELOPMENT PLAN AND TECHNICAL DEVELOPMENT PLAN.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W77-11661

PROCEDURES FOR THE EVALUATION OF ENGINEERING ALTERNATIVES,
Engineering-Science, Inc., Arcadia, Calif.
For primary bibliographic entry see Field 6B.
W77-11771

AN INVESTIGATION INTO ENVIRONMENTAL EFFECTS OF SEWAGE EFFLUENT REUSE AT THE KANE'OHE MARINE CORPS AIR STATION KLIPPER GOLF COURSE,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W77-11792

SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACTS OF COAL GASIFICATION AND LIQUEFACTION PLANTS,
AME Technology, Inc., Lexington, Ky.
R. G. Edwards, A. B. Broderson, and W. P. Hauser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 747, Price codes: A12 in paper copy, A01 in microfiche. Prepared for University of Kentucky Institute for Mining and Minerals Research, Lexington, Report IMMR14-GR2-76, April 1976, 269 p, 5 tab, 14 fig, 438 ref.

Descriptors: *Environmental effects, *Social aspects, *Economic impact, *Planning, Land use, Solid wastes, Sedimentation, Acid mine water, Water use, Land reclamation, Social change, Bibliographies.
Identifiers: *Coal gasification, *Coal liquefaction.

The water related impacts of a typical coal gasification and liquefaction plant include the use of 10-25,000 acre feet of water annually, with additional water required for the mine, land reclamation, and municipal growth. Adequate water supplies are essential. Water pollution concerns include acid mine drainage, leaching from buried wastes, leakage from the plant, and sedimentation from the large amounts of land disturbed. Disposal of up to 20,000 tons of ash, sulfur, sulfate sludges, mine tailings, and other solid wastes is a major concern. Socioeconomic balances will incur perhaps the greatest impacts. There will typically be 3,700 new jobs and 15,000 new people. Schools, roads, municipal facilities, and others may become overcrowded. Major planning will be required to convert the economy of affected areas from an energy to a nonenergy base to avoid a local depression in 20-30 years after the coal has been depleted. The land development which will occur for town areas, new services, and mine reclamation will create a need for area-wide land use planning. 25-60 megawatts of electricity will be required for the plant, and many more utilities will be required for new growth. These factors will create a complex siting problem. (Nessa-NC)
W77-11851

FINAL ENVIRONMENTAL IMPACT STATEMENT: AUBURN INTERCEPTOR (GREEN RIVER SEWERAGE AREA), KING COUNTY, WASHINGTON.
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5D.
W77-11861

COMPARATIVE UTILITY OF LANDSAT-1 AND SKYLAB DATA FOR COASTAL WETLAND MAPPING AND ECOLOGICAL STUDIES,
American Univ., Washington, D. C. Dept. of Biology; and Geological Survey, Reston Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-11874

NUTRIENTS IN THE NEUSE RIVER ESTUARY.
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-11886

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. NORTHEAST GULF OF ALASKA.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
Annual Reports Summary--1975. Report to the Bureau of Land Management based on studies through March 1976, May 1977. 298 p, 61 fig, 88 tab.

Descriptors: *Alaska, Water resources, *Environmental effects, *Baseline studies, Resources development, *Continental shelf, Water pollution.
Identifiers: *Outer Continental Shelf, *Resources availability, *Gulf of Alaska, Annual reports.

The first year's progress of an interdisciplinary environmental assessment program is summarized. The program, centered in the Northeast Gulf of Alaska, had two interrelated major objectives: to establish an environmental baseline in the region, against which development-related impacts might be detected and assessed, and to provide a basis for evaluating the primary impact of the petroleum development on the marine environment of the region. For the first year of the NEGOA program, emphasis was placed on the first two of these research categories. Research on contaminant effects was incorporated in the second year, following a period of preparation extending over several months. The results of first year studies are outlined in detail in this report. (Sinha-OEIS)
W77-11887

VLCC 'METULA' OIL SPILL,
Texas A and M Research Foundation, College Station.
For primary bibliographic entry see Field 5G.
W77-11889

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, CHEMICAL OCEANOGRAPHY.
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Atmospheric Labs.
For primary bibliographic entry see Field 5B.
W77-11896

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME I: AN OVERVIEW,
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
F. Parker, D. Brower, and D. Frankenberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 247, Price codes: A08 in paper copy, A01 in microfiche. North Carolina State University, Raleigh, Sea Grant Program Publication No. UNC-SG-76-05, April 1976. 166 p, 2 tab, 21 ref. SG-04-6-158-44054.

Descriptors: *Ecology, Lagoons, *Estuaries, *Barrier islands, *North Carolina, Coasts, Planning.
Identifiers: *Coastal zone management, *Ecological determinants.

Natural science information relating to the North Carolina coastal area is given in this report followed by policy and management implications of that information. Appendices are bound separately as Volume II of this report, but the table of contents is included in this volume for reference. For the purpose of analysis, two major environmental systems are identified: the barrier island system and the lagoon-estuary system. While each is dependent on the other, they may be described in terms of the processes which are most essential to each. The value of the coastal environments is dependent on their ability to function together as part of an overall system. This is the basic policy implication of North Carolina's Coastal Area Management Act and is the basis for recommending specific tools by which development in the coastal area may be guided or controlled. (See also W77-11898) (Sinha - OEIS)
W77-11897

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME II: APPENDICES,
North Carolina Univ. at Chapel Hill. Urban Services Center for Urban and Regional Studies.
D. Brower, F. Parker, D. Frankenberg, B. J. Copeland, and R. Alden.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 248, Price codes: A17 in paper copy, A01 in microfiche. North Carolina State University, Raleigh, Sea Grant Publication No. UNC-SG-76-05, April 1976. 426 p. SG- 04-6-158-44054.

Descriptors: *Coasts, *Ecology, *Resources development, *Regulation, *Baseline studies, North Carolina, Barrier islands, Lagoons, Estuaries, Taxes, Planning.
Identifiers: *Coastal zone Management, *Environmental regulations, Land acquisition, Policies.

Volume II of this report consists of two appendices: 'Ecological Determinants' and 'Tools and Techniques for Coastal Area Management'. Appendix one discusses the coastal ecological systems--barrier islands and lagoon-estuary systems. Appendix two describes the tools and techniques for coastal area management, namely, land acqusistion, public spending, taxation, development regulation, environmental regulations, and regulation of development in areas of environmental concern. (See also W77-11897) (Sinha - OEIS)
W77-11898

AN ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT: 6TH QUARTERLY REPORT.
National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-11899

A STUDY ON THE EFFECTS OF MAINTENANCE DREDGING ON SELECTED ECOLOGICAL PARAMETERS IN GULFPORT HARBOR, MISSISSIPPI.
Water and Air Research, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5C.
W77-11901

APPLICATION OF LANDSAT-2 TO THE MANAGEMENT OF DELAWARE'S MARINE AND WETLAND RESOURCES,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W77-11903

7. RESOURCES DATA

7A. Network Design

METHODOLOGY FOR EVALUATING THE COST OF URBAN STORMWATER QUALITY MANAGEMENT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W77-12075

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va. Water Resources Div.
M. E. Moss.
Hydrological Sciences Bulletin, Vol 21, No 1, p 113-127, March 1976. 2 fig, 3 tab, 11 ref.

Descriptors: *Network design, Data collections, *Surface waters, *Regression analysis, *Regional analysis, Project planning, Methodology, Costs, Probability, Feasibility studies, Decision making.
Identifiers: *Bays theorem.

The concept of equivalent years of record, a measure of parameter accuracy, in conjunction with regression analysis simulation leads to a methodology for specifying sets of numbers of gaging stations and lengths of record required to attain a prespecified level of regional streamflow-parameter accuracy. This methodology can be used in network design to identify the number of stations and length of record that is the least cost network that meets the accuracy criteria. The methodology also indicates situations in which the criteria cannot be met without improving the underlying regionalization model. (Woodard-USGS)
W77-12154

7B. Data Acquisition

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 10C.
W77-11594

RAIN RESULTING FROM MELTING ICE PARTICLES,
Arizona Univ., Tucson. Inst. of Atmospheric Physics.
For primary bibliographic entry see Field 2B.
W77-11597

MODEL OF THE DISTURBANCES IN HYDROLOGICAL SEQUENCES BASED ON THE METHOD OF DEMODULATION,
Karlova Universita, Prague (Czechoslovakia).
For primary bibliographic entry see Field 2E.
W77-11602

A MODIFIED MERCURY TENSIOMETER,
Ministry of Agriculture and Natural Resources, Nicosia (Cyprus). Dept. of Water Development.
For primary bibliographic entry see Field 2G.
W77-11615

AN ULTRASONIC NEBULIZATION TECHNIQUE FOR ADDING AQUEOUS SOLUTIONS UNIFORMLY TO DRY SOILS,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 2G.
W77-11616

REMOTE SENSING OF WATER DEMAND INFORMATION,
California Univ., Santa Barbara. Dept. of Geography.
For primary bibliographic entry see Field 6D.
W77-11635

REMOTE SENSING AND DEVELOPING COUNTRIES: POTENTIAL AND PROBLEMS IN THE TRANSFER OF TECHNOLOGY,
Clark Univ., Worcester, Mass. Graduate School of Geography.
For primary bibliographic entry see Field 6B.
W77-11639

RADIOACTIVITY IN MISSISSIPPI RIVER WATER,
Louisiana Water Resources Research Inst. Baton Rouge.
For primary bibliographic entry see Field 5A.
W77-11641

WASTEWATER FLOW MEASUREMENT IN SEWERS USING ULTRASOUND,
Milwaukee Sewerage Commission, Wis.
R. J. Anderson, S. S. Bell, W. H. Vander Heyden, and W. K. Genthe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 902, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-76-243, November 1976. 100 p, 50 fig, 7 ref, 4 append.

Descriptors: *Flow measurement, *Flowmeters, *Ultrasonics, *Combined sewers, *On-site tests, Instrumentation, Sewerage, Sewers, Flow rates, Flow control, Waste water treatment.
Identifiers: Ultrasonic flowmeter, Milwaukee(WI).

Accurate, reliable measurements of waste water flow are necessary to insure the efficient operation of a sewage system and to minimize outflow of raw sewage from a combined sewer system. A method for the measurement of sewage volume, depth, and velocity using ultrasonic probes has been investigated. Major elements in an ultrasonic metering system are the velocity meter, the height gauge, and an electronic signal processing unit. For the test conducted by the city of Milwaukee, costs for acquisition were considered sufficiently low for general use. Maintenance and installation requirements were not extraordinary. Depth measurements were accurate from 25% to full capacity in the sewer. Velocities were considered accurate over their full range at the test sites. Measurement interference was observed to be caused by entrained air, foam surfaces, and fluctuations in solids loading. It was suggested that existing flowmeters be used in conjunction with ultrasonic systems to further test the reliability of the ultrasonic probes. Recommendations for further investigations included the development of a portable monitoring unit, a method for operation in smaller line sizes (6-36 inch diameter), and a method for eliminating measurement interference. (Schulz-FIRL)
W77-11759

SELECTED APPLICATIONS OF INSTRUMENTATION AND AUTOMATION IN WASTEWATER-TREATMENT FACILITIES,
Raytheon Co., Portsmouth, R. I.
For primary bibliographic entry see Field 5D.
W77-11761

A CLOSING, REPLICATE-SAMPLE, SEDIMENT TRAP,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 2J.
W77-11802

AN ELECTRON MICROSCOPY STUDY OF PARTICULATES PRESENT IN INDIVIDUAL RAINDROPS,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Metallurgical and Materials Engineering.
For primary bibliographic entry see Field 2B.
W77-11821

COMPARATIVE UTILITY OF LANDSAT-1 AND SKYLAB DATA FOR COASTAL WETLAND MAPPING AND ECOLOGICAL STUDIES,
American Univ., Washington, D. C. Dept. of Biology; and Geological Survey, Reston Va. Water Resources Div.
R. Anderson, L. Alsid, and V. Carter.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Vol I-A. Report No NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, P 469-474, September 1975. 3 fig, 5 ref.

Descriptors: *Remote sensing, *Wetlands, *Coastal marshes, *Satellites(Artificial), *Mapping, Methodology, Evaluation, Photography, Ecosystems, Estuarine environment.
Identifiers: *Landsat-1 data, *Skylab, Digital data.

Skylab 190-A photography and LANDSAT-1 analog data have been analyzed to determine coastal wetland mapping potential as a near term substitute for aircraft data and a long term monitoring tool. The level of detail and accuracy of each was compared. Skylab data provides more accurate classification of wetland types, better delineation of freshwater marshes and more detailed analysis of drainage patterns. LANDSAT-1 analog data are useful for general classification, boundary definition and monitoring of human impact in wetlands. (See also W77-08408) (Woodard-USGS)
W77-11874

AUTOMATIC CATEGORIZATION OF LAND-WATER COVER TYPES OF THE GREEN SWAMP, FLORIDA, USING SKYLAB MULTISPECTRAL SCANNER (S-192) DATA,
Geological Survey, Tampa, Fla.; Geological Survey, Miami, Fla. Water Resources Div.; and Bendix Aerospace Systems Div., Ann Arbor, Mich.
A. E. Coker, A. L. Higer, R. H. Rogers, N. J. Shah, and L. Reed.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Vol I-A. Report No NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 479-506, September 1975. 9 fig, 3 tab, 9 ref.

Descriptors: *Remote sensing, *Wetlands, *Mapping, *Satellites(Artificial), *Florida, Photography, Hydrology, Swamps, Analytical techniques, Evaluation.
Identifiers: *Green Swamp(Fla), *Skylab data, Digital tape data.

The Green Swamp, the fountainhead of five major rivers, a broad flat wetland comprising 2,253 square kilometers (870 square miles) of the central highlands of the Florida peninsula was chosen as a Skylab Earth Resources Experiment Package (EREP) test site. This report summarizes the techniques used and the results achieved in the successful application of Skylab Multispectral Scanner (EREP S-192) high-density digital tape data for the automatic categorizing and mapping of land-water cover types in the Green Swamp. Data was provided from NASA Skylab pass number 10 on 13 June 1973. Significant results achieved included the automatic mapping of a nine-category and a three-category land-water cover map of the Green Swamp. The land-water cover map was used to make interpretations of a hydrologic condition in the Green Swamp. This type of use marks a significant breakthrough in the processing and utilization of EREP S-192 data. (See also W77-08408) (Woodard-USGS)
W77-11875

REMOTE SENSING OF OIL SLICKS WITH MICROWAVE RADIOMETER,
Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
For primary bibliographic entry see Field 5A.
W77-11891

LANDSAT OBSERVATIONS OF OCEAN DUMP PLUME MOVEMENT AND DISPERSION,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5B.
W77-11894

CIRCULATION OBSERVATIONS IN THE LOUISIANA BIGHT USING LANDSAT IMAGERY,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2L.
W77-11895

APPLICATION OF LANDSAT-2 TO THE MANAGEMENT OF DELAWARE'S MARINE AND WETLAND RESOURCES,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W77-11903

CHANGES IN AQUATIC MACROPHYTES ACCOMPANYING PHOSPHORUS REDUCTION IN A EUTROPHIC LAKE IN NEW YORK STATE: AN ASSESSMENT BASED ON REMOTELY SENSED AND OTHER DATA,
Cornell Univ., Ithaca, N.Y. Center for Environmental Research.
For primary bibliographic entry see Field 5A.
W77-11940

EVALUATION OF PORCELAIN CUP SOIL WATER SAMPLERS FOR BACTERIOLOGICAL SAMPLING,
Florida Univ., Gainesville. Dept. of Microbiology; and Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5A.
W77-11968

A METHOD OF PRECALIBRATING RE-OXYGENATION RATES IN EXPERIMENTAL CONTAINERS,
Colorado Cooperative Fishery Unit, Fort Collins.
W. J. McConnell, and U. T. Jackson.
Transactions of the American Fisheries Society, Vol. 105, No. 2, p 343-346, 1976. 2 fig., 5 ref.

Descriptors: *Design, *Methodology, Technology, *Oxygen, *Research equipment, Oxygenation, Oxygen demand, Oxygen requirements, Respiration, Dissolved oxygen, Laboratory equipment, *Calibration.
Identifiers: *Re-oxygenation rates, Precalibration procedure, Oxygen consumption.

A precalibration procedure was outlined that allowed sufficient re-oxygenation to balance oxygen demand in static containers used to hold small aquatic animals. The procedure was based on predicting the rate of controlled turbulence at which re-oxygenation balanced oxygen consumption at oxygen concentrations below saturation. (Klein)
W77-12051

AN EMERGENCY WATER SUPPLY FOR SMALL AQUARIUM SYSTEMS,
Puerto Rico Nuclear Center, Mayaguez.
K. W. Watters, and T. E. Prinslow.
Transactions of the American Fisheries Society, Vol 105, No 2, p 347-348, 1976. 1 tab, 1 ref.

Descriptors: *Aquaria, *Equipment, *Laboratory equipment, *Water supply, *Safety factors, Methodology, Aquiculture, Technology, Research facilities, Research and development, Design.
Identifiers: *Aquarium pumps, *Emergency water supply.

An emergency standby pumping system for small aquariums was described, which was independent of the main aquarium pumping system, has a self-contained power supply, and starts and resets automatically. (Katz)
W77-12061

EXTENDED FIELD USE OF SCREEN-COVERED THERMOCOUPLE PSYCHROMETERS,
Intermountain Forest and Range Experiment Station, Ogden, Utah.
For primary bibliographic entry see Field 2G.
W77-12116

NEW TECHNIQUE FOR MEASURING THE WATER POTENTIAL OF DETACHED LEAF SAMPLES,
Intermountain Forest and Range Experiment Station, Ogden, Utah.
R. W. Brown.
Agronomy Journal, Vol. 68, No. 2, p 432-434, March-April 1976. 4 fig, 7 ref.

Descriptors: *Evaporation, *Sampling, Leaves, Measurement.
Identifiers: Leaf water potential, *Leaf samples.

Evaporative losses and contamination in sample disks after they are cut from plant leaves often cause errors in measurements of water potential. A new technique for collecting detached leaf disks to measure water potential eliminates most of the errors associated with other methods. The leaf cutter contains a double-junction Peltier thermocouple psychrometer. When a leaf disk is removed from the plant, it can be sealed immediately against the cavity containing the psychrometer. (Skogerboe-Colorado State)
W77-12117

EVALUATION OF AN ELECTRONIC FOLIOMETER TO MEASURE LEAF AREA IN CORN AND SOYBEANS,
California Univ., Davis. Dept. of Land, Air and Water Resources.
J. L. Hatfield, C. D. Stanley, and R. E. Carlson.
Agronomy Journal, Vol. 68, No. 2, p 434-436, March-April 1976. 2 fig, 1 tab, 5 ref.

Descriptors: *Corn(Field), *Soybeans, Measurement, Instrumentation, Leaves.
Identifiers: *Leaf area measurement, Electronic foliometer, Measurement error.

Known areas were measured with an electronic foliometer to determine the errors involved with this instrument. Good agreement between measured and known areas was found and there was high accuracy and precision for both the conveyor belt and sheath method. Tests were made comparing the foliometer, a planimeter, and maximum length times maximum width (LW) for soybeans and comparing foliometer and LW for corn. There was close agreement between planimeter and foliometer measurements for soybeans ($r = 0.99$). The foliometer compared favorably with LW for corn ($r = 0.96$). Coefficients for converting LW measurements to leaf areas were determined for soybeans and three corn hybrids. (Skogerboe-Colorado State)
W77-12118

SIMULATION MODEL FOR NUTRIENT UPTAKE FROM SOIL BY A GROWING PLANT ROOT SYSTEM,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-12119

A SYSTEM AND PROGRAM FOR MONITORING CO2 CONCENTRATION, GRADIENT, AND FLUX IN AN AGRICULTURAL REGION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
N. J. Rosenberg, and S. B. Verma.
Agronomy Journal, Vol 68, No 2, p 414-418, March-April 1976. 3 fig, 6 ref.

Descriptors: *Photosynthesis, *Carbon dioxide, Nebraska, Sampling, Wind speed, Air temperature, Data collections, *Monitoring.

Because of the changing global concentration of carbon dioxide and the possible effects of this change on photosynthetic activity worldwide, a program has been developed for monitoring atmospheric carbon dioxide concentration and gradients representative of a large agricultural region. The program is carried out at Mead, Nebraska. A meteorological tower is equipped with sampling intakes at various elevations up to 16 m, through which air is drawn to the laboratory for analysis with infra-red gas analyzers. An automatic calibration system has been developed to permit hourly checks of analyzer performance. Profiles of wind speed and air temperature are also measured. The equipment, the calibration techniques, and the errors associated with the measurements of CO2 concentration and gradients are described. Some initial observations of CO2 concentrations an fluxes are presented. (Skogerboe-Colorado State)
W77-12120

ALGORITHM FOR SOLAR RADIATION ON MOUNTAIN SLOPES,
Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
L. W. Swift, Jr.
Water Resources Research, Vol 12, No 1, p 108-112, February 1976. 2 fig, 1 tab, 17 ref.

Descriptors: *Algorithms, *Solar radiation, Computer models, Model studies, Mountains, Slopes.
Identifiers: *Mountain slopes.

A generalized algorithm provides the daily total of potential solar radiation on any sloping surface at any latitude. The algorithm can be coded as subroutines of a computer model that requires solar radiation as a variable. The required inputs are Julian dates and the latitude, inclination, and aspect of the slope. In addition to computing potential solar radiation, the routine provides estimates of actual radiation on any slope on the basis of measured solar radiation for a nearby horizontal surface that has the same cloud cover. (Skogerboe-Colorado State)
W77-12135

SIMULTANEOUS PASSIVE AND ACTIVE MICROWAVE OBSERVATIONS OF NEAR-SHORE BEAUFORT SEA ICE,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 2C.
W77-12157

DEVELOPMENT OF ORGANIC SOLUTE AND TOTAL ORGANIC CARBON MONITORS,
Life Systems, Inc., Cleveland, Ohio.
For primary bibliographic entry see Field 5A.
W77-12199

DISPOSABLE ELECTRODE CHAMBER FOR MEASURING OPERCULAR MOVEMENTS OF FATHEAD MINNOWS,
Environmental Research Lab.-Duluth, Minn.
For primary bibliographic entry see Field 5A.
W77-12206

TEMPERATURE SAFETY DEVICE FOR AQUATIC LABORATORY SYSTEMS,
Environmental Protection Agency,-Duluth, Minn.
D. L. DeFoe.
The Progressive Fish-Culturist, Vol 39, No 3, p 131, 1977. 1 fig.

Descriptors: Design, *Design criteria, *Temperature, *Safety factors, *Research equipment, *Laboratory tests, *Temperature control, Research and development, Equipment, Methodology, Aquiculture.
Identifiers: *Temperature safety device.

A simple, inexpensive temperature safety device was described that stops water flow when the temperature-controlling system in aquatic rearing and holding facilities failed and set temperature limits were exceeded. The design criteria and operation of the device were given. (Katz)
W77-12207

ELECTRONIC CONTROLLER FOR PRODUCING CYCLIC TEMPERATURES IN AQUATIC STUDIES,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
P. R. Abell, L. B. Richardson, and D. T. Burton.
The Progressive Fish-Culturist, Vol 39, No 3, p 139-141, 1977. 1 fig, 2 tab, 6 ref.

Descriptors: *Equipment, Research and development, Design, *Research equipment, *Temperature, *Temperature control, *Electrical equipment, Electrical design, Equipment, Design criteria, Methodology, Laboratory tests, Aquiculture.
Identifiers: Cyclic temperatures, *Electronic temperature controller.

Construction of an electronic device for the production of sine wave cyclic temperatures in aquatic systems was described. The controller was assembled from readily available parts and provided reliable temperature oscillations. Applications and modifications were discussed. (Katz)
W77-12208

7C. Evaluation, Processing and Publication

HYDROGEOLOGY OF THE IOSEGUN LAKE AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W77-11587

HYDROGEOLOGY OF THE MOUNT ROBSON-WAPITI AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W77-11588

HYDROGEOLOGY OF THE WHITECOURT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W77-11589

LAKE ONTARIO ATLAS: CHEMISTRY,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 5C.
W77-11654

THE INVESTIGATION OF SEWER NETWORKS BY COMPUTER,
London Borough of Hammersmith (England). Directorate of Engineering.
For primary bibliographic entry see Field 5G.
W77-11670

SOME REMARKS ON COMPUTER MODELING OF COASTAL FLOWS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-11781

SPECIAL FLOOD HAZARD INFORMATION: ALAMEDA AND LAS CRUCES ARROYOS, LAS CRUCES, NEW MEXICO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W77-11834

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH JUNIATA RIVER,
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W77-11835

FLOOD PLAIN INFORMATION: BUFFALO CREEK, N.Y. IN THE TOWNS OF ELMA AND WEST SENECA.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W77-11836

FLOOD PLAIN INFORMATION: CAZENOVIA CREEK, NEW YORK, CITY OF BUFFALO AND TOWN OF WEST SENECA.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W77-11837

FLOOD PLAIN INFORMATION: RIVER ROUGE, MICHIGAN, MAIN, EVANS DITCH, AND FRANKLIN BRANCHES IN WAYNE AND OAKLAND COUNTIES.
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W77-11838

FLOOD PLAIN INFORMATION: UPPER RIVER ROUGE, FARMINGTON, MICHIGAN.
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W77-11839

FLOOD PLAIN INFORMATION: ATLANTA, TEXAS: BLACK BAYOU AND TRIBUTARIES.
Army Engineer District, New Orleans, LA.
For primary bibliographic entry see Field 4A.
W77-11840

FLOOD PLAIN INFORMATION: CHADAKOIN RIVER, JAMESTOWN-FALCONER, NEW YORK.
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W77-11841

FLOOD PLAIN INFORMATION: ANTELOPE CREEK, SECRET RAVINE AND TRIBUTARIES, ROCKLIN, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-11842

BLACKSMITH FORK AND SPRING CREEK FLOOD PLAIN INFORMATION, MILLVILLE, UTAH.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-11843

FLOOD PLAIN INFORMATION: ANDROSCOGGIN AND DEAD RIVERS, LEEDS, MAINE.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-11844

FLOOD PLAIN INFORMATION: MERRIMACK, SHAWSHEEN, AND SPICKET RIVERS, LAWRENCE, METHUEN, ANDOVER AND NORTH ANDOVER, MA.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-11845

FLOOD PLAIN INFORMATION: PENOBSCOT AND STILLWATER RIVERS, OLD TOWN AND MILFORD, MAINE.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-11846

FLOOD PLAIN INFORMATION: SACO RIVER, FRYEBURG, MAINE.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-11847

USER MANUAL FOR SEWER AND WATER ACCOUNTS PROCESSING MODULE.
For primary bibliographic entry see Field 5G.
W77-11856

WATER AND SEWER RATES IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6C.
W77-11868

COMPARATIVE UTILITY OF LANDSAT-1 AND SKYLAB DATA FOR COASTAL WETLAND MAPPING AND ECOLOGICAL STUDIES,
American Univ., Washington, D. C. Dept. of Biology; and Geological Survey, Reston Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-11874

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 2. SOUTHERN FLORIDA.
Geological Survey, Tallahassee, Fla. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 660, (2 books), Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report FL-75-2, May 1976. 1451 p, (two reports), 26 fig, 3 tab, 46 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.
Identifiers: Southern Florida.

Water resources data for the 1975 water year in south Florida are contained in two publications (pages 1 to 770 and pages 771 to 1451). The data consist of discharge records for 85 streams, stage-only records for 82 streams, elevations for 35 lakes, and daily water-level measurements for 239 wells. Water quality data for more than 400 surface-water sites and 600 wells are included. Also, included are miscellaneous measurement, flood profile and crest-stage partial records. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W77-11876

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 1. NORTHERN FLORIDA.
Geological Survey, Tallahassee, Fla. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 659, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report FL-75-1, June 1976. 769 p, 36 fig, 5 tab, 46 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.
Identifiers: Northern Florida

Water resources data for Florida, for the 1975 water year, are in three volumes as follows: Volume 1. Northern Florida; Volume 2. Southern Florida which contains Vol 1 (pages 1 to 770) and Vol 2 (pages 771 to 1451); and Volume 3. West-Central Florida. This volume for northern Florida consists of discharge records for 100 streams, stage-only records for one stream, elevations for 47 lakes, and daily water-level measurements for 274 wells. Water quality data for more than 125 surface-water sites and 300 wells are included. Also, included are miscellaneous measurement and crest-stage partial records. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W77-11877

POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT, NORTH FLORIDA, MAY 1976.
Suwannee River Water Management District, Fla.; and Geological Survey, Tallahassee, Fla. Water Resources Div.
D. W. Fisk, and J. C. Rosenau.
Water Resources Investigation 77-1 (open-file report), 1977. 1 sheet.

Descriptors: *Aquifers, *Potentiometric level, *Observation wells, *Mapping, *Contours, Florida, Gulf coastal plain, Water levels, Hydrogeology.
Identifiers: *North-Central Florida, *Floridan aquifer, Suwannee River Water Management District.

A map showing the potentiometric surface of the Floridan aquifer was prepared for that area north and west of Gainesville to near Tallahassee, Florida. Contoured at 10-foot (3.048-meter) intervals and at a scale of 1:500,000, the map illustrates the altitude to which water would rise in tightly cased wells that tap the aquifer as of May 1976. The sites of observation wells used as control are shown. The potentiometric surface slopes southwest toward the Gulf of Mexico and to the Suwannee River and its tributary, the Santa Fe River. (Woodard-USGS)
W77-11878

DIGITAL MODEL ANALYSIS OF THE PRINCIPAL ARTESIAN AQUIFER, SAVANNAH, GEORGIA AREA,
Geological Survey, Doraville, Ga. Water Resources Div.
H. B. Counts, and R. E. Krause.
Water-Resources Investigations 76-133 (open-file report), 1976. 4 sheets, 19 ref.

Descriptors: *Model studies, *Artesian aquifers, *Aquifer systems, *Hydraulic models, *Maps, Data collections, Water level fluctuations, Pumping, Drawdown, Water management(Applied), Evaluation, Projections, *Georgia.
Identifiers: *Savannah area(Ga).

A digital model of the principal artesian aquifer has been developed for the Savannah, Georgia, area. The model simulates the response of the aquifer system to various hydrologic stresses. Model results of the water levels and water-level changes are shown on maps. Computations may be extended in time, indicating changes in pumpage were applied to the system and probable results calculated. Drawdown or water-level differences were computed, showing comparisons of different water management alternatives. (Woodard-USGS)

W77-11879

HYDROLOGIC UNIT MAP--1974, STATE OF LOUISIANA.
Geological Survey, Reston, Va. Water Resources Div.
Available from U.S. Geological Survey, Reston, VA, 22092, price $1.25. Hydrologic Unit Map of Louisiana, 1977. 1 sheet.

Descriptors: *Maps, *Hydrology, *Louisiana, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(La), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Louisiana that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-11880

HYDROLOGIC UNIT MAP--1974, STATE OF ARKANSAS.
Geological Survey, Reston, Va. Water Resources Div.
Available from U S Geological Survey, Reston, VA., 22092, price $1.00. Hydrologic Unit Map of Arkansas, 1977. 1 sheet.

Descriptors: *Maps, *Hydrology, *Arkansas, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Ark), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Arkansas that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-11881

HYDROLOGIC UNIT MAP--1974, STATE OF KENTUCKY.
Geological Survey, Reston, Va. Water Resources Div.
Available from U.S. Geological Survey, Reston, VA., 22092, price $1.25. Hydrologic Unit Map of Kentucky, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Kentucky, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Ky), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Kentucky that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-11882

HYDROLOGIC UNIT MAP--1974, STATE OF MISSISSIPPI.
Geological Survey, Reston, Va. Water Resources Div.
Available from U.S. Geological Survey, Reston, VA., 22092, price $1.25. Hydrologic Unit Map of Mississippi, 1977. 1 sheet.

Descriptors: *Maps, Hydrology, *Mississippi, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Miss), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Mississippi that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Countil for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-11883

HYDROLOGIC UNIT MAP--1974, STATE OF TENNESSEE.
Geological Survey, Reston, Va. Water Resources Div.
Available from U.S. Geological Survey, Reston, VA. 22092, price $1.00. Hydrologic Unit Map of Tennessee, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Tennessee, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Tenn), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Tennessee that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-11884

HYDROLOGIC UNIT MAP--1974, STATE OF MISSOURI.
Geological Survey, Reston, Va. Water Resources Div.
Available from U.S. Geological Survey, Reston, VA. 22092, price $1.25. Hydrologic Unit Map of Missouri, 1977. 1 sheet.

Descriptors: *Maps, *Hydrology, *Missouri, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Mo), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Missouri that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. the Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-11885

DIGITAL SIMULATION OF A DRAINAGE BASIN,
Madras Univ., Guindy (India). Dept. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 2A.
W77-12082

DESIGNING CONCEPTUAL CATCHMENT MODELS FOR AUTOMATIC FITTING METHODS,
Ministry of Works, Wellington (New Zealand).
For primary bibliographic entry see Field 2A.
W77-12084

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1977.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-12151

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7A.
W77-12154

HYDROLOGIC DATA FOR NORTH CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, Tex. Water Resources Div.
C. C. Kidwell.
Open-file report 76-724, April 1977. 50 p, 2 fig, 3 tab.

Descriptors: *Hydrologic data, *Small watersheds, *Rainfall-runoff relationships, *Streamflow, *Flood control, *Texas, Storms, Flood protection, Watershed management, Gaging stations, Flow rates.
Identifiers: *North Creek(Tex), *Trinity River basin(Tex).

This report contains the rainfall, runoff, and storage data collected during the 1975 water year for the 21.6-square-mile area above the streamgaging station North Creek near Jacksboro, Texas. The weighted-mean rainfall in the study area during the water year was 39.01 inches, which is greater than the 18-year average of 30.21 inches for the period 1958-75. Monthly rainfall totals ranged from 1.04 inches in November to 7.94 inches in May. The mean discharge for 1975 at the

stream-gaging station was 5.98 cfs, compared with the 14nyear (1957-70) average of 5.75 cfs. The annual runoff from the basin above the stream-gaging station was 4,330 acre-feet or 3.76 inches. Three storms were selected for detailed computations for the 1975 water year. The storms occurred on Oct. 30-31, 1974, May 2, 1975, and Aug. 26, 1975. Rainfall and discharge were computed on the basis of a refined time breakdown. Patterns of the storms are illustrated by hydrographs and mass curves. A summary of rainfall-runoff data is tabulated. There are five floodwater-retarding structures in the study area. These structures have a total capacity of 4,425 acre-feet below flood-spillway crests and regulate streamflow from 16.3 square miles, or 75 percent of the study area. A summary of the physical data at each of the floodwater-retarding structures is included. (Woodard-USGS)
W77-12155

MAXIMUM FLOODFLOWS IN THE CONTERMINOUS UNITED STATES,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. R. Crippen, and C. D. Bue.
For sale by Supt. of Documents, GPO. Washington DC 20402, price $1.70. Water-Supply Paper 1887, 1977. 52 p, 19 fig, 1 tab, 4 ref.

Descriptors: *Floods, *Peak discharge, *Maximum probable flood, *United States, Gaging stations, Streamflow, Flow rates, Drainage area, Hydrologic data, Data collections.
Identifiers: *Conterminous United States.

Peak floodflows from thousands of observation sites within the conterminous United States were studied to provide a guide for estimating potential maximum floodflows. Data were selected from 883 sites with drainage areas of less than 10,000 square miles (25,900 square kilometers) and were grouped into regional sets. Outstanding floods for each region were plotted on graphs, and envelope curves were computed that offer reasonable limits for estimates of maximum floods. The curves indicate that floods may occur that are two or three times greater than those known for most streams. (Woodard-USGS)
W77-12156

SUBSURFACE DRAINAGE COST AND HYDROLOGIC MODEL,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W77-12166

8. ENGINEERING WORKS

8A. Structures

DUAL TECHNOLOGICAL SYSTEMS IN WATER AND GRAIN STORAGE,
Wunderman Foundation, New York.
For primary bibliographic entry see Field 6B.
W77-11638

8B. Hydraulics

STATISTICAL PROCEDURES FOR BED FORM ANALYSIS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
K. Mahmood, and H. Ahmadi-Karvigh.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-260 642, Price codes: A11 in paper copy, A01 in microfiche. Report CER75-76KM-HAK41, July 1976. 247 p, 46 fig, 6 tab, 35 ref. NSF ENG72-00274 OIP75-15976.

Descriptors: *Streambeds, *Profiles, *Channel morphology, *Data processing, *Alluvial channels, Statistics, Computer programs, Potamology, Roughness(Hydraulic), Foreign countries, Foreign research, Waves(Water).
Identifiers: *Bed ripples, *Pakistan, *Bed forms, Streambed profiles.

Procedures were outlined for preprocessing of data for spectral and zero crossing analyses of bed form wave characteristics. Methods of testing the statistical distribution of wave characteristics in a record also were included. Data on bed form characteristics from alluvial rivers were collected from link canals of Pakistan. The bed forms were mapped with single and multiple transducer ultrasonic sounders. The bed form data thus collected presented a wide range of wavelengths. The smaller waves of the order of few flow depths are important in the context of resistance to flow. To isolate the bed forms related to individual phenomena and to measure their characteristics, it was necessary to detrend and to filter the data before analyzing for wave characteristics. The application of the methodology developed was illustrated by using the link canal data. Computer programs were included with user's manual. (Bhowmik-ISWS)
W77-11582

BREAKING WAVE CRITERION ON A SLOPING BEACH,
Naval Postgraduate School, Monterey, Calif.
R. M. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 323, Price codes: A05 in paper copy, A01 in microfiche. Master's Thesis, Sept. 1976. 97 p, 14 fig, 1 tab, 42 ref, 2 append.

Descriptors: *Waves(Water), *Shallow water, *Hydrodynamics, *Beaches, *Velocity, Slopes, Laboratory tests, Equations, Mathematical studies.
Identifiers: *Wave theory, *Braking waves, Perturbation technique, Long waves.

The various wave theories, theoretical breaking criteria, and derived breaking criteria were reviewed for shallow water waves. To account for the nonlinear hydrodynamics present in a shallow water wave breaking on a beach with a sloping bottom, the perturbation technique of Iwagaki and Sakai was used to derive a second order expression for the horizontal water particle velocity for long waves. The kinematic breaking criterion was applied to the derived wave phase speed and horizontal water particle velocity values to establish breaking. The results indicated that the ratios of elevation of free surface referenced to still water level at breaking point to deep water wave length (N sub b/L sub o) and the depth of water referenced to still water level at breaking point to deep water wave height (h sub b/H sub o) provide reliable breaking criteria. Each of the parameters was dependent only upon beach slope and H sub o/L sub o. Theoretically derived values for h sub b/H sub o compared favorably with field measurements and offered improvement over previous theory. Predicted breaking depths were less than those present in experimental data, susggesting extension to higher orders may be warranted. (Bhowmik-ISWS)
W77-11585

FINAL REPORT OF THE TASK COMMITTEE ON BRANCHING CONDUITS,
American Society of Civil Engineers, New York.
J. V. Williamson, T. J. Rhone, E. Reeves, and J. R. Villemonte.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY7, Proceedings Paper 13082, p 681-684, July 1977.

Descriptors: *Junctions, *Pipe flow, *Energy loss, *Abstracts, Pipelines, Flow, Flow resistance, Hydraulics, Flow friction, Conduits, Publications.
Identifiers: *Branching conduits, Manifolds.

This report presented a final summary of the Task Committee on Branching Conduits and was intended to provide reference to the publications resulting from the committee's work. The purposes of investigations on branches are basically to determine energy losses; pressure fluctuations including cavitation; and the relation of hydraulic losses to structural considerations in large conduits, particularly as they influence the overall economics. Generally, losses at branches are relatively minor, but they become significant under certain conditions, such as low-head cooling water systems in power plants, and in hydroelectric conduits where the value of power is considerable. In these cases, individual efforts are made to reduce losses by modifying the branches. On the other hand, heating and air conditioning systems usually consist of a variety of standard ducts and bends selected and assembled to meet a particular specification. Higher losses often are tolerated in the interest of ease of manufacture or assembly. The results from the investigations and research conducted by the Task Committee were presented in six papers published by ASCE. (See also W71-10178, W73-10608, and W75-08805-W75-08807) (Humphreys-ISWS)
W77-11590

SOME BASIC CONCEPTS ON FLOW IN BRANCHING CONDUITS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
J. R. Villemonte.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY7, Proceedings Paper 13051, p 685-697, July 1977. 5 fig, 27 ref, 1 append.

Descriptors: *Junctions, *Pipe flow, *Energy loss, Estimating, Head loss, Roughness(Hydraulic), Flow friction, Pipelines, Conduits, Flow resistance, Analytical techniques, Theoretical analysis, Moody resistance diagrams, Laminar flow, Turbulent flow, Flow, Hydraulics, Transitional flow, Laboratory equipment.
Identifiers: *Branching conduits, Manifolds.

Phenomenological explanations were given of the mechanisms associated with 'nondisturbed' and 'disturbed' flows in branching conduits, as well as straight ducts. Four categories of flow conditions were defined, covering situations ranging from deep in the laminar regime (R less than 10) to high in the complete turbulent regime. Analytical concepts were reviewed, and guidelines were presented for the construction of a standardized laboratory test apparatus. Protocols were presented to aid the design engineer in the calculation of energy losses in pipe flow resulting from fittings, with particular reference to the combining and dividing flows for pipe tees, branches, and manifolds. (See also W71-10178, W73-10608, and W75-08805-W75-08807) (Humphreys-ISWS)
W77-11591

TURBULENT FLOW IN VERY NONCIRCULAR CONDUIT,
Research Council of Alberta, Edmonton. Transportation and Surface Water Engineering Div.
R. Gerard, and W. D. Baines.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY8, Proceedings Paper 13105, p 829-842, August 1977. 8 fig, 14 ref, 2 append.

Descriptors: *Boundary processes, *Turbulence, *Velocity, *Shear drag, *Reynolds number, Laboratory tests, Analytical techniques, Hydraulics, Pipe flow, Measurement.
Identifiers: *Secondary flow, Noncircular conduit, Boundary shear.

Secondary flows in noncircular conduits affect the average flow velocity. The inclusion of secondary

lows in the case of a square duct eliminates the lifference between measured and predicted verage flow velocity. A laboratory experiment vas conducted to measure the friction factor ariation with Reynolds number and the mean elocity and boundary shear distributions for a mooth conduit having a cross section similar to hat formed between circular rods stacked in a quare pattern. This section has a considerable hape effect because of the cusped corners. Head oss measurements indicated significant difference etween the friction factor in the conduit shape nd the friction factor in a circular pipe. The elocity distributions along normals to the wall fol-owed the universal distribution reasonably well. The observed velocity and boundary shear dis-ributions were compared with those calculated or the conduit shape using a finite element al-gorithm neglecting secondary flow effects. The lifference between the measured and the calcu-ated velocity distributions was used to estimate he magnitude of the secondary flow in the conduit hape. (Singh-ISWS)
W77-11592

NUMERICAL MODEL FOR DISCRETE SET-TLING,
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
H. Z. Sarikaya.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY8, Proceedings Paper 13150; p 865-876, August 1977. 5 fig, 11 ref, 2 append.

Descriptors: *Dispersion, *Sedimentation, *Turbulence, Numerical analysis, Settling basins, Foreign research, Velocity, Open channel flow, Uniform flow, Sediment transport.
Identifiers: *Discrete settling, Stability analysis, Isotropic turbulence, Logarithmic velocity distribution.

A numerical method of solution was given for the differential equation describing the discrete set-tling in two-dimensional uniform and turbulent open-channel flow. Stability condition of the finite difference equations was derived by applying linear stability analysis. By neglecting the effect of longitudingal turbulent diffusion, settling efficien-cy generally is expressed in terms of two indepen-dent variables. Further, it is assumed that turbu-ence is isotropic and solid particles behave like a fluid mass. Three sets of solutions were obtained for uniform, logarithmic, and parabolic velocity distributions in vertical direction. However, the results of the last two were given graphically. In the case of uniform velocity distribution, results of numerical solution were compared with Camp's solutions, and high accuracy was obtained. The ef-fect of turbulence and velocity distribution was shown. Solutions obtained for the logarithmic velocity distribution, which was verified experi-mentally, were suggested for practical applica-tions. (Singh-ISWS)
W77-11593

BEHAVIOR OF AUXILIARY INTAKE OF RAM-GANGA DAM AT LOW LEVELS,
Irrigation Commission, Lucknow (India). Design and Research.
H. Mohan, H. D. Sharma, D. V. Varshney, and S. S. Tiagi.
Journal of the Hydraulics Division, Proceedings, American Society of Civil Engineers, Vol. 103, No. HY7, Proceedings paper 13091, p 753-762, July 1977. 6 fig.

Descriptors: *Trash racks, *Intakes structures, *Hydraulics, *Model studies, *Dams, Reservoir operation, Diversion tunnels, Air entrainment, Hydraulic valves, Irrigation water, Foreign coun-tries, Foreign research.
Identifiers: *Ramganga Dam(India), *India, Hemi-spherical trash-racks, Auxiliary intake.

One of the diversion tunnels at the Ramganga Dam, 418 ft high earth and rock fill dam in Uttar Pradesh, was designed to be used as a low-level auxiliary outlet for irrigation releases during the closure period of the powerhouse or for other reasons depleting the reservoir below the dead storage level. The intake structure is provided with a hemispherical trash-rack weighing 8 tons, and vertical trash-racks are provided between the piers supporting the hemispherical rack. In June 1975, when the auxiliary outlet was being run, the hemi-spherical trash-rack was lifted up, displaced from its seat, and subsequently sucked into the tunnel. Model studies were conducted to investigate the causes of the trash-rack displacement and of the auxiliary intake behavior at low reservoir levels. The studies indicated that the release of air-water spouts resulting from escape of locked air in the tunnel through the intake shaft could have lifted up and displaced the rack. In order to avoid air entry into the tunnel, a regulation curve for valve operation was suggested to prevent such recur-rence in the future. (Singh-ISWS)
W77-11823

COMPUTATION OF BACKWATER AND DISCHARGE AT WIDTH CONSTRICTIONS OF HEAVILY VEGETATED FLOOD PLAINS,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.; Geological Survey, Columbus, Ohio. Water Resources Div.; Geological Survey, Jackson, Miss. Water Resources Div.; and Geolog-ical Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-12152

8C. Hydraulic Machinery

AXIAL-FLOW PUMPS FOR DEEP WATERS.
Mono Pumps Africa Pty Ltd. (South Africa).
Municipal Administration and Engineering, Vol 40, No 491, p 78-80, July 1976. 3 fig, 1 tab.

Descriptors: *Axial flow, *Pumps, Water resources, Groundwater, Boreholes, *Design criteria, Suspended solids, Centrifugal pumps, Comparison.

The use of small diameter boreholes to gain access to underground water supplies and the use of small diameter multi-stage pumps for lifting this water to the surface is an accepted practice. Design criteria include high efficiency, erosion resistance to sand and silt, constant flow characteristics, minimum maintenance and adjustment, and the ability of pump speeds to suit pole speeds of standard elec-tric motors. Axial flow pumps are discussed in detail and compared with centrifugal pumps. (So African Water Info Center)
W77-11550

VISCOSITY EFFECTS OF SLUDGE.
For primary bibliographic entry see Field 5E.
W77-11722

WATER TREATMENT PLANT DESIGN IS COST-EFFECTIVE,
Engineering-Science, Inc., Arcadia, Calif.
For primary bibliographic entry see Field 5D.
W77-11742

WAVE AND TIDE ACTUATED HYDRAULIC ELECTRICAL GENERATING APPARATUS,
C. S. Long, and J. Long.
U.S. Patent No 4,009,395, 7 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 955, no 4, p 1343, February 22, 1977.

Descriptors: *Patents, *Waves(Water), Tides, *Tidal powerplants, Tidal energy, Electrical powerplants, Floating, Equipment.

A wave and tide actuated hydraulic electrical generating apparatus includes a flotation chamber supported in a water containing basin area con-nected to a fluctuating water source, such as the tide and wave level of an ocean. The flotation chamber rises and falls with the changes in eleva-tion of the water in the basin. The chamber is linked by lever arms through suitable gear mechanisms to a multitude of piston rods as-sociated with a like number of hydraulic cylinders which are connected in hydraulic parallel relation-ship. The movement of the flotation chamber in an upward direction effects movement of the piston rods in a direction relative to the cylinders, and the movement of the flotation chamber in a downward direction effects movement of the piston rods in the opposite direction in their associated cylinders. This movement effects a pumping of hydraulic fluid to a hydraulic turbine to power it. The turbine in turn is connected to an electric generator. (Sinha-OEIS)
W77-11933

WAVE OPERATED POWER PLANT,
H. A. Mattera, P. F. Pitts, and M. M. Pitts.
U.S. Patent No 4,009,396, 5 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 955, no 4, p 1345, February 22, 1977.

Descriptors: *Patents, *Waves(Water), Ocean waves, Hydraulic systems, Turbine blades, Elec-tric power, Hydroelectric power.

A wave operated power plant is provided where a buoyant vessel is anchored on the ocean surface with wave motion causing displacement of water carried in a chamber in the hull so that upon rocking motion the water is forced upward through pipes on one side of the vessel. The water contacts turbine blades which through shafts rotate electri-cal generators and generate electricity. The water is returned to the chamber when the vessel moves in the opposite direction and the cycle is repeated with water forced up through pipes in the other side of the vessel, used for electrical generation and then returned to the chamber. The water being forced up from the chamber can contact the blades directly or be stored in a tank on top of the vessel and released at a predetermined rate. (Sinha-OEIS)
W77-11934

8E. Rock Mechanics and Geology

SCIENTIFIC INFORMATION IN THE DECI-SION TO DAM GLEN CANYON,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
P. C. Perkins.
Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-261 678, Price codes: A03 in paper copy, A01 in microfiche. Report NSF-RA-E-75-177, May 1975. 26 p, 80 ref. NSF GI34835.

Descriptors: *Streamflow, *Water quality, *Colorado River, *Evaporation, *Sedimentation, *Risks, Dam design, Dam foundations, Hydrol-ogy, Rock mechanics, Foundation failure, Utah.
Identifiers: *Glen Canyon Dam, *Navajo sand-stone, *Lake Powell(Utah).

Scientific issues considered during the debate preceding authorization of Glen Canyon Dam in-cluded: (1) streamflow--uncertainties in the future flow of the Colorado; (2) geological foundation of the dam site--weakness of the Navajo sandstone, particularly when exposed to water, would require the design of a dam with low bearing pressure on the rock abutments; (3) suitability of Chinle shale to contain a reservoir, due to its propensity for slumping; (4) evaporation--large reservoirs, needed to store water in the desert, would evaporate more water with greater surface area;

(5) sedimentation–reservoirs would fill with silt possibly at rates significantly rapid compared with their anticipated economic lifetimes; and (6) water quality–developments in the Upper Colorado Basin could worsen water qualtiy downstream. In addition, one physical science issue raised during the 1950's was that of bank storage. It was debated whether very large amounts of water might leave the Glen Canyon reservoir and enter the banks due to the high porosity of the Navajo sandstone walls. (Singh-ISWS)
W77-11583

8F. Concrete

CONCRETE PROPERTIES AT OCEAN DEPTHS,
Civil Engineering Lab. (Navy), Port Hueneme, Calif. Ocean Structures Div.
H. H. Haynes, and R. S. Highberg.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WW4, p 455-470, November 1976. 12 fig, 3 tab, 19 ref.

Descriptors: *Underwater, *Construction, *Absorption, *Permeability, *Compressive strength, Oceans, Pore water, Pressure.
Identifiers: *High strength concrete, *Offshore structures, *Ocean engineering, Concrete properties, Triaxial tests, Research.

Reported herein are the results of three studies on seawater absorption and compressive strength of 6-in. x 12-in. (152-mm x 305-mm) concrete control cylinders subjected to simulated ocean conditions, and on the long-term permeability of concrete spheres in the ocean at depths to 4,200 ft (1,280 m). The first study determined that seawater absorption of field-dry concrete was 2.36% by weight after exposure to a pressure head of 550 ft. (168m) for 84 days. The second study determined that the uniaxial compressive strength of concrete saturated and tested under a pressure head of 20,000 ft (6,100 m) decreased by 10% when compared with the compressive strength of fog-cured concrete. Concrete under 1 ft and 500 ft (0.3 m and 152 m) pressure heads had a compressive strength similar to that of fog-cured concrete. The third study reports interim data from an ongoing 10-year investigation of the permeability of concrete spheres placed in the ocean. (Bell-Cornell)
W77-11779

8G. Materials

PLASTIC PIPES IN SEWERAGE AND DRAINAGE,
K. R. Hart.
Plastics Southern Africa, Vol 4, No 5, p 34-55, February 1975. 1 tab.

Descriptors: *Plastic pipes, Pipelines, Plumbing, Design criteria, Pipe dimensions, Conduits, Water conveyance, Domestic plumbing, Water pressure, Design standards, Drainage, Standard specifications, Corrosion, Pressure pipes, Waste water treatment.

Four different plastics are in current use throughout the world for sewerage and drainage systems. viz. high-density polyethylene (HDPE), polypropylene (PP), acrylonitrille-butadiene-styrene (ABS) and uplasticized polyvinyl chloride (UPVC). SABS specifications have been drawn up for UPVC pipes for soil and vent, waste, sewer, pressure and drainage piping, choosing pipe dimensions wherever possible from the table for pressure pipes. Colour codes for different applications are:-white for sewers, grey for waste, blue for potable water, green for agricultural purposes and black for electrical conduit. Today more than 50% of new soil, vent and waste pipe installations are done with the UPVC pipes. The design of pipes and fittings and methods of jointing are discussed in detail. UPVC sewer pipes are compared with the ideal standards, covering cost per unit, strength, inertness, impact and abrasion resistance, weight, friction coefficient, availability, leak-proof joints, and trouble-free use. New developments in the plastic pipe field include helically wound pipes with reinforced plastic or steel ribs built into the helix, thin-walled concentric pipes with the intervening space filled with concrete, and pipes made from glass-reinforced polyester resin mixed with sand. (So African Water Info Center)
W77-11554

ROOF DRAINAGE OF LARGE BUILDINGS IN SOUTH AFRICA,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 3B.
W77-11555

BALL CLEANING OF SEWER PIPES,
National Building Research Inst., Pretoria (South Africa).
L. C. Miles, and A. M. Murdoch.
Municipal Engineer, Vol. 7, No. 3, p 89-93, 1976. 5 fig, 2 tab.

Descriptors: *Sewers, *Pipelines, Maintenance, *Cleaning, Equipment, Hydrostatic pressure, Hydraulic head.
Identifiers: South Africa.

Cleaning tests have been carried out by the National Building Research Institute, using sewer cleaning balls imported from the USA and the results have confirmed the claims made by American sewer authorities about the efficiency and economy of this cleaning method. In sewer ball cleaning, the ball, which is made of tough rubber and is inflatable, is placed in the sewer to be cleaned. This restricts the sewer flow and a hydraulic pressure builds up behind the ball, propelling it along the line. Debris in the line is moved along ahead of the ball while water escaping past the ball has a scouring effect on the pipe. The passage of the ball along the sewer is controlled by a cable attached to a lug on its upstream face. The tests show that this cleaning method is effective and inexpensive. It is especially suitable for maintenance cleaning programmes and for testing the integrity of sewers, because of the speed at which the ball can pass through a pipeline. (So African Water Info Center)
W77-11566

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 10C.
W77-11594

ADEQUACY OF DREDGING METHODS AND EQUIPMENT IN THE UNITED STATES FOR MAINTENANCE OF NAVIGABLE WATERS,
American Society of Civil Engineers, New York. Committee on Waterways of the Waterway, Port, Coastal and Ocean Div.
W. L. Black, D. R. Basco, T. D. Burke, A. P. Crouse, and A. W. Mohr.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW3, Proceedings Paper 13146, p 349-372, August 1977. 1 fig, 10 tab, 9 ref, 1 append.

Descriptors: *Dredging, *Spoil banks, *Navigable waters, *United States, Canals, Channels, Construction equipment, Harbors, Transportation, Earth handling equipment, Excavation, Materials, Slurries, Equipment.
Identifiers: *Dredges, *Excavating equipment, Dredging fleet.

The Task Committee reviewed the dredging fleet of the United States (both Federally and privately owned) to determine the fleet's usage rate and adequacy. Basic information and needs, such as type of material disposal, new dredging parameters, and environmental concerns, were documented. The dredging fleet was not able to meet the above mentioned needs or to fill the current need for operations in exposed waters and for beach nourishment. Generally, there were insufficient hopper and sidecasting dredges (entirely Government owned). The dustpan and mechanical dredge fleet was adequate to cope with existing and foreseeable requirements. Pipeline dredges were only about 50% in capacity (predominantly privately owned) and were in need of modernization. (Roberts-ISWS)
W77-11595

8I. Fisheries Engineering

COMPOSITE SAMPLING METHOD AND SYSTEM,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 5A.
W77-11920

SOLID-STATE ENVIRONMENTAL CONTROLLER FOR AQUACULTURE SYSTEMS (SECAS),
Oceanic Inst., Waimanolo, Hawaii.
S. Ribakoff, and C. Pelton.
The Progressive Fish Culturist, Vol. 39, No. 3, p 109-111, 1977. 3 fig, 4 ref.

Descriptors: *Aquiculture, *Fish management, *Equipment, *Control systems, *Design, *Research and development, Environmental control, Aquaria, Monitoring, Regulation, Salinity, Photoperiodism, Fish farming, Fish food organisms, Fish handling facilities, Mullets, Larvae, Phytoplankton.
Identifiers: Solid-state environmental controller, *Striped Mullet, Mugil cephalus.

The development and operation of a solid-state environmental controller that was designed to be used in conjunction with facilities for rearing larval striped mullet (Mugil cephalus), was described. The unit monitored and automatically regulated photoperiod, salinity, and phytoplankton population. (Klein)
W77-12018

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

1975-1976, ANNUAL REPORT, WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 9D.
W77-11794

9D. Grants, Contracts, and Research Act Allotments

1975-1976, ANNUAL REPORT, WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 322, Price codes: A04 in paper copy, A01 in microfiche. Report UNC-WRRI-76-00, (1976), 58 p. OWRT A-999-NC(50), 14-34-0001-6034.

Descriptors: *Water Resources Institute, Education, *Universities, *Colleges, *North Carolina, Training, *Projects, *Research and development.

The Water Resources Research Institute is The University of North Carolina's water research center. Located at N. C. State University at Raleigh, the Institute serves all sixteen campuses of The University of North Carolina System. It works closely with the Department of Natural and Economic Resources and other agencies in the formulation of a research program responsive to State water resource problems. A 29 member Advisory Committee representative of State and Federal water agencies, industry, conservation, agriculture, local government, and the general public provides program guidance and review. The Institute's research program for FY 1975-76 was supported by an annual allotment and 17 matching grants from OWRT, USDI; a grant from EPA; matching State appropriations; and grants from the Division of Environmental Management, N. C. Department of Natural and Economic Resources. One research project was jointly supported by the Institute and the University of North Carolina Sea Grant Program. All senior colleges and universities in North Carolina are eligible to participate in the Institute's program. During FY 1975-76, projects were conducted at N. C. State University, University of North Carolina at Chapel Hill, Duke University, East Carolina University, and University of North Carolina at Charlotte.
W77-11794

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

FINAL REPORT OF THE TASK COMMITTEE ON BRANCHING CONDUITS,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 8B.
W77-11590

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
E. B. Pickett, S. Vigander, J. C. Schuster, and L. J. Hooper.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY8, Proceedings Paper 13141, p 889-903, August 1977.

Descriptors: *Bibliographies, *Discharge measurement, *Discharge(Water), Reviews, Flow, Flow measurement, Measurement, Methodology, Publications, Information exchange, Information retrieval, Data collections, Instrumentation, Current meters, Velocity, Research and development.

The Task Committee's change relative to flow measurement included a review of techniques available, the encouragement of research in flow measurement, and the preparation of a final report. Two older published bibliographies concerning flow measurement are well known and generally available. The first, by Kolupaila covers the science and art of flow measurement from its historical beginnings to approximately 1960. The second, by Dowden, begins with the year 1950 and covers contributions to 1970. In 1970 during the tenure of the Task Committee, a symposium on hydrometry was held at Koblenz, Germany, under the auspices of the International Association of Hydrological Sciences. A 1975 paper published in the Transactions of the American Society of Mechanical Engineers also was referenced as a worthwhile evaluation of measurement methods. This bibliography will provide a ready reference for those engaged in utilizing and developing methods of hydrometry. (Froehlich-ISWS)
W77-11594

LAGOONS AND OXIDATION PONDS, (LITERATURE REVIEW),
Black and Veatch, Dallas, Tex.
For primary bibliographic entry see Field 05D.
W77-11714

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 05D.
W77-11729

DISINFECTION, (LITERATURE REVIEW),
Georgia Inst. of Tech. Atlanta.
For primary bibliographic entry see Field 05D.
W77-11730

THE WINTERS DOCTRINE: SEVENTY YEARS OF APPLICATION OF 'RESERVED' WATER RIGHTS TO INDIAN RESERVATIONS,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 06E.
W77-11787

SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACTS OF COAL GASIFICATION AND LIQUEFACTION PLANTS,
AME Technology, Inc., Lexington, Ky.
For primary bibliographic entry see Field 06G.
W77-11851

10F. Preparation Of Reviews

THE WINTERS DOCTRINE: SEVENTY YEARS OF APPLICATION OF 'RESERVED' WATER RIGHTS TO INDIAN RESERVATIONS,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 06E.
W77-11787

MODELING THE IMPACT OF STRIP MINING AND RECLAMATION PROCESSES ON QUALITY AND QUANTITY OF WATER IN MINED AREAS: A REVIEW,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 05C.
W77-11833

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